3D Modeling For Beginners

Learn everything you need to know about 3D Modeling!

Danan Thilakanathan

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Why I Wrote This Book

I wrote this book because I know the pain of learning 3D modeling when starting out and I wanted to share with you ways to make the process of learning 3D modeling easier. I know there are a number of great books out there that are helpful, but this may be a bit too expensive for those who just want to learn the basics and get a deeper understand of what 3D modeling involves. I wanted to create an educational resource that would be both affordable and helpful for 3D modelers who are just starting out and give them confidence to be able to tackle any 3D modeling project given to them.

Why You Should Read This Book

This book will help you get started with modeling in 3D. You will learn some important concepts about 3D modeling as well as some of the popular techniques used to generate any 3D model. I will share some of the “secrets” that have helped me become a better 3D modeler and ways to speed up your workflow. I have written this book in a way that minimizes jargon and is easy-to-understand even if you have never heard of 3D modeling. I have also written this book in a personable way and share some of my own experiences.

Practicing is one of the best ways to become better at any skill. Towards the second half of the book, I provide a number of exercises covering the creation of a variety of different 3D objects, which you can follow-along, to get practice and ultimately gain confidence in being able to tackle any 3D project with ease.

Although this book is designed for beginners, it is aimed to be a solid teaching resource. I’ll cover almost everything about 3D modeling. There are 12 chapters and over 200 pages of helpful advice, lessons and exercises that is solely aimed at making you a better 3D modeler.

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Chapter 1. Introduction

So you want to become a 3D modeler? Great choice! 3D modeling can be really fun and on top of that, there are a bunch of great perks of being a 3D modeler. But I'll cover that a little later in the book. Even if you do not wish to be a 3D modeler, you can make full use of learning 3D modeling skills as a stepping stone leap onto bigger and perhaps, more ambitious projects like film and game development.

This book aims to teach you the necessary fundamentals to 3D modeling as well as some popular industry techniques that are used to create nearly every type of 3D model. In other words, we will learn the techniques to modeling furniture, trees and terrains, mountains, high-detailed characters and low-poly models to name a few. By learning to create nearly every type of 3D model, you will gain confidence in tackling any given 3D modeling task with ease. I know the pain of learning 3D modeling. Especially when starting out. Creating even the simplest of 3D objects can seem like solving the Rubik's cube. Unless you're already good at solving the Rubik's cube, that is. I truly hope this book helps you in your path to becoming a successful 3D modeler.

Throughout this book, I will assume you know little to nothing about 3D modeling. Technical jargon will be reduced to a minimum. And whenever I use them, I aim to provide the simplest explanations possible. If you are more experienced with 3D modeling, please refrain from throwing this book away. There are more advanced contents covered in the book which may be of use to you. Since I've assumed you know nothing about 3D modeling, let's start right from the beginning and learn what exactly 3D modeling is.

What is 3D Modeling

Just doing a few Google searches and checking up on some books, *3D modeling is generally defined as the process of developing a representation of a real or inanimate object in the three-dimensional world with the aid of 3D software. The resulting 3D object is defined via location, rotation and scale. A 3D modeler can manipulate the location, rotation and scale of the 3D object as part of the process of 3D modeling.*

To explain it simply, 3D modeling is the process of creating a real-world object (like a car) or an imaginary object (like a UFO) in a 3D virtual world. The resulting 3D object that you create looks like, or at the very least, can be visualized, as the real or imaginary object. When I say visualized, I mean that people will be able to relate your 3D model to the thing that you're trying to create even if it doesn't really 100% like the real thing.

For example, if you envision to create a 3D model with human-esque qualities, you could, in its simplest form, create a box with eyes and a mouth and be done. That's just a simple example. You could create a tree with a cylinder as the trunk and spheres as bunches of leaves. Of course, a real world tree would not look like this, but we as humans, would be able to relate to it as a tree. We humans are just intelligent like that.

So that being said, there are 2 main types of 3D models: Stylistic and Photorealistic.

Stylistic vs. Photorealistic Modeling

Stylized modeling is what we just talked about in the last few paragraphs. A box with eyes or our cylinder-sphere tree. This is when 3D modelers purposely go out of their way to make 3D objects a lot different to the real world in order to fulfill some purpose. The purpose may be to appeal in an artistic way, to create a sense of style, or create some form of emotion. They play on the human's ability to recognize real-world objects from abstract images. Just then, I spoke of humans as if they were a different species. Anyways, here is a render containing examples of stylized 3D models:

Figure 1. Stylized characters from the Blender Foundation short film "Big Buck Bunny"

Photorealistic modeling aims to simulate eye-for-eye a 3D object that looks exactly like the real-world object. This can serve many purposes. If you want to do 3D modeling for the medical or dental field, or perhaps even architecture, accurate and photorealistic modeling skills are very much essential. A hospital wanting you to simulate the human face for some anatomy purpose, would not be too happy if you threw them a box eyes. If

you actually did that, I would refrain from asking them to be a referee for your next job. Photorealistic modeling is also becoming very popular in filmmaking and game development. There is just something cool about making video that appears to be from a video camera but you later have your mind blown when you realize it's all CGI. It's as if the real-world is a boring and mundane place that we have to simulate the exact same thing using computers and our own skill. Nevertheless, it is undeniably exciting though. Films like Terminator Genisys, illustrated awesome looking photorealism when they recreated a younger version of Arnold Schwarzenegger. You'll have to see the scene for yourself. It looks exactly like the younger Arnold Schwarzenegger and you would think that is video footage, not CGI. They even bring back actors who have passed away. There is an advertisement where they recreate actress Audrey Hepburn and I didn't believe this was CGI when I saw this. I was so convinced it was real. My mind was blown when I saw this. This is something you really need to see for yourself. Of course, lighting and rendering played a major part in those, but showing you have the ability and skills as well as what it takes to create photorealistic 3D models can become very handy indeed.

Here is an example of a render containing photorealistic 3D models:

Figure 2. Photorealistic render made by myself using Blender

It's important that whichever type of 3D modeling you choose (Stylized or Photo-real), that you stick with that throughout your project. It is usually quite odd to mix the two styles but don't take my word for it. Pixar's *The Good Dinosaur* has pulled it off with ease. But there's still a part of me that can't help but feel a bit odd when seeing cartoony dinosaurs set in the backdrop of some stunning, photorealistic landscape imagery. I also can't help but feel like it would probably have been awesome to see photorealistic dinosaurs than the cartoony ones. But that's just my own opinion anyway.

Why Do 3D Modeling

There has never been a better time to be a 3D modeler in my opinion. With the advancements in technology and accessibility of advanced 3D modeling software and tools, it really is a great time to be a 3D modeler. While the process of learning 3D modeling may seem quite daunting at first, it starts to become really fun once you get the hang of it. So fun, that it nearly becomes addictive. There were times where I spent days or even late nights just modeling. I think I even skipped a few weekends and consequently skipped on living life in the real world. While this is by no means a reason to do 3D modeling, and of course I highly encourage you to live and enjoy your life without too much compromise, I just wanted to demonstrate how fun 3D modeling could be. Sometimes, you just don't notice the time passing by. Thankfully, I've now learned to balance my life a lot more. Comes with experience and age I guess.

Once you gain experience and become a pro, you will have an abundant of opportunities available to you. You can work in nearly every type of industry. Nearly all industries need 3D modelers in some form or another. Here is a short list of industries where 3D modelers may come in handy:

- Architectural Visualization
- Film Production/VFX
- Game Development
- Virtual Reality/Augmented Reality
- TV
- Advertising Agencies
- Hospitals
- Dentists
- Real Estate
- Schools/Colleges
- Mathematics
- FBI and Crime Units
- Event Organizations
- Government
- YouTubers
- Goods/Product Suppliers
- Science and Research
- Freelancers

That list is basically endless. I'm sure there are far more industries that aren't even mentioned in this list. Note that I also mentioned Goods/Product Suppliers. That was not a mistake. I wouldn't have even mentioned that until I remembered that time I went to a job interview with one of them. I was applying for a Software Engineering role at the time. That was because I had formal education in Software Engineering and absolutely no formal education in 3D modeling. I had a lot of experience with 3D modeling though and even had some samples ready to show. At the interview, I mentioned I do 3D modeling as a hobby. To my surprise, they were quite impressed. They even took a look at some of my

3D work. I didn’t really impress them with my Software Engineering skills and I’m sure the other candidates would have performed better. I also didn’t appear that confident either and had those nasty voice shakes. Those voice shakes seem to always be there whenever I feel judged. But to this day, I believe the reason I was selected for that job, was because I had something extra to offer that company. They may have sensed my passion when I talked about my 3D modeling skills. Attaining 3D modeling skills can be a useful perk and you may not even realize how much more valuable you will become because of it. Especially if you love doing 3D modeling. There is never a better feeling than spending the rest of your life doing the things you love.

Have you head of that quote “You need to love yourself before you can expect anyone else to love you”? Well, that applies to 3D modeling as well. You have to really love 3D modeling before you decide whether you want others to hire you based on your skills. You’ll need to really put in the time to learn 3D modeling. Get yourself to a point that you’re really good and let your passion and creativity shine. People can tell by looking at ones 3D models, how much love and passion they have for 3D modeling. It can always help to have a visual and imaginative mind!

What To Expect

As I may have mentioned before, I'll assume you are a complete beginner to the world of 3D modeling. Any terminology that may not be familiar to you will be explained in an easy-to-understand manner and you can also refer to the back of this book for definitions.

By the end of this book, you will have gained sufficient knowledge regarding the process of 3D modeling. You will gain an understanding of the techniques of modeling almost any kind of 3D model. You will also gain confidence in tackling 3D modeling projects on your own. This book is aimed at being a comprehensive guide to learning 3D modeling. I won't claim you'll become an expert 3D modeler. That is completely dependent on you and how much you're willing to learn and how much you're willing to put in the time to practice 3D modeling. In fact, I think it would be silly of me (or anyone) to claim that you'll be an expert pro 3D modeler just by reading a book. That's like saying "Here kids, read this book and you'll be a bike riding pro by the time you're done". Reading a book like that might help them understand the process and techniques of riding a bike, or playing a piano, or even how to swim. But without actually applying that knowledge and putting it into use, they cannot be called experts. Reading about it is one thing, actually applying it is another. Time and time again, it is proven that the best way of learning is through practicing and practicing. Yikes, it sounds like I'm un-promoting my own book. This book can guide you and give you direction to become a good 3D modeler and show you how 3D modeling is done. But this book is pretty useless if you're expecting to be a Pixar level 3D modeler by the time you reach the end of this book.

This book can provide a good start for you to enter the world of 3D modeling and make learning a smoother experience for you. This isn't a full on theory book. There are follow-along exercises throughout which can start to give you that much needed hands-on experience. The exercises are like training wheels on a bike. Once you're confident enough to take off the training wheels and throw this book away, you'll be able to tackle 3D model projects on your own and continue your journey to become an expert from there. We will use Blender throughout this book. If you plan to use Blender as your main 3D modeling software, you will be at a slight advantage. However, anyone using any 3D software will be able to incorporate the techniques in this book to their own preferred 3D software.

What We Will Cover

I will now provide a brief overview of what we will over in each Chapter, so that you have an idea or a big picture of what's to come.

- In Chapter 2, we will discuss ways to become a better 3D modeler and find motivation and inspiration.
- In Chapter 3, we will discuss the main essentials of 3D modeling and you will be introduced to some concepts and terminologies.
- In Chapter 4, we will discuss the popular methods to approach 3D modeling. You will learn the process of applying these methods in your own works.
- In Chapter 5, 6 and 7, we will learn the techniques of approaching hard-surfaced modeling, organic modeling and environment modeling respectively. You will gain a better understanding of how to model these types of objects on your own.
- In Chapter 8, we will go through some more exercises to give you that much needed practice which in turn will help you become a better 3D modeler.
- In Chapter 9, we discuss the difference between low-poly and high-poly models and when to use them.
- In Chapter 10, we look at putting the finishing touches to our 3D model by briefly looking at texturing and shading.
- In Chapter 11, we learn ways to showcase our models and get people to notice your work. We also look at ways that you can earn some nice side income using your newfound 3D modeling experience.

Summary

In this chapter, we were given a brief introduction to 3D modeling. We learnt the definition of 3D modeling, the benefits of 3D modeling and what to expect from the rest of this book. We were also provided an outline of what is to come throughout the remainder of this book. In the next chapter, we start to look for ways to get inspired to make 3D models and how to gain confidence in the approach to building 3D models.

Chapter 2. Become A Better 3D Modeler

In this chapter, you will learn about becoming a better 3D modeler. First, we will discuss ways to get inspired. Then, we'll move onto the many tools that you can use at your disposal to help you become a better 3D modeler.

Introduction

As I mentioned in the last chapter, the only way to becoming a better 3D modeler is by practicing. Practice long, practice hard. We will however, look at ways to make learning easier, smoother and hopefully fun experience so that you fully make use of your practicing time. First, let’s take a look at ways to get inspired.

Ways To Get Inspired

There are many ways to get inspired to do 3D modeling. You could watch a good 3D animated film and wonder how they would have created that, or feel a sense of motivating energy like “I want to create something like that one day!” You could watch behind-the-scenes footage or see other 3D artists at work on YouTube. Some of my biggest inspirations have come from seeing other 3D artists at work on YouTube who aren’t really famous or earn a lot but I can feel their passion and am always in awe of the work they produce. Another way that I get inspired is just by being imaginative. My own imagination is a form of inspiration for me as somewhat conceited as it sounds. When I was young, I always pictured my own made-up city. Maybe I was a little weird, as I didn’t know too many kids at the time who had imaginations like me. But I always pictured this vast, beautiful green city and even created names for some of the buildings. I know, I was a weird little kid. Little did I know that that would inspire me to take up and learn 3D modeling. I remember feeling that “Aha” moment when I realized the possibility of showcasing to everyone my imaginary world in CGI. It would be the perfect way to visualize my dreams instead of letting it stay stuck within the boundaries of my mind. If you tend to be a visual person and can “see” your imaginations in 3D, then you will naturally be motivated to do 3D modeling and even have a stronger eye for detail.

One of the best ways to get inspired is through learning. I don’t know if that sounds a bit cliché. The more you learn and discover new techniques of 3D modeling, the more you will be inspired to keep making 3D models. Sometimes I may look out the window and see a tree. I tell myself “I can model that”. But then I may look at the Ferrari parked next to it and wonder “Hmm, I don’t really know how to model that thing yet, I’m gonna go home later and try to figure it out.” It’s that desire to learn that can help us become better 3D modelers. You will likely experience it too, once you start to the hang of 3D modeling.

Let’s now have a look at some of the ways that help assist you to become a better 3D modeler and make the process of learning and actually creating your 3D models a smoother experience.

References

Real life references can help make the modeling process a LOT easier. The idea is that you take a real-world object you want to model, and either use a photograph of that object or have it physically right there in front of you as you model. Using references is not cheating. You won't be classified as a better 3D modeler if you can model anything without having references of them. Actually, come to think of it, you would actually be a pretty talented 3D modeler if you could do that. But the reality is that 3D modelers, even the best ones, use references all the time. The only time I can think of where I modeler doesn't use references is when they may have created the same object (like a cup for example) over a hundred times or so as they pretty much know what they're doing from the get go. They still would have initially started out using references though.

References can also be a source of inspiration. Instead of sitting in the same place in front of a computer all day, once in a while, go to your nearest local park. Sit on one of the benches and just observe everything around you. Try and find something that would be interesting to recreate in 3D. Maybe it's that beautiful oak tree, or one of the slides in the children's playground. Perhaps it's something as simple as a bike or something as complex as humans. A word of advice, do not observe any one human for too long. They consider this behavior to be quite creepy. Never engage eye contact with other humans for an extended period of time. Again, I have no idea why I treat humans as if they were a separate species. Anyways, just spend time observing things around wherever you are. Maybe you're on the train or bus, waiting in line in a café, or just walking the streets. Just observe the things around you and try to understand the object's shape and form. For example, I could look at a leaf and think "Wow, most leaves on this tree are symmetrical. They have pointy ends and they bend towards each other on the symmetrical axis. The leaves also have a bit of thickness." See how this can help? You should probably carry a notepad around with you to help jot down your memory. Without making these observations, I would have probably modeled the same leaves as just a bunch of squashed ovals with no thickness. I would have thrown that at people's faces and tell them to tell me how much they love my work. While these squashed-oval leaves might actually be a good idea for stylized models, you may get better looking stylized models by observation. In this instance, you may exaggerate some of the distinct features of the leaves that I've described, which in turn will help get that nicer, more relatable looking stylized leaves.

And that's only the observation bit. You could use references during your modeling as well. References while modeling can assist in making the process a whole lot easier. If you don't know how to accurately model a chair for example, you could take a front and side photo of the chair and load that into your 3D software. By placing the front and side photos in the front and side views of your 3D software, you have a basis upon which you can build an accurate 3D model of your chair keeping the proportions intact. The reference images within your 3D software can help you evaluate much better how you're going. We will be covering doing exactly this in a later chapter.

You probably still aren't convinced and think this whole process is just cheating. Well, it really isn't. Take for example, something as complex such as humans. 3D modelers for

big feature films and games always rely on reference images for complex objects. Whether it be Woody from *Toy Story*, Nemo from *Finding Nemo*, *Shrek* from..well..Shrek, or all those Na'avi characters from *Avatar* and pretty much all the characters from every big animated film ever. These characters were all modeled based on reference images. Someone came up with the idea for the look of the character, and then drew a bunch of pictures of how they would look like. This is known as concept drawings or concept art. 3D modelers use these drawings as a reference to craft and build those 3D characters that we've come to love today.

If you've seen a lot of those photorealistic models, I can nearly guarantee those models were created with the help of reference images. The detailed pores on the character's face, the various engines of a car, and the intricate details of a Hindu temple would all benefit from reference photographs of the real scene.

I hope this has convinced you to use references and drop that mindset that it's all cheating. In all honesty, a great 3D modeler is someone who can create models with good, clean topology using the least amount of vertices as required to get the job done. That probably made absolutely no sense to you. It may have sounded like total gibberish. Don't worry, it will all make sense after you're done reading the next chapter. For now, the best thing to do is to just go out there and observe stuff. Try to understand their shape and form and any other interesting little details you can find. Try to develop a good eye for little details as those little details can help make your final 3D models stand out and pop.

Exercise

Here is your first exercise! That mouse you are using to navigate your computer screen. Try to describe in list form everything you can about its physical shape and form as well as any little details you can find. Let me start you off.

- The mouse is flat at the bottom.
- The mouse is rounded at the top.
- …

Don't stress too much over this. Keep it dumb and simple. If you can't think of too many, that's ok. It might just be a simple object. Developing an eye for detail is something that will just take time.

By the way, if you're reading this with a phone or a Kindle, then you might not have a mouse to observe. Just observe the device you're using instead.

Once you're done with that, spend some time going out and observing stuff. Eventually, you may find something you really want to model in 3D. Go to Google Images or favorite image search engine, and try to find images of that thing you want to model. Save a bunch of these images as a collection in a folder in your computer. Find images that have different angles, lighting, close-ups, and full shots and so on. Close-ups in particular can help you find the little details better.

Now study those images and try to find similar features about all the images. Take your time and list out everything you can about the common physical form of that thing you

want to model as well as any minute details you find. That’s good enough for now. A word of caution though, don’t ever distribute this collection to anyone else. Not that people will steal your idea, more the fact that you would probably break a hundred copyright laws by doing that.

Books

Books are great to learn 3D modeling. There are many quality books on Amazon teaching you various aspects of 3D modeling. For example, how to create detailed 3D characters. Your library may also have books teaching you the art of 3D modeling.

Sometimes reading a good book can be an eye-opener and teach you many things you didn't know before. I'm hoping this book can also be a good source of learning for newer 3D modelers. Taking the time to read a good book and trying out the exercises can help greatly. Books allow you to work at a pace most comfortable to you and in turn this will allow you to retain information much better in the long run. It sort of reminds me of my University days, where I used to cram all my learning in the last week before my exams purely for the purpose of passing my exams. Months after that, I forgot most of the things I learned.

With books, I find that I was able to learn better. I purchased 2 books on Amazon related to 3D character development. That helped me so much and I really love the fact that if I ever start to forget something, I can always refer back to the book to refresh my mind. The contents pages of a book are a lifesaver (as well as the index pages). Sometimes if an author speaks in the first person, like I'm doing now, it may help to provide an even more engaging learning experience. Books like this are a lot more fun to read on the train than a "formal" book, but then again, that's my own opinion. I mean, imagine if this book was formal. It may not garner as much interest and you would have probably already thrown it away overwhelmed at the number of words on this screen. It seems like it's so hard to read a book that goes like "3D modeling is the process of…., and was invented by Sir… in 1979. Its art form is thee appreciated worldwide. You shall thou develop an appreciation or else." Again, I'm probably being a little biased and getting a little sidetracked from the focus of this book.

The point is, read a few good and engaging books on 3D modeling and you may develop a deeper understanding of how 3D modeling works and also enjoy doing so.

You don't even have to religiously follow a book. Feel free to form your own opinions and ideas. A book is simply there to guide you, not tell you exactly what to do. I, myself, have never exactly followed word for word the advice of books. My own 3D character development process was shaped by a combination of a few books and tutorials. I pick out the best and easiest process steps possible from everything I've read and make it my own.

Online Tutorials

This is one of the most powerful ways of learning 3D modeling and one that I highly recommend. You can accelerate your learning by seeing how others create their models and replicate it yourself under their guidance. There are two types of tutorials; text-based tutorials and video tutorials.

Text-based tutorials are sites that show you step-by-step how to create something. This is not only limited to websites and blogs. It could also be paper-based or PDFs. A book can also be a kind of tutorial. A mega-tutorial if I may. Text-based tutorials are best utilized by having the tutorial partially available on your screen (or desk if using paper-based), with the 3D software you regular use covering the remaining part of your screen. This way, you can refer to the tutorial while attempt to create the 3D model. Windows 8 users can use the split screen feature of Windows to partially open different screens at the same time. If you have a dual-monitor setup, you can use one screen for the tutorial and the other to work on your 3D model. Text-based tutorials that utilize screenshots tend to be far more popular since a screenshot is generally the equivalent of a thousand words.

Video-based tutorials are those where the instructor shows you step-by-step how to create a 3D model. This gives you confidence that you will also be able to do the same thing if you copy what the instructor did. You can't split the screen here (unless you have a dual-monitor setup or another tablet beside you). You'll just have to keep switching back and forth with your 3D software and also keep pressing the pause button a lot. The main advantage compared to text-based tutorials, is that you get to see first-hand the 3D model being created. A text-based tutorial can tell you to press button A, but it won't really help if you can't find where button A is. With video tutorials, you see the instructor navigating to and pressing button A, so that you can easily identify where button A is. Now you may be thinking, this is clearly first-world problems. But it really does get annoying after a while. There has been many times I've followed a text-based tutorial and I've been left frustrated not knowing where to click and what will happen if I click it. Honestly, it's like a feeling that if I accidentally press the wrong button, I will somehow set off Windows 10 and make my computer burn on fire. Video tutorials makes life a whole lot easier in this regards as you get to see first-hand the instructor doing it, so you can be left confident that you won't set off some secret Windows 10 fire command.

Especially for a visual craft like 3D modeling, video tutorials are always going to be far more popular and far more helpful. It's just a lot easier to show a vertex being added to a specific part of a human ear compared to the nightmare of reading some complicated text about it.

My personal recommendation is, unsurprisingly, to take full advantage of video tutorials for a far more effective learning experience of 3D modeling. I seriously believe that one of the main reasons I'm able to model with some level of comfort now is due to following video tutorials. You will just get better if you follow video tutorials and actually do them yourself. Remember that thing I said about practice? Video tutorials will give you that much needed practice that you require. Especially as a beginner, there is so much

benefits to following tutorials.

Don’t feel bad about copying the process of someone else. You just need time to learn and form your own process. When you try to replicate and imitate another person for so long, you may end up becoming that person. Wow, that sounded a little unintentionally creepy. And also quite bad advice in general. I mean, there’s no point trying to imitate Michael Jackson in the hopes of becoming Michael Jackson. You’ll end up looking a little crazy, especially if singing or dancing isn’t your thing. It’s always important to be yourself. What I meant by my statement though is, when you try to replicate the process of one 3D artist and see for yourself how it’s done, you may learn the ins and outs of that process and even alter that process to suit your own goals and needs. Once you become comfortable with your own process, you can then teach others and allow them to form their own processes and so forth.

I’d also like to add that watching a professional’s timelapse videos of the creation of their epic 3D models can be great for learning. Why? Well, as we see the process of masters in action, this can become a source of motivation for us. It helps when they add epic motivational background music to those timelapse videos as well.

Video tutorials are such a powerful learning tool, and utilizing video tutorials in your journey to mastering 3D modeling will make the learning curve a lot easier to handle.

INFOGRAPHICS

This is perhaps a more modern day approach. The idea is to collect any helpful infographics related to 3D modeling. If you don't know what an infographic is, it's basically what it sounds like. It's a graphic image with information on it that can help you. Infographics are quite popular nowadays and big websites and bloggers utilize them since a lot of people download and consume them like hot cakes. Infographics can show you how to do something or teach you some useful facts in a visually nice looking way. As they say, a picture speaks a 1000 words. People tend to learn better by looking at an image and interpreting it rather than just reading plain words all day. Your journey to mastering 3D modeling can be sped up through infographics as you'll find you are better able to process the information then reading of book or tutorial for example.

There are plenty of infographics all over the Internet in relation to 3D modeling. They can show you how to model something as simple as a soccer ball to something as complex as a high-detailed cinematic character. They can teach you the process of becoming a 3D modeler and some useful tips and shortcuts you can use during 3D modeling. There are many places you can go to find helpful infographics. Places like Facebook, Tumblr and Pinterest are littered with a whole bunch of infographics related to 3D modeling. If you subscribe or follow those 3D profiles, you can get regular feeds full of awesome eye-catchy infographics. I, myself regularly put out infographics on my website from time to time. You can find them on ThilakanathanStudios.com. I don't think I was that subtle there with the self-promotion of my site.

My best advice is to subscribe to wherever you can get helpful infographics on 3D modeling and download as much infographics as you find useful. This way, when you check out your regular feeds, you get the added bonus of learning new things. Facebook friend feeds can get boring after a while. You just get the same old pictures of the same old holidays they went to or the same old parties they attended, pulling the same old poses over and over again. With regular infographics feeds in between, you at the very least get to develop more understanding and grow your knowledge base. If you have friends that like 3D modeling, you can share the infographics with them too, making you look all knowledgeable and smart.

Another bit of advice which I may recommend, is to print out all the most important infographics you find. The ones where you will regularly refer to again and again. Once you've printed these out, stick them on your wall or keep them beside your bed table or wherever you work. That way, you can quickly refer to them as needed. I actually keep an infographic showing the modeling of a basic human as well as the right way to model a human face. Of course, I may not always remember this process of modeling the human off the top of my head. I may forget as I move onto other things like other aspects of production. Be it animation, lighting, video editing and so on. It's always handy to have an infographic right there, or as I like to call it, my "cheat sheet" nearby. And I always prefer to physically print them out.

You can actually just download a copy and store it in a folder somewhere. But I

find that whenever you need to refer, you need to open the folder and find the infographic. It hurts my finger muscles. Whereas, with a printed version, I just turn my head and eyes slightly and it’s right there. Also, switching back and forth is a lot smoother with the printed version. Again, maybe first-world problems, but it really does make the experience of 3D modeling quite enjoyable when you can refer easily. You may also feel more confident when modeling knowing that you have everything you need right there beside you.

Figure 3. An example of an infographic.

Practice! Practice! Practice!

I believe I have mentioned this a couple of times in this book already. The ONLY way you will get better at 3D modeling, is if you put in the time to actually do 3D modeling yourself. It is completely find to fail! I believe I may have heard a saying somewhere that, the more you fail, the more you are likely to succeed. When you fail, you build resilience. You become stronger, and you also build knowledge. You now know not to do whatever it is that caused you to fail. You'd be surprised to know how many potential people are out there, who aren't 3D modelers right now. And they would likely have had serious potential. The main reason is that they give up after a few failures. They think that they are no good at 3D modeling, when really, they were getting better, even if just slightly. The more you fail at 3D modeling, the more you LEARN not to do whatever caused that failure. Thus, the more you build resilience. You may then try experimenting again. And if that fails as well, then try again. Becoming better at 3D modeling really does come through a lot of practice. It comes through failing, persevering and then experimenting again. You can keep experimenting, failing, researching why you failed, and keep this cycle going on and on. It may seem like a never-ending loop but eventually you will reach a tipping point where everything starts to fall into place. Once you reach your first goals, you will feel a great sense of satisfaction. But don't stop there. Keep going with it and make something else. Don't be a one-hit wonder. Aim to be legendary. Knowing and mastering how to model one thing is great, but knowing how to model a variety of things is even better. Eventually, you will start to gain a grip of 3D modeling and who knows, you may even develop your own style. You may develop stylized 3D models that are unique to you. Not only will you gain a great sense of satisfaction, but you will also gain a feeling of ownership that you really and truly own your own models. It is at this point, that you can pitch your expertise or perhaps even sell your models to make some easy cash on the side.

But I'm venturing way too far into the future here. Let's focus on what we can do now. When you're starting out 3D modeling, you may find it a bit overwhelming. When you open up your 3D software, you may be a little daunted at the number of different modeling tools that are available. So overwhelmed that you think this is all rocket science. When I first started out 3D modeling, I downloaded the free open-source 3D software Blender. I was so frustrated with the controls and so overwhelmed there were so many that I eventually gave up. I blamed the tool for not being user-friendly enough as the reason to not continue pursuing 3D modeling. And while user-friendliness is an important aspect regarding the positive experience of using software, it should not have been the cause for me to give up 3D modeling. So I decided to start from scratch. To start from the bare basics and make my way up slowly. This worked fantastically. 3D modeling is a skill just like any other. It takes time to grasp the concepts and learn the techniques of effective 3D modeling. Just like playing the piano. You would first start from the bare basics of knowing what note each key in the piano does. Or even more basic than that, knowing the musical scale and notations in general. From there, you keep learning and practicing. Eventually, you will have built up enough skill and timing to finally start creating your own compositions. 3D modeling is similar. Although, I'd like to think that it isn't as tough

a skill as a piano. But then again, I wouldn’t be able to play the piano to save my life.

I read somewhere that claimed research has shown that to be able to master any skill from scratch, you need to put in at least 10,000 hours of work. That’s 10,000 hours of learning and practicing. In other words, from the point of knowing absolutely nothing about that skill to being able to call yourself an expert at it, will take an average of about 10,000 hours. In that 10,000 hours, you will need to learn, experiment, practice and do this again and again. The more exposure you get to 3D modeling, the more likely you will naturally become skilled at it and won’t really on some book. You may even write your own book on it one day.

I can’t stress enough the importance of practice in achieving this skill. Without practice, this book will be of no use to you. While you can read everything in the book and understand it, you won’t truly understand it without practicing and practicing since the human brain retains information in the long-term memory when you actually practice and learn for yourself. Reading about it will only retain information in short-term memory and you would likely forget in about a month’s time without constantly refreshing. So keep practicing even well after you’re done with this book to become a better 3D modeler.

FEEDBACK

One of the things that can help you in your quest to 3D modeling domination is **motivation**. If you don't have enough motivation, you will stagnate and eventually you may even put off the idea of 3D modeling for good. It's always important to stay motivated, especially throughout your learning period. And one of the ways to stay motivated is to keep working on your small projects and setting yourself deadlines to complete (say a week). Feel good and reward yourself in any way once you've completed the making of your own 3D model. Then go back and make another model on a deadline. The idea of setting yourself tight deadlines forces you to work on other projects without staying stuck on one project. You can always come back to where you were stuck later on. Also, rewarding yourself by taking yourself out to coffee or watching a movie (preferably animated, but then again who am I to tell you what to watch) or even spending quality evening time with your loved ones are great to keep your motivation going strong.

Another form of motivation and one that can aid in the process of learning, is feedback. It is best to register yourself on forums or online social groups like Facebook Groups, or Google+ Communities to name a few. You can interact with other like-minded modelers and get feedback for your work. When you post your work, you will likely get honest feedback for your work. They usually encourage you and shower you with positive feedback. They will also point out things that they like about your model and areas that need improvement. This is great, because they may spot issues which you might have been completely unaware of. It's always nice to get feedback for you work as you know the areas you can improve on. And in turn, you develop and become a better artist because of that. If you make a character's eyes way too big than it should be, so much that it hinges on slightly creepy, you will keep making all your subsequent characters like that too. Without that feedback, you would never learn to fix this. Always try to post your work in public forums and social networks whenever you can, because that is how you develop as a 3D artist. You don't have to post only your finished works, you can also post your works in progress. You could do a daily progress update post which will keep your social presence active. You may even notice the same people who gave you feedback earlier will come back to give you even more feedback. This is also a great ways to make more friends online with people all over the world ranging from beginner to pro. Note that if these are your only friends, then that is a sign that you need to immediately stop what you're doing on the computer, and go for a walk outside in the real world where humans and animals inhabit.

I'll also have to note one more thing about feedback. From time to time, you may receive feedback that is less than pleasant. If they truly mean well and are trying to help you, then you better stuff your ego and put it aside as listening to them may help you. For example, a comment like "This is really bad bro. The topology is messed up and model is just plain weird. Here's an idea, start again from scratch. That was unbearable..k, thx" may rile you up and make you want to shove that keyboard down the throat of whoever wrote that comment. But that's ok, because it is helping you. You are ultimately becoming a better 3D modeler because of it. At other times, you may receive just downright harsh

comments like “This is horrible. Just give up, or even better kill yourself”. These types of comments really suggest that there’s some issue with that person rather than you or your work. There is nothing constructive about that comment and just comes across as bickering. Perhaps they get pleasure from making you react. It’s best to just ignore it and not keep the flame going as it doesn’t rub off nicely as a growing 3D modeler. And also don’t act on that advice of killing yourself! If you did, then I will not take responsibility for it. Just wanted to put that out there in case.

You may get really hurt and upset and perhaps even react. Try to remain calm and understand why the person would have wrote that. Most times, you will know whether they’re constructive and trying to help you or whether they’re just downright bashing (and perhaps slightly jealous of you). We 3D modelers are calm folk. I mean, we have to be since we need that patience when modeling 3D objects. I guess all that agro stuff is best suited for football or boxing or something, I don’t know. To me personally, it shows a great strength of character when I see a person rarely react to someone’s hate comment. They just take the points for improvement and move on. Initially, I myself was a victim of a lot of these so-called “haters”. I remember being quite upset initially. They really know how to push your buttons and ruin your day. But I guess the more you receive them, the easier it becomes to brush it off and say “heard that one before”. It’s like they have a dictionary of hateful sentences and re-use those again and again. Take the criticism with a grain of salt. Take the points for improvement and move on. Likewise with positive comments, don’t feel too overjoyed by them. Again, take the improvements and move on. It’s never good to feel too upset or too overjoyed by comments.

Also, don’t stop posting updates because of a few bad eggs. Post to receive honest criticism and feedback. Don’t worry about annoying anyone. It’s actually more appreciated if you share your work or work-in-progress for others to see as they too would like to feel included in your journey. So keep posting and asking for feedback instead of likes.

Summary

In this chapter, we learned about ways to become a better 3D modeler. We started off discussing ways to get inspired. We then looked at the different tools we can use to assist in our journey to learning. These include observing references, reading books, watching and following online tutorials and timelapses, consuming infographics and keeping them near you, and practicing constantly. We emphasized the importance of practice in improving our 3D modeling skills as well as the importance of feedback and how not to take them too personally. In the next chapter, we will learn some of the core fundamentals of 3D modeling.

Chapter 3. The Essentials

In this chapter, you will learn the main essentials of 3D modeling. You will be introduced to concepts and terminologies as they apply to 3D modeling. First, we will cover the properties of those objects that we 3D modelers can manipulate. We will then end the chapter by discussing a few popular modeling tools that 3D modelers have at their disposal.

The Basics

All right, so enough of my advices and ramblings. I hope I haven't overwhelmed or put you off so far. Now, we'll put our foot down and start focusing on what this book promised; to learn 3D modeling. So let's no waste any more time and start with the extreme basics.

3D Software

First of all, you need a 3D software application where you will be doing all your 3D modeling. Without it, creating 3D models is almost impossible. Almost? Well, there are ways to create 3D models using the Java programming language (and probably a few other languages), but this will require you to know some coding. We're focusing on modeling 3D objects, not coding them. This is similar to molding a clay pot by hand rather letting a machine do it for us.

Some of the best 3D software applications out there right now include:

- 3DS Max
- Autodesk Maya
- Cinema4D.
- Lightwave
- Rhino
- Solidworks

These are the most popular 3D software applications today and they are even used in the making of Hollywood animated films, so you can be sure they're really good. The only catch is, that it is really expensive. As in, well in the thousands of bucks expensive. Recently, 3DS Max changed this payment model and you can only purchase yearly subscriptions (which I kind of hate to be honest).

If that is way out of your budget, there are free options out there. You can get trial versions of the software listed above. Daz3D is also a growing 3D software application. However, Daz3D is a bit limited in their range of modeling tools and mostly rely on you using their library of existing models. This software is also more suitable for character animation than for modeling but this may change in the future as development is currently very active. Caligari's TrueSpace is another free 3D modeling and animation software application. This used to be paid software but Caligari have since dropped support for TrueSpace and given it away for everyone to use.

However, my personal favorite is Blender3D. They have the most features out of any free 3D software application. So much that they even compete with the expensive Hollywood software applications. Blender is a free open-source 3D software application that apart from being a solid modeling tool, does everything from animation, lighting, texturing, shading, rendering, compositing, video editing and even game development. You can check out my book entitled *Blender 3D for Beginners: The Complete Guide* to get a basic introduction to getting up to speed with all these features.

With Blender, you can make your own movies and games with just the one software. Their community base is really strong and they're also really friendly. Due to this active community, development is also active and there are new releases of the software almost every month or two. And if you manage to find a bug in the new release, you can report it and be a part of the Blender's development and growth.

I personally use Blender for all my 3D projects which include 3D animated films, short videos, and 3D art imagery. In fact, I will be using Blender throughout this book to illustrate the concepts and ideas. I highly encourage you to download Blender to follow along. You can download it at http://blender.org. Since they have one of the most industry standard modeling tools available, this will be the perfect tool to learn 3D modeling. If you prefer using your own 3D software, feel free to do so. This book is targeted for anyone wanting to learn 3D modeling with any 3D software. Blender users may benefit by being able to follow along better but the tools used should be transferrable to any other 3D modeling software. I won't go into detail of every command I use. So I assume you at least know how to navigate and work your way around your 3D software.

3D Viewport

Once you open your 3D software application, you will be greeted with a screen similar to this:

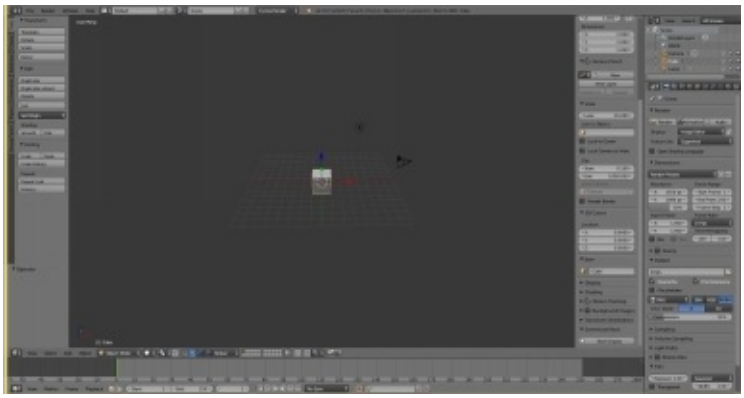


Figure 4. The 3D Viewport

This is called the 3D viewport. This is your virtual “world”. Or even better, your 3D universe. This is where all your 3D models you create will live. The 3D universe is really huge. It can go towards infinity or wherever your 3D application limits it. Our real universe may have planets and stars and galaxies, but our 3D universe has absolutely nothing. We 3D modelers have the power to create our own world, in whichever way we like it. Our Earth may be round, but you could make your Earth flat with no ending. You could make your planet squared, which come to think of it, a concept I have never ever seen anyone do before in films. You don’t even need to create a world for your 3D models. You can create your 3D models directly in the 3D universe. Don’t worry, they won’t float away (unless you apply some physics on them). They also won’t die due to no air. It is generally best practice to save your models as separate files so that you can later import it when you create a scene (or world) for it.

The 3D universe has 3 different axis; the X-axis, Y-axis and the Z-axis.

These are used to define the location of your 3D models in the 3D universe. The 3D universe is defined in length, depth and height. The X-axis usually denotes the horizontal (length) coordinates, the Y-axis denotes the depth coordinates and the Z-axis denotes the height coordinates. A 3D model at X, Y, Z coordinates of {0, 0, 0} will be right at the center of the 3D universe. A 3D model at {2, 3, 4} will have an X-coordinate of 2, meaning it would move 2 units to the right if you’re seeing the 3D universe front on. The Y-coordinate would be 3, meaning it would be pushed back 3 units. The Z-coordinate would be 4, meaning it would move up 4 units. The value of the units could mean anything. It could mean meters, centimeters, inches and so on. This is something you will need to define in your 3D application settings. Blender, by default, uses meters for each unit. Negative coordinates like {-2, -3, -4} means it would move in the opposite direction. In other words, the X-coordinate would move 2 units to the left, the Y-coordinate would move 3 units towards you, and the Z-coordinate would move 4 units down (assuming your

view is the front).

Navigating The Viewport

You can also navigate your 3D viewport and move away from the default (which is usually) front view. Navigating the viewport is very necessary when doing 3D modeling and that you will do often. For example, if you are working on a character's hand, if would crazy to model everything from the front view only. You will need to see the back view, or the top view, and switch between these regularly. Some people prefer to split their viewport window and have the front, left, right and top view all visible on the one screen like this:

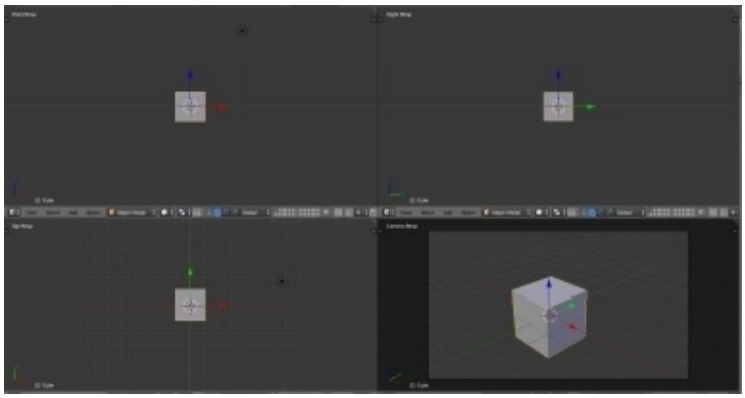


Figure 5. Multiple views

I'm not really fussed with that to be honest. If you prefer doing that, then that's great. Stick with that. I find that I tend to work better when I see the one view. Splitting the view clutters up my screen a bit and doesn't allow me to see everything in detail. I'd rather spend time working on one view, then switch and spend time work on that view and so on. Go with what you are more comfortable with. Spend some time navigating your viewport and try to get comfortable with it. You're going to spend the rest of your 3D modeling life navigating the 3D viewport so may as well get used to it. Do things like movie to a different place in the viewport, rotating around your viewport and also zooming in and out. Try to see if you can rotate around a selected object. There is a mini-tutorial for Blender users at the end of this chapter showing how you can do that in Blender.

3D Objects

Our 3D universe would be quite boring if we didn't have anything in it. There are many different types of 3D objects you can work with and use as a starting point to build your own 3D models. The main object types are primitive, curves, metaballs, text, cameras and lights.

- Primitive Objects – These are the default 3D objects that are preloaded into your 3D application. The most popular types of primitive objects include a cube, sphere, cone, plane, circle and so on. You can choose to add any of these objects and they will appear in your 3D world as an object you can use. This is perhaps the first 3D model anyone creates. Within seconds, you can add a few cool shapes and models in your 3D world. Blender has an extra primitive type. It's a monkey head. Her name is Suzanne. It's like the brand mascot for Blender. 3D modelers usually don't use these primitive models as they are and call

themselves modelers. They would extend them and tweak them to their own needs to help them create their target object. The primitive objects are created with vertices, faces and edges.

- Curves – A curve is used to help create nice curvy-looking objects. You can make curvy roads, pipes, wires, or even a vase. A curve has control points or "handles" that control the curvature and look of the overall curve. The change the look of the curve, you need to grab one of the handles and move, rotate and scale them however you want. Each handle has a line with 2 dots at the end. These are like mini-handles and manipulating these can further control the look of your curve. You can extend a curve, thereby creating more control points if the default isn't enough. You can subdivide to create new handles between the existing ones to allow more detailed curvature control.
- Metaball – This is a weird way to create interesting forms and shapes. A meatball is a sphere that can "stick" with other metaballs in a funny looking way. They sort of act like jelly. By sticking a bunch of metaballs, you can create some nice jelly-like organic forms. Metaballs can be quite useful to create things like clouds or be used as a basis to create organic models like humans and animals.
- Text – This just adds a plain 2D text object to your 3D world. You can modify properties of the text, such as the words you want to display, the font, size, shape and so on. You can later make the text 3-dimensional by adding depth. This is great for things like adding a name to a shop for example, or creating a logo for your personal brand or company.
- Camera – If you plan on rendering your completed 3D model(s), you would need a camera. It functions similar to a real camera. Point and shoot. In this case, point and render. You can set up some properties for the camera like render size, or if you have a more advanced 3D software, DoF settings, sensor size and so on. The camera can also be animated so this is good if you're making a movie or creating a flythrough of your 3D model.
- Lights – These are needed to light up your 3D world. Again, if you plan on rendering your 3D model(s), you need lights or your renders will be pitch black. You can create different types of lights. The default ones usually include a sun lamp, area lamp, point lamp and spotlight lamp. You'll need to learn good lighting to showcase your models in an appealing eye-catching way. This is out of scope for this book though.

Editing 3D Models

A 3D object defined by vertices, edges and faces is known as a mesh. The primitive 3D objects we discussed are all meshes. Curves, meatballs, cameras and lights are not meshes. 3D modelers normally start with a primitive 3D object and use it as a basis to build upon a more complex 3D model. Let's take a look at some properties of 3D meshes.

Vertices, Edges, Faces

Let's backtrack to old school mathematics a little bit and discuss what vertices, edges and faces are.

A vertex is used to connect one or more edges. It is usually the corners of all edges. In your 3D software, vertices are those dots.

An edge is used to connect 2 vertices. It is the direct line between one vertex to another vertex. In your 3D software, edges are those lines.

A face is an enclosed area containing a series of vertices and edges. The edges form a loop where you start from one edge and go around edge by edge until you reach the same edge. In your 3D software, faces are those filled shapes that are visible to the camera when rendered.

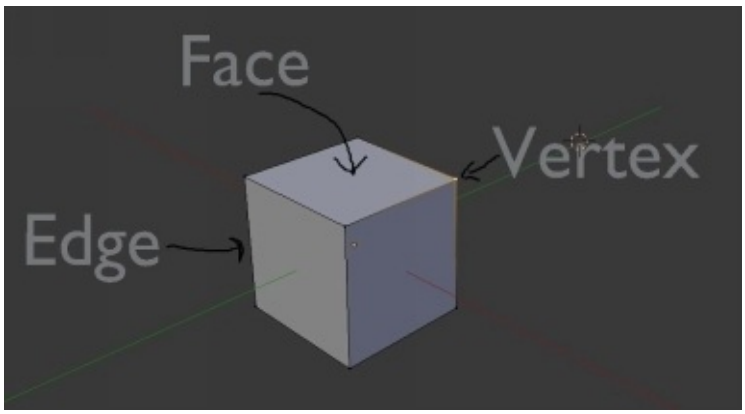


Figure 6. Vertices, edges and faces in a 3D model

Location, Rotation, Scale

You can do 3 things to directly manipulate vertices, edges and faces. Those 3 things including moving their location in the 3D space, rotating them and scaling their size. That is, you can select any vertex, edge or face and then move/rotate/scale them around. Note that you can't rotate or scale any single vertex. Vertices will always remain the same size no matter how small/large your 3D object is. It behaves like control points and won't be visible to the camera when rendered. You can however, select 2 connected vertices (an edge) and scale, rotate that, but you will really only be scaling and rotating that edge. By pushing and pulling around these vertices, edges and faces, you will be able to shape out and create your 3D models.

That is essentially a part of what 3D modeling is about. It's about creating vertices, edges and faces and then pushing, pulling and nudging them around. If you don't have enough vertices to play with, you can create more and continue shaping and building your

model on top of that. You can’t just use a bunch of cubes and somehow shape objects out of that. Although it could give a cool stylized type of model. It’s better and more efficient to use one mesh and nudge vertices around.

If you want to model a skyscraper, you would have a cube as your foundation, then add vertices, edges and faces upwards shaping out windows and balconies and so on until you have yourself a tall skyscraper. Maybe too much detail for now. We’ll cover this in a later chapter. For now, just know that you can start with a primitive 3D object and then manipulate that object’s vertices, edges and faces as well as create and delete a few to get a 3D model the way you want it.

Modeling Tools

On top of nudging a few vertices and edges, there are a few popular modeling functionality you can use to make your 3D modeling life easier.

Object Manipulation

This is just as I discussed in the previous subsection. You change the location, rotation and scale of either your whole 3D model or the parts making up your 3D model (the vertices, edges and faces). Blender uses shortcut keys of **G**, **R** and **S** to change location, rotation and scale respectively. You'll want to go into Edit mode in Blender (by pressing **Tab**) to be able to play around with vertices, edges and faces. In the middle-bottom part of the 3D window, you can choose between vertices, edges or faces.

Figure 7. Choosing between vertex mode, edge mode or face mode in Blender

You can't manipulate vertices and faces at the same time. Only one type can be selected at a time. That is, you can only work with vertices, or only with edges, or only with faces. You have to change the mode to work with another mode. Try playing around with the default cube and manipulate its vertices, edges and faces.

Extrusion

Another very popular modeling tool is Extrusion. Extrusion allows you to extract out or force out new vertices, edges or faces. You just have to select a few vertices/edges/faces and then use your extrusion tool (press **E** in Blender) to create a new set of vertices/edges/faces.

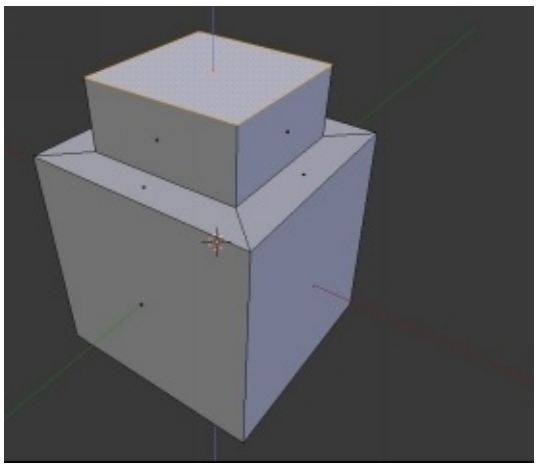
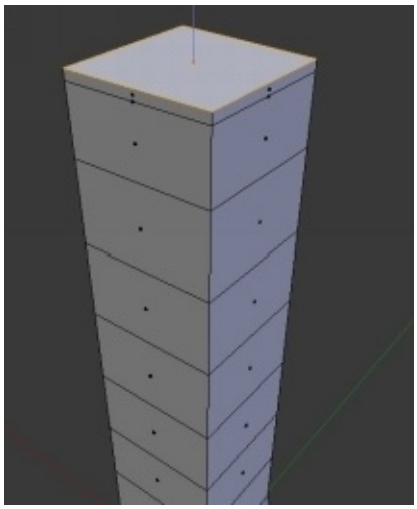


Figure 8. Extrusion

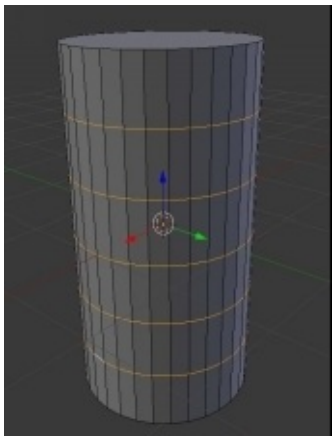
Let's take our building example for instance. We can select our cube, and in Edit Mode, we can select the top face of the cube. We can then extrude this face and choose a relevant height for our skyscraper. We can then keep extruding to get the full height of the skyscraper.



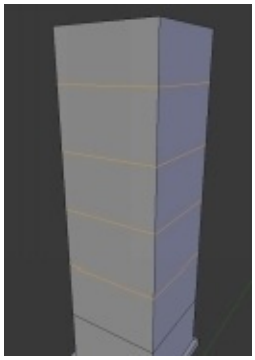
Extrusion is something you will commonly use throughout your 3D modeling journey.

Loop Cuts

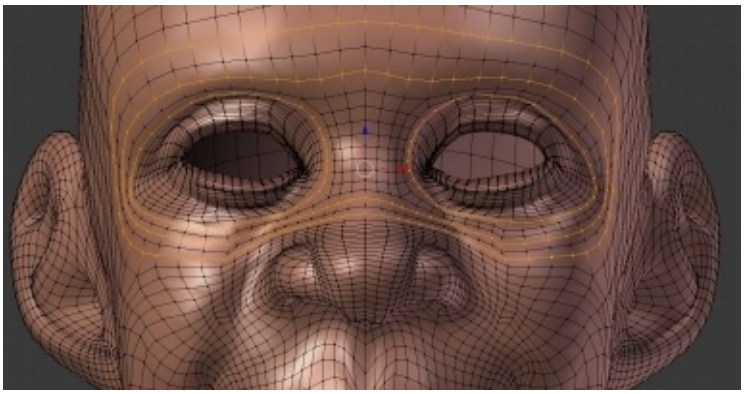
Before we can look at loop cuts, we need to understand the concept of loops. A loop is a series of connected vertices and edges that if we start with one vertex and make your way down the chain, we will end up on the same vertex eventually. This cylinder has a bunch of loops:



This building has loops:



Even this character has loops around his body:



You can test by selecting a loop in Blender (pressing **Alt+Right click** any vertex/edge/face). Your selected vertex will highlight along with all the vertices down the chain until it reaches back to your original vertex. You can also select multiple loops in Blender by pressing **Shift+Alt+Right** click.

Loop cuts are used to create a new set of loops between two existing loops. A loop cut will place new vertices, edges and faces between the two existing loops. All newly added vertices will share exactly 4 edges.

Loop cuts are great because they can be used to add more detail to a model. Since a loop cut adds more vertices, that's more vertices you get to play around with and the more you can detail your 3D model. There are many reasons why loop cuts are great. The main one is that of the greater level of detail and control it allows in shaping your 3D model. To add a loop cut in Blender, all you have to do is hover around any 2 adjacent loops and press **Ctrl+R**. You will a purple line indication showing where you want to add the loop. Scrolling up or down will increase the number of loops you want to add and you will correspondingly get more purple lines.

Duplication

Duplication is making an exact duplicate of a 3D object, or parts of your 3D object. When I mean parts, I mean you could duplicate vertices, edges and faces of a 3D object. Duplication is best for situations where you need more than one mesh of something. Maybe you want 5 chairs of the same model. Maybe you'd need to duplicate the door of a house to several rooms. When it comes to parts of a 3D object, you could duplicate the keys of a piano, the leaves of a simple tree, or ears on a human. Duplication is another very commonly used 3D modeling tool.

To duplicate an entire object in Blender, you first select the object (by **right-clicking**) and then pressing **Shift+D**. You can also duplicate by pressing **Alt+D**, but this creates an instance of your 3D object, meaning whatever change you make to the original model will automatically be copied over to the instanced duplicate. This is best if you are venturing into instancing. Similarly, if you want to duplicate parts of a 3D mesh, you select the vertices, edges or faces you want duplicated and also press **Shift+D**. Then you can move to your desired position via pressing **G** and moving around.

Joining/Merging and Separating

Suppose you have two objects. Say, a human model and a hat model. Now, you

want to make them one object. You can do this by joining the two meshes together to form one combined mesh. In 3D modeling, this is called joining or merging.

You can also join (or merge) vertices, edges and faces while working on just the one model. You can join 2 or more vertices, 2 or more edges, or 2 or more faces. This is very useful when you have disjointed parts in your mesh and you want to connect them as one unified mesh.

In Blender, you can merge 2 objects by selecting both of them (**Shift+Right clicking**) and then pressing **Ctrl+J**. When you're in Edit Mode, you can join (or merge) 2 vertices/edges/faces by selecting both of them by **Shift+Right clicking** and pressing **Atl+M**. You will usually be provided with a number of options like merge 'At Center'. Pick the one more suitable to your requirements. Another feature that is most commonly used in Blender is the 'Fill' tool. This is where you can fill a gap in the model. If there are 2 disjointed vertices, you can press **F** to fill the gap with an edge. You can also fill a face by selecting all the edges or vertices that should have a face.

You can also separate objects. This is the opposite, where we take the hat and separate it from our human. You have to select all the vertices that make up the hat and use your 3D application's command to separate the objects.

In Blender, you would Tab into Edit Mode, then select all the vertices of the hat by hovering over the hat and pressing **L** (this gets all linked vertices), and then pressing **P** to separate. Again select the option in the dropdown that best suits you (I generally choose 'Selection'). Note that, you're mesh does not need to have disjointed parts to be separated. You can separate parts of an already connected mesh. Just select all the vertices/edges/faces you want separated and then simply press **P**.

Deleting

This one is really simple. You can remove your model as a whole from your 3D space or you can delete parts of your mesh. Deleting helps if you've made a mistake or you have too many duplicates of something.

In Blender, the command to delete is **X**. Just select your object(s), or the vertices/edges/faces of your object, and then press **X** **Delete**. That's it!

Modifiers

When modeling in 3D, modifiers can be a massive lifesaver. Modifiers make changes to your existing mesh in a non-destructive manner. This means that modifiers will take your existing mesh and use it as a basis to make changes to your mesh on top of it. A modifier essentially modifies your original 3D object using some mathematical functions. If you remove the modifier assigned to the mesh, the changes/modifications will disappear but your existing mesh, the way you originally created it, will still remain intact. So what are these so-called “changes” I speak of? Well, they can be anything. You can make your models bumpy looking. You can mirror your mesh. You can quickly create many duplicates of a mesh using the push of a button. You can even convert a boring old square to a high-detailed ocean surface. If you remove the modifier assigned to your ocean, you will get your boring old square back to the way you created it. Let’s take a look at some of the important and most used modifiers.

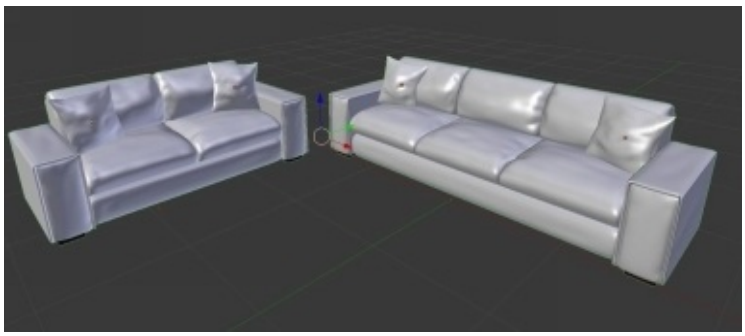
Subdivision Surface (SubSurf)

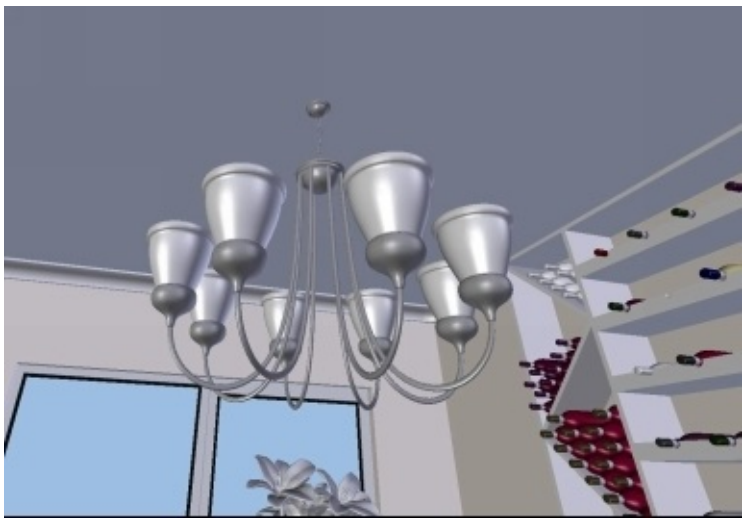
This will subdivide your model and make it look more detailed and smooth. How? First, I need to explain what subdivision is. Subdivision is the process of increasing the density of vertices/edges/faces of a mesh by diving the mesh. Its aim is to create clean, scalable models that look smooth and beautiful when rendered. By increasing the subdivisions, we get more vertices and thus a smoother and detailed looking 3D model. In Pixar’s *Geri’s Game*, the old man was one of the first characters to have experienced subdivision. That’s how the wrinkles on his face were possible. It was such a revolutionary thing at the time.

The characters above would not have been possible without subdivision. The fine wrinkles and pores and the overall smoothness of the model is made possible by subdivision. There are ways to fake it (like using normal maps), but usually subdivision can be used to quickly add detail to a model and make everything look really defined and smooth.

Of course, SubSurf isn’t only limited to characters. Almost any type of 3D object can make use of SubSurf. This is one of the most used modifiers in 3D modeling and you would benefit from using it even for the simplest of 3D models. The next two images also

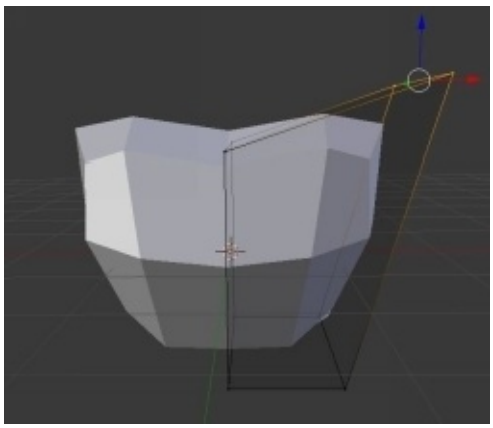
use SubSurf and notice how smooth and detailed they look. These models don’t actually have that many vertices but it looks like it does.





Mirror

This one is quite straightforward. Your model is simply mirrored on the axis of your choosing. Then you edit your 3D model, you can usually see your modeling being mirrored on the opposite side as well. This modifier can be very effective when modeling humans. You just have to focus on modeling half of the body and face and the mirror will copy the rest to the other side. This essentially cuts out half the modeling time and can be a real timesaver. This modifier is best used for anything that is symmetrical.



Bevel

This makes the edges of your models smoother and more rounded. This is quite heavily used in photorealistic architectural modeling. The idea is that every real world item is not completely sharp. Even a knife is slightly rounded at the edge. Even though we can't see it. By adding a bit of beveling to real world items like chairs, tables and other furniture, we make our models look a lot more believable and realistic.

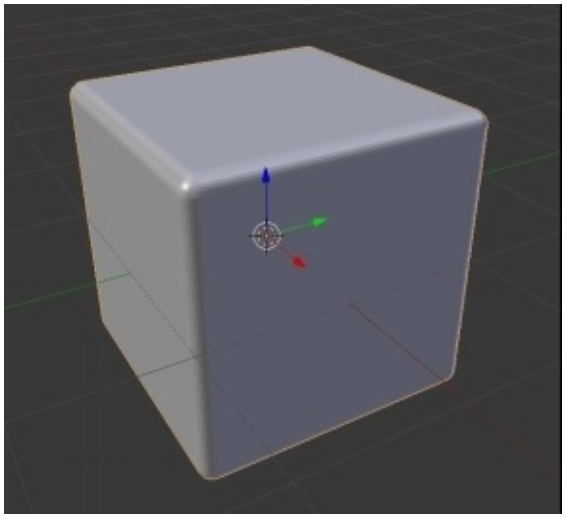
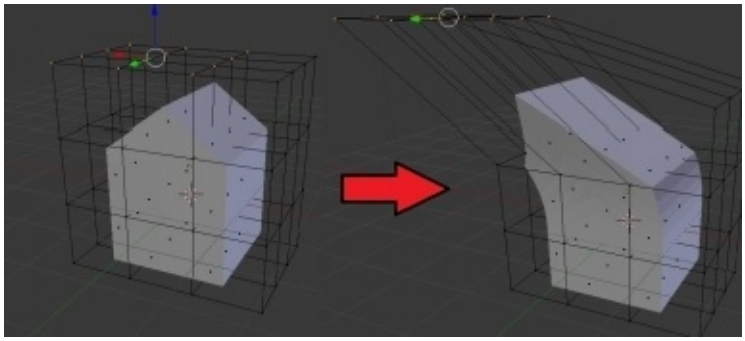


Figure 9. A normal cube with Bevel modifier added

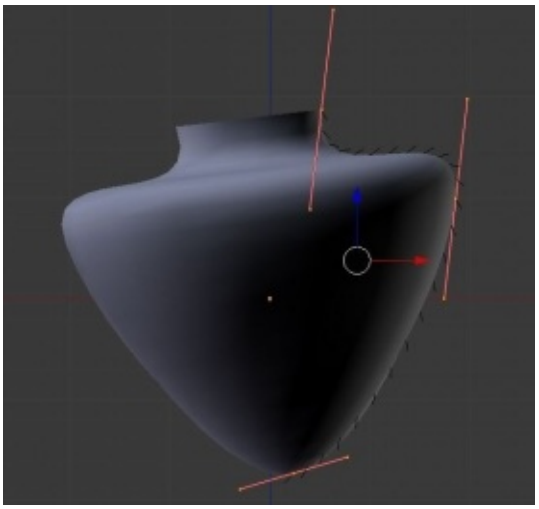
Lattice

Lattices are used to give your 3D models a warp looking effect. This is best used for cartoony models where an exaggerated amount of squeezing and stretching may be necessary. Sometimes it's just easier to use a lattice than to model by hand. But lattices are mostly utilized in animation as it is easier to animate a lattice squeeze and stretch than to animate the mesh manually.



Screw or LATHE

A screw modifier (Blender) or lathe modifier (3DS Max) will take your curve object and spin it around to give you interesting 3D shapes. This is best used to make cups, glass, wine bottles, jars, pots, vases and so on. All you have to do is layout half the silhouette of the vase you want to create and the modifier will do the rest by shaping your curve and giving you the resulting vase that you designed.



Tutorial - Blender Essentials

If you don’t have Blender installed already, it would be wise to go ahead and install it now. It shouldn’t take too long (depending on your Internet speed of course). The steps to doing this are as follows:

1. Go to **http://blender.org**
2. Go to ‘Download’.
3. Depending on what type of computer you have (Windows, Mac, Linux), select the right installer for you. I use Windows and just downloaded the direct .msi installer.
4. Follow the installation instructions and you should have Blender installed on your machine.

Blender is made up of pretty much windows. For example, you might have Google Chrome open in one window and Microsoft Word open in another. Maybe you’ll have Media Player running in another window. Blender functions in a similar way! You might have the 3D view open in one window, a video editor open in another and an image editor open in another. In Blender, these so-called ‘apps’ are called Editors. You can create as much windows as you want in Blender and change the Editor within each window.

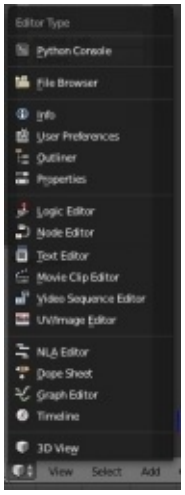


Figure 10. Here are all the available editors in Blender

Explain the interface already…

If the window thing doesn’t make sense, let me start right at the beginning and describe the first thing that shows when you open Blender. You’ll probably see the Blender splash logo. You can click out of that. The below image is what you should see when you open Blender. This is the default Blender interface.

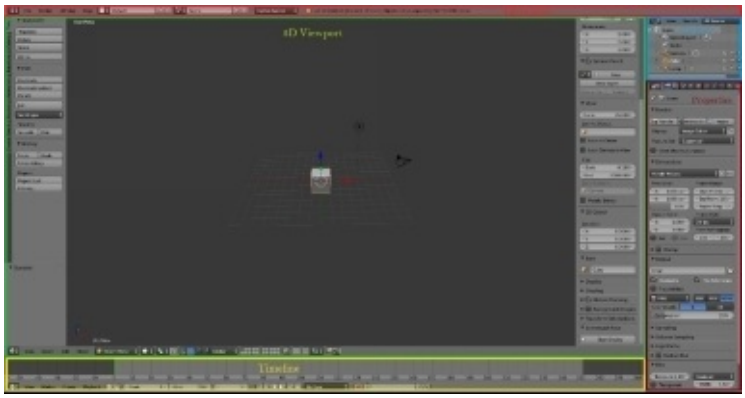


Figure 11. The Blender Interface

If you don't see this screen, you've probably downloaded some other software by mistake. http://blender.org should be the legitimate website! That, or you've probably come across this book this sometime in the future at which point Blender might have changed to a brand new interface.

See where I've highlighted boxes everywhere. Yes, these are examples of windows in Blender. Within each window are Editors (3D Viewport, Timeline, Properties, etc.). Before I go further, let me give you a very brief description of the Editors you see in the above Blender interface.

Green Box – This is the 3D viewport. Here is where you will make your 3D animated movie. You create 3D models here, you animate them here, you see them come to life here. This is one of the most important editors in Blender. It would be pretty difficult (and dead silly) to animate or model something without the 3D viewport open. See the buttons you see on the right? This is the toolbar and contains a lot of the functionality that you would previously had to remember some shortcut key for. Pretty handy!

Blue Box – This the Outliner. Every 3D object you have in your 3D viewport (including objects, lights and cameras) will be visible as a list here. This is useful if you have so many 3D objects in your scene and want to find the exact object by just searching. Say you're working on a massive epic scene involving thousands of soldiers for example. You might struggle to find the soldier named "Bob" in the 3D viewport alone. In the Outliner, you can search by typing "Bob" and the list will filter to show that soldier. On a side note, I cannot picture a soldier with a name of Bob. It just doesn't sound powerful for some reason.

Maroon Box – The Properties editor. This is pretty much the jam in the toast (Sorry, that's the best I could come up with. It sounded better in my head though). This editor pretty much sets up the properties for most of Blender. If you want to render, you will need to come here. If you need to add materials to your models, you need to come here. If you want to add hair, fluids or other physics, you would come here as well. If you want to add some advanced camera effects like depth-of-field or motion blur, you will need to come here. If you want to make changes to your 3D world such as dimensions, you will still need to come here. It's one of the most important editors in Blender just like the 3D viewport. In some cases it's more important than the 3D viewport. Take video editing for

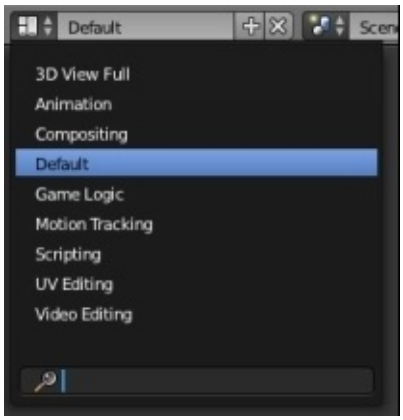
example, you don't even need the 3D viewport open at all but you still need Properties when you do your final render!

Yellow Box – The Timeline. You can playback your animation here, set start and end times of your animations and other timeline related stuff like adding markers. Not much else to say, it's pretty straightforward.

Red Box – This is Info editor. You have a File menu where you can do stuff like Save, Open, New, Preferences, etc. Then there's the Render menu which contains options to render images or animations. The Window menu allows you to select whether you want to work full screen or create a screenshot of your scene. The Help menu gives you options for help (I guess that would be obvious, lol). Next, you have the screen-layout dropdown menu thing (A bit of detail on this below). Next to this, you'll find the Scene selection dropdown. This allows you to create several scenes in Blender file. For example, you could animate 2 friends having a phone conversation. One friend could be at home and the other friend could be in a different country or just hopping off the train or something. You could create 2 different Scenes in Blender and then join them together in the video editor. Next to the Scene selection dropdown, is your current Blender version (yours is likely to be higher than mine) and information about your scene such as the total amount of vertices/faces, how much memory your scene is consuming and your currently selected object.

Screen Layouts

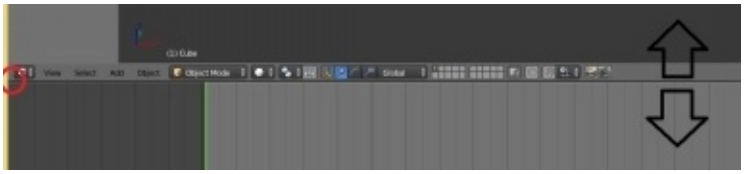
Now back to the screen-layout dropdown that I mentioned a few sentences ago. When you click the dropdown, you see this:



In this dropdown, you see a bunch of different options such as Animation, Compositing and Game Logic. Clicking them will take you to a different looking layout of Blender. This doesn't mean Blender has switched to some different state. It's still the same Blender but with different windows containing different Editors. For example, clicking Animation will take you to a layout containing the most optimal editors you would need for animation. Clicking Video Editing will get rid of the 3D viewport (that's not necessary as you only work with already made video, images and music). Instead, it shows editors that

are related to video editing.

If you don’t like the layouts shown here or want more different layouts, you can create your own layout! You have the ability to create your own Blender interface! You just have to press the plus ‘+’ button next that you see there. This will duplicate the current layout. So if I’m already in Default layout. Pressing the ‘+’ button will create a Default.001 which is a clone. You can then modify this layout to suit your needs.



Another thing! You can change the size of your windows by dragging any edge of a window up or down (shown in black arrows). You can create more windows by dragging the 3 diagonal line thingies (shown in red) away. This makes the Blender interface oh-so customizable!

Summary

In this chapter, we looked at the basics of the 3D viewport and discussed how the 3D universe worked. We then discussed the main 3D object types and their properties. We discussed vertices, edges and faces as well as how to manipulate their location, rotation and scale. We looked at some effective and commonly used modeling tools. We were also introduced to the concept of modifiers. The chapter ended with a short tutorial on carrying out what we've learned using Blender. Phew! That's quite a bit in one chapter! Please take the time to let this all sink in before moving on. And don't forget, keep practicing what you learned! In the next chapter, we cover some of the popular approaches to modeling objects and show you step-by-step how it's all done.

Chapter 4. Modeling Methods

In this chapter, you will learn the main techniques to approach 3D modeling. By using one (or a combination) of these techniques, you will find a systematic way to approaching the building of almost any type of 3D model. These techniques are popular and even utilized within industries and studios. Let’s first start with learning what topology means since a lot of the modeling methods takes topology into consideration.

What Is Topology?

Topology is the organization, flow and structure of vertices, edges and faces of a 3D model. It is how well you can organize your vertices in your 3D model such that it is efficient, clean and detailed.

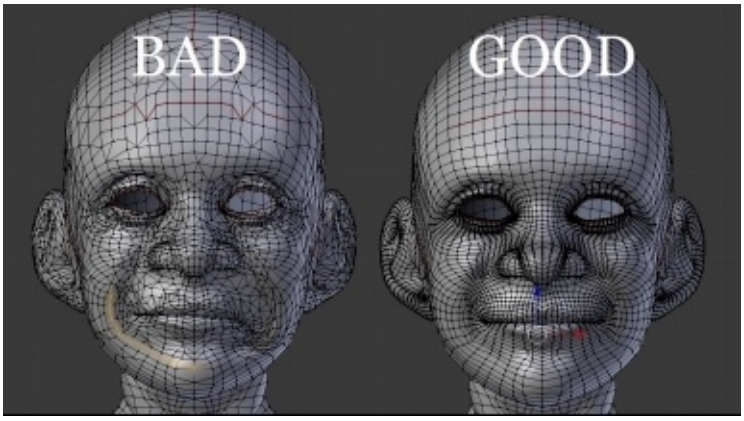


Figure 12. Bad topology (left) vs. Good topology (right)

It is important that you maintain good, clean topology when building your 3D models. Maintaining good topology has a numerous amount of benefits:

- **Easier to work with** – You can easily make modifications to a model that has nice topology compared to a model with bad, messy topology where vertices just hang around randomly for no good reason.
- **Makes deformed animations look** fluid – The animators in your production team will be forever grateful if you incorporate good topology into your 3D modeling workflow. When vertices are organized in a way that makes sense with how objects bend and deform, animation becomes easier and smooth looking. With bad topology, animation becomes a little difficult and even if you manage to nudge out some animation, the result will look horrid with a lot of artefacts like punching and weird stretching in places.
- **No weird artefacts** – Not only for animations, but your 3D model in general may be susceptible to weird artifacts like pinching and stretching in places if your topology is bad and unorganized. These may also be caused by some vertices overlapping one another.
- **Modifiers work smoothly** – Popular modifiers like SubSurf will work better on models with good topology. You will get a nice smooth result without doing much tweaking. Adding a SubSurf modifier on a model with bad topology may introduce strange, unexpected results where your model won’t end up looking like your model.
- **It looks neater** – 3D models with good topology still look good if you see a wireframe of the same model. It has a nice organized look. This is beneficial if you would like to sell your 3D models in a marketplace. People generally buy a 3D model if they see a model and will likely examine the wireframe images. This can determine whether people will buy it or not. Not only for selling though. If you work in a team environment, it is always pleasant for the other 3D modeler to use your models when you have nice, clean topology.

- **It uses less memory** – A model with bad topology with hundreds of vertices/edges/faces is going to hog up valuable memory space. You don't want to have hundreds of vertices just to model a cube. 8 vertices would be enough to get the job done. No point showing off. Good topology ensures that you create a 3D object using the least amount of vertices as necessary, so that your computer will electronically thank you and give you a big hug if you incorporate good topology in your workflow.

A good 3D modeler always ensures good topology in their 3D models. Here are some tips that I've learned, that will ensure your 3D model has good, clean topology.

- Use the least amount of vertices as necessary to get the job done for your 3D model. If you want to smooth things out, try using the SubSurf modifier.
- Try to make all your faces quads. Quads means 4 vertices. A Tri is 3 vertices. By aiming to have ALL the faces in your 3D model Quads, you will eliminate artefacts such as pinching.
- Make all your faces as even-sized squares as possible. Try to make all the quad faces in your 3D model as even-sized as possible throughout your entire model. Don't create too big faces or too small faces at random places. There may be some exceptions like the face and legs. The legs can afford to have larger faces since it isn't as detailed as the face. But even on the face alone, try to aim mostly for even-sized squares as possible. Watch the behind-the-scenes of famous animation movies and you'll notice that a lot of their model's wireframes contain mostly even-sized squares. There are exceptions like in simple hard-surfaced models (like tables for example).
- Try to use circular loops in areas where joints in your model will bend. I find having circular loops around joints helps in giving smoother bends. Like the elbow or knees for example. It can be helpful to have a bunch of circular loops perpendicular to the direction of the bend. You can use **Ctrl+R** in Blender to add loop cuts.

That's pretty much the basics of topology. Make sure the organization, flow and structure of the vertices in your 3D model look good. Now lets' finally start looking at some modeling techniques and approaches. We will first start with the most popular one and also one that beginners can quickly get accustomed to; Box Modeling!

Box Modeling

This is a technique that is most popular with beginners. Box Modeling works by starting out with a cube and blocking out the overall shape and form of the thing you want to model in box-like shapes. The reason for choosing cubes (or box-like) shapes is because cubes are easy to manipulate. They only have 8 vertices in total and it's generally easier to create box-like shapes than rounded circular shapes. Box modeling mostly utilizes tools such as extrusion and loop cuts.

You first block out the overall shape and form of the object you want to model. You start with a cube and extrude faces out. You then reshape these faces to fit the shape of the thing you want to model. Reshaping can involving changing the location, rotation and scale of the vertices/edges/faces.

Once you have your "blocky" object created, you then refine the model and get it looking closer to your desired object. Remember, the more detailed your object is, the more vertices it's going to need. You can do this via extrusion or loop cuts. Loop cuts can be an effective way to add detail and help further shape your object.

Figure 13. Box Modeling

Don't ever feel the need to purposely add in more vertices in the hope that it will give you super detailed eye-catching models. It simply won't. Only add the amount of vertices that are necessary for your model. A highly detailed character for a movie would need far more vertices than a simple table for instance. A simple table would not look like a super table if you throw in thousands more vertices at it.

So that is basically the process of box modeling. You start out with a cube and block out the main shape and form as if you were working with a lego set. Then, you go and refine the blocky lego model by adding loop cuts, extrusions and reshaping them accordingly. Finally, you may add modifiers like the SubSurf modifiers to smooth things out and create more detailed renders.

Box modeling is best used to make hard surfaced objects like desks, doors, TV screens, sofas, furniture, buildings, and so on. You can model cars, houses, streets and so on.

You can also use box modeling to create more complex objects like animals and humans. Both are the same thing, I know. However, things can get complicated if you want to animate them, since topology becomes important. A little on that later.

Box modeling is also a great way to sketch out and try ideas early on. This is mainly because box modeling is really quick and efficient.

Sculpt Modeling

This is a fairly new way of modeling. Sculpt modeling works similar to the way we may sculpt in real life. If you have experience sculpting stuff in real life like clay models, then you're going to have a lot of fun digital sculpting. There are many 3D applications dedicated completely to sculpting, such as ZBrush and Sculptris. Blender can also function as a sculpting tool. These applications contain a bunch of different brushes which may aid in sculpting your model the way you want it. There are brushes that can add form to your model and make it bumpy and rough. There are brushes where you can smooth things out, or use an image texture to add indents (like pores) into a model. You can also use image textures to create lizard skin.

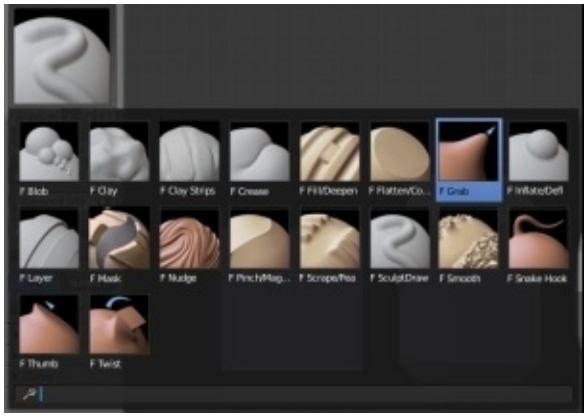


Figure 14. Sculpting brushes in Blender

You can literally turn a cube into a giant hulk beast using nothing but sculpting. This is possible by something called **dynamic topology**. That is, as you use your brush to paint and control the look of your model, the sculpting software is smart enough to dynamically add (or remove) vertices and reshape your models accordingly. You don't have to worry about pushing and pulling vertices, or extruding and adding loop cuts and so on. Unleash the artist within you as it is the artist that is in control, not the software. And that's a good thing! We don't want software to control or restrict how our models will look. Only our imagination should have the permission to do that. And sculpting is a step forward in the right direction.

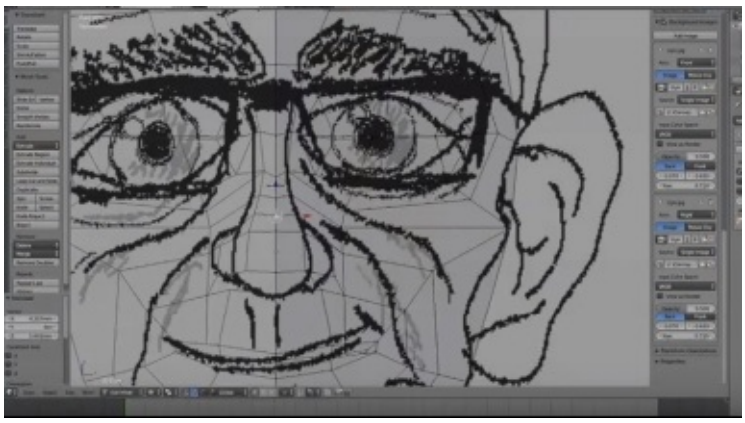
One drawback with sculpt modeling, however, is topology. If you want to stuff up your topology and create a mess with a bunch of vertices and faces that are hard to edit, then sculpting will always give that. Almost always, dynamic sculpting will give you more vertices than is necessary and may find that it hogs up a lot of your PC's memory when your sculpted models start to get detailed. Sculpting software do have features that smartly

control memory consumption but still it isn’t overly smart. If topology is important (that is, if animating, or memory consumption, or even selling/working for someone), then sculpting is best used in combination with retopology (explained later in the chapter).

An artist would generally approach sculpting by starting with a cube or sphere. It doesn’t really matter in this case. This is the base model. From there, the sculptor would build up form using the brushes and constantly refine/smooth. There are no specific rules to how to sculpt. Just do what your inner artist tells you.

Polygonal Modeling

Polygonal modeling is where you start with a single vertex and then using techniques like extrusion, make your way by building your model. Unlike box modeling, you don't block out any parts. Rather, as you build your model, everything you've done so far is the final thing. You can still refine later if you want to but the main idea is that you can start from scratch and make it perfect as you build. Any vertex, edge or face you add, you make sure they've been placed perfectly before you go and add even more vertices/edges/faces. For this reason, polygonal modeling may not suit beginners as it does appear a little daunting. However, it is a necessary skill to have as you can directly control the topology and make it look clean and tidy. A good 3D modeler always ensures that their models have good, clean topology.



Polygonal modeling can be very time consuming. You essentially have to create your model a vertex at a time and make sure it looks good, even if you're partially done. You can still refine later, but hopefully by the time you reach the refining stage, you won't have that much to do.

Something like facial modeling is best suited to the polygonal modeling approach. Since topology is very important when it comes to modeling faces, the polygonal modeling approach is almost necessary. It would be a bit more difficult (although can be done) to box model a realistic face and often times you would have to make a lot of guesses or follow a formula someone came up on some tutorial. Polygonal modeling will take all that guess work out since you only concentrate on developing a feature at a time (for example, the eyes or ears) and making sure it looks perfect before you move onto the next feature. Polygonal modeling is also best suited to complex models and those that require good and slightly complex topology. This is the downside to box modeling. Not knowing how to block out a model while taking topology into consideration.

Even though, it can be quite time consuming, it's important not to get too bogged down just to get everything 100% perfect. Many times when modeling in 3D, you will find that you aren't satisfied with your modeling. If it really is that horrible, you can keep refining. But if you keep refining and refining for days, that would be counterproductive. It would simply be better to stop and work on something else or research further skills. You still need time to develop and mature as a 3D modeler. Once you get more experience, you can come back and aim to tackle it again. We humans only have around

75 years or so of life (that was a guess, not a statistical fact), so we shouldn’t spend most of those years perfecting a model. That being said, don’t ever rush either. Take your time. Patience is a virtue when it comes to 3D modeling.

Polygonal modeling is almost never an approach adopted once throughout a project’s lifecycle. This hybrid workflow can not only speed up workflow, but can also produce higher quality 3D models. In other words, you can make good quality 3D models quickly and efficiently. To model a human character, a 3D modeler would first block out a draft of the character using box modeling and may refine via extrusion, loop cuts and vertex/edge/face manipulation. Then, they concentrate on the core features like the face, ears and stomach. They may adopt a polygonal modeling approach for this. You initially lay out the foundation and then perfect each part one by one. My workflow to create characters is exactly that. I always box model the body and then polygonal model the head. I find this workflow easy but it really depends on your own preferences and capabilities.

Curve Modeling

Curve modeling uses curves to create 3D models. You can't create a huge variety of objects like you can with box modeling or polygonal modeling. Curve modeling is best suited for objects that primarily require curvature in some form or another. Some examples include ropes, pipes, tunnels, the fancy intricate designs of an antique sofa, the trunk of a tree, bendy road tracks, snakes and so on. I mean, it isn't impossible to model these with box modeling or polygonal modeling techniques, but curve modeling just makes it that much easier.

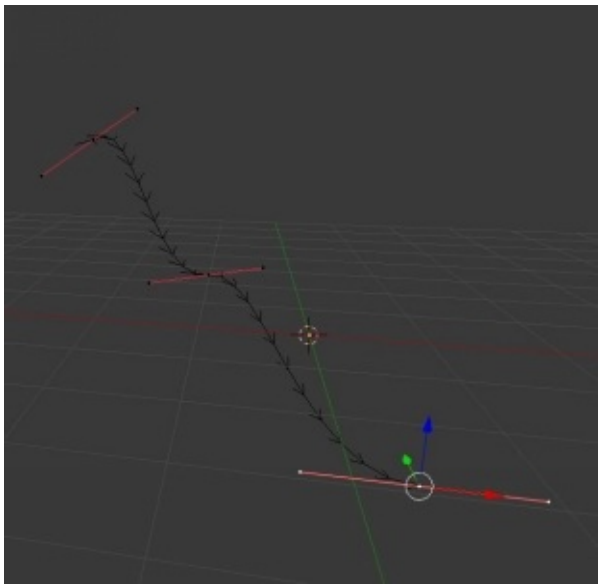


Figure 15. Curves and Handles

Curves are controlled by "handles". Handles are just like vertices but the additionally control curvature of a connected edge. When you move a handle, the edge that is connected to that handle also moves and along with it, changes the overall curvature of the curve. The same thing applies when you rotate or scale a handle. Handles can be visualized as vertices while the curve itself can be visualized as edges. When you see a handle, you'll notice they have a line through with what appears to be 2 more dots (or vertices) attached to the ends of it.

These are used to control the curvature of the curve. They may look sophisticated like some rocket or physics controller, but it really is quite simple in its usage. You can move, rotate and scale them and this will modify the curvature around the main handle. In fact, you can move, rotate and scale handles and those little curvature controllers the same way you would for vertices in Blender (by pressing **G**, **R** and **S** respectively). Play around with it to see its effect.

You will be able to create complex and smooth curves in a matter of minutes using a couple of handles. You can extrude handles (pressing **E**) to get more curves in there and you can also subdivide handles (selecting 2 adjacent handles and then pressing **W** **Subdivide**) to further detail your curve.

Another special use for curves is the creation of vases, coke bottles, glass, cups, wine jars, and other cup-like objects. In Blender, you can use the Screw modifier to quickly

create these objects with ease. You just need to create an outline of half your cup and let the modifier do the rest. In fact, you will be creating this yourself as I show you step-by-step in the next chapter.

For now, just know that curve modeling is best used to create objects that mainly rely on curvature.

3D Scanning

This is very new age and may not really require much 3D modeling “skills”. I put the apostrophes since it may be a skill in itself to know how to setup a 3D scan. The idea is that you take a real world object, say for example a statue head, a tiny ring, or some stationary. You then place this real, physical object in a 3D scanner. The scanner will then scan your object and output a 3D version of it on your computer. This is pretty much like using your printer scanner to scan your documents or pictures to your computer.

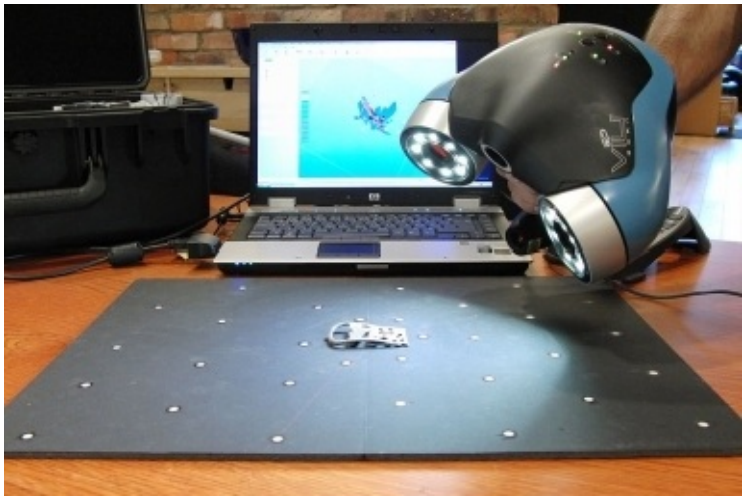


Figure 16. The VIUScan 3D scanner in action (by CreativeTools)

This is quite modern and never really existed a couple of years ago. I’m not sure exactly how they work but I believe the 3D scanners fire some X-ray like thing through your model from the front, side, top and bottom. Those X-rays calculate the distance from where it hits and where it escapes. This data is then combined in a 3D voxel volume simulating your 3D object around the middle. This voxel volume is converted to your 3D model by eliminating all that empty space in the voxel volume and leaving just the 3D form. It really depends on what type of algorithm 3D scanners use though. That description got way too complicated and I apologize for that. You don’t need to know that to be a good 3D modeler.

Let’s keep it simple. You throw your real world object into a scanner. The scanner scans your object and outputs a 3D object file representing your object to your 3D software application.

3D scanners aren’t smart enough to assess the topology of your item, so the returned 3D models will always have bad topology. Even something as simple as say a box. Therefore, you should never use the 3D scanning method alone if you plan to model for any kind of production, animate the model, or if your plan to sell these 3D models. You also shouldn’t rely on 3D scanning if PC memory is important to you.

There’s some pretty cool stuff going on now where they 3D scan human actors. This is great, because you get to preserve their shape, form and even the super-fine details like the pores on their skin. While this is cool, there are divided opinions about this as some feel that this is a little creepy. I guess it probably is, but nevertheless cool.

RETOPOLOGY

Retopology is the process of taking a model with bad topology and making a copy of that model but this time with good topology. It is essentially, the process of fixing a model with bad topology. It is a very popular technique and that is growing rapidly. This is a fairly new technique and rarely ever existed a decade ago. Retopology didn't exist as a technique because some crazy statistic said "3D modelers are getting worser at 3D modeling at an all-time high of 50% this year, something needs to be done before it's too late." Retopology is actually used to compliment the other modeling techniques where topology took a backseat. The process of retopologizing mainly involves the polygonal modeling technique. This what may be the process of a 3D modeler:

- Create a 3D model using sculpt modeling (or 3D scanning).
- The result is a really good-looking 3D model (hopefully) but a model with bad, crowded, messy and unorganized topology.
- The 3D modeler now uses that awesome super-detailed 3D model with bad topology as a base, and creates a new mesh on top of that uses polygonal modeling to retopologize over the high-detailed model.
- The result is slightly less detailed but near accurate to the original 3D model.
- The 3D modeler may then bake the bump maps and such to preserve the details from the original model and apply this bump map image texture to the lower resolution retopologized version to fake the details.

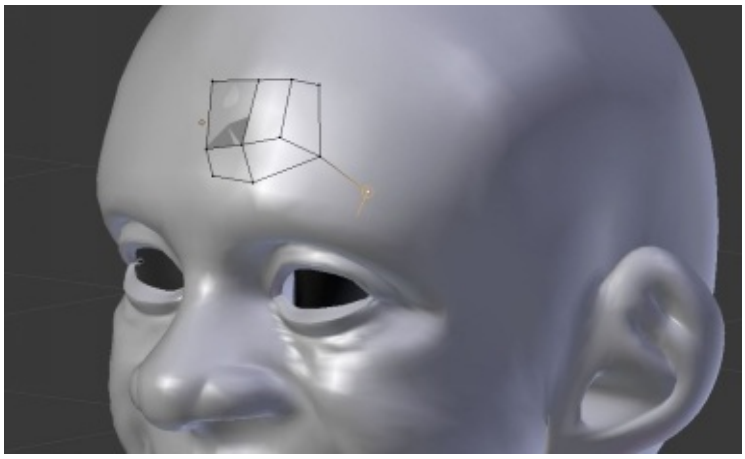


Figure 17. Retopology

That's basically the general workflow for retopology. You have the freedom to create high-detailed 3D models using the sculpt modeling technique without worrying/caring about topology and/or memory. Then later on, you "fix" the topology using retopology while being prepared to accept the fact that you may lose detail along the way.

In Blender, you would generally approach retopology by importing your high-resolution 3D model. You would then create a new mesh. Vertex by vertex, you would "stick" them on the detailed mesh. You can use the "Snap during transform" button which is shaped like a magnet and choose "Face" in the dropdown next to it. Vertices will now stick onto any closest mesh surface it could find. Below is what the tool looks like:

You would approach just how you would polygonal model. That is, you would extrude a vertex, stick it to the detailed mesh, extrude another, stick that to the detailed mesh and keep it going on. All the while filling in faces where necessary (pressing **F** to do so) and taking note of good topology while placing your vertices. You shouldn't guess where to add vertices or place them randomly wherever you feel like. If you know the right topology for your model, you will know what you are doing and where to place your vertices. With more practice, you should be getting quicker and quicker and vertex placement will become second nature to you. We will briefly go through a systematic approach to retopo-ing a head later in Chapter 6.

Summary

In this chapter, we looked at the most popular techniques for approaching the 3D modeling of objects. These are Box Modeling, Polygonal Modeling, Sculpt Modeling, Curve Modeling, 3D Scanning and Retopology. We also looked at what topology is and why it is important. Now that you know how to approach 3D modeling, we can finally move onto creating stuff and getting that much needed practice. In the next chapter, we start by learning how to approach and create hard-surfaced objects like tables, chairs and buildings.

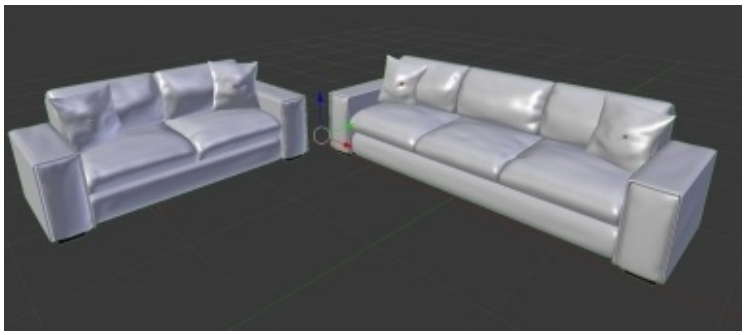
Chapter 5. Hard Surface Modeling

In this chapter, you will learn the process and techniques of approaching the construction of hard-surfaced models. We will be applying some of the techniques we learned in Chapter 4 and some of the tools we looked at in Chapter 3 to assist in developing our hard-surfaced models.

What Are Hard-Surfaced Models?

Quite simply put, hard-surfaced models are models of objects that have a hard surface and usually don't have much roundedness. They also don't have much (if not, any) life. There are many examples of hard-surfaced objects. Here are a few:

- Tables
- Chairs
- Shelves
- Cupboards
- Doors
- Rooms
- Buildings
- TV Screen
- Alarm clock
- Bed
- Roads
- Sofa
- Skyscrapers
- Vases
- Kitchen set
- Computer set
- Stadiums
- Vehicles
- Spaceships
- Phones



Hard surfaced models are generally easier to model compared to organic models like characters. But having said that, the complexity level also varies on the type of hard

surface model you make. For example, a table would be far easier to model compared to a car.

Technique

The best way to approach hard-surface modeling, I find, is through Box Modeling on most instances. The idea is that you first start with a cube as your base model. You then block out the overall shape of the hard-surface model you wish to make. By continually extruding and shaping, you will eventually have your hard-surfaced model completely made. From time to time, you may also use loop cuts to further shape and accentuate some details. Finally, you would then add a SubSurf modifier to smooth out everything and add further detail. SubSurf is almost always used to help smooth things out and showcase finer details.

We generally use Box Modeling technique due to the simplistic nature of hard-surfaced models. It would be a waste of time if you wanted to sculpt hard-surfaced models, or even 3D scan them. It's far easier, and much more efficient in terms of vertex count and thus memory, to simply use Box Modeling. You can also use Polygonal Modeling techniques if you prefer (where you start with a vertex and incrementally build your final model). I personally find Box Modeling to be a lot quicker and more efficient, that's all. It really is up to what you're comfortable with. You can try experimenting with both techniques and find which one you most suit.

Uses

There are many places where hard-surfaced models are necessary. Here are a few:

- Architectural Visualization: You need to have great hard-surface modeling skills if you want to be a 3D modeler for arch-viz purposes. Arch-vizers value people who can model hard-surfaced objects as they always need hard-surfaced objects as part of their workflow.
- Film/Games Development: Films and games need hard-surfaced objects in their scenes. In games, they may be used as obstacles, whereas in films they may be used as props, or the backdrop of a scene.
- Crime Investigation: Detective and FBI people need hard-surfaced modelers as these models are needed on demand to reconstruct a crime scene.
- Virtual Reality/Augmented Reality: Hard-surfaced objects would obviously be needed here as these objects form the objects in the virtual world. They add to the immersive experience.

Approach

We will be creating 4 hard-surfaced models in this book. We will use a combination of box modeling and polygonal modeling (but primarily focus on box modeling). We will also look at leveraging 3D modeling tools to assist in modeling objects more efficiently.

The four models we will be creating are:

- Table and Chair
- Fence
- Building
- Vase

We will be using Blender to demonstrate the process. If you prefer another 3D modeling software, please go ahead and use that as the process should be easily transferrable to any other 3D software.

Instead of reading, I highly encourage you to follow along and try to replicate the results for yourself. This will give you a deeper understanding that mere words simply cannot give. By the end of these 4 exercises, you will start to gain confidence modeling hard-surfaced objects on your own.

Also, as I may have mentioned in the beginning of the book, I'll assume you can at least work your way around Blender (or your own 3D modeling software) and know how to do basic things like navigation as well as basic controls and functions.

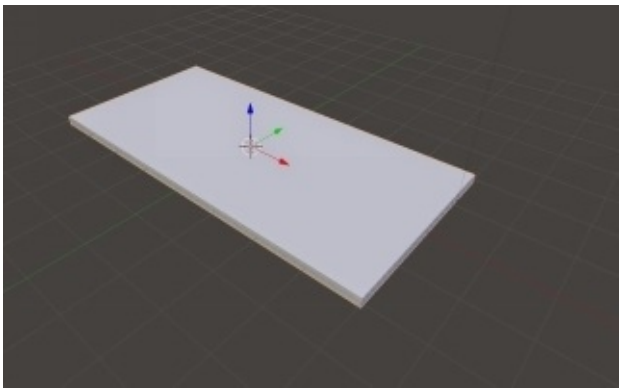
So let's start off with modeling a table and chair!

Modeling A Table

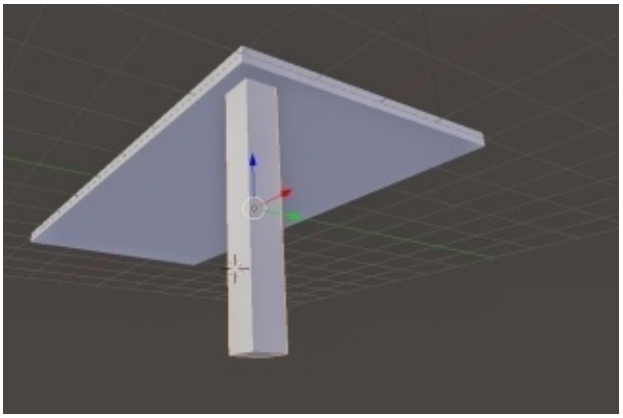
Let’s start off with something easy. Let’s start by creating a simple table. In the end, we’ll make it look a little bit fancy.

Step 1: Open up Blender and select the default cube.

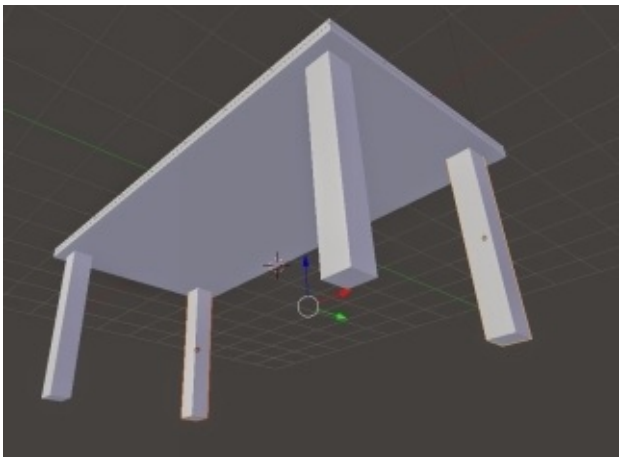
Step 2: Scale the cube and shape to the size of a table top. Press **S** to scale, then **Z** to limit to the z-axis and then **0.1** to scale it to 10%. Similarly, I did **S + X + 4** to scale 4 times along the x-axis and **S + Y + 2** to scale twice along the y-axis.



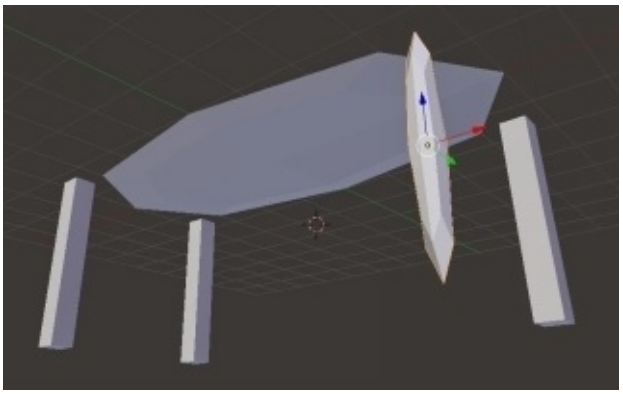
Step 3: Duplicate the top (**Shift+D**) and now scale it to the size of one of its legs. I did **S + X + 0.05**, **S + Y + 0.1**, **S + Z + 15**. Position the leg to one of the corners of the table top (leaving some gap).



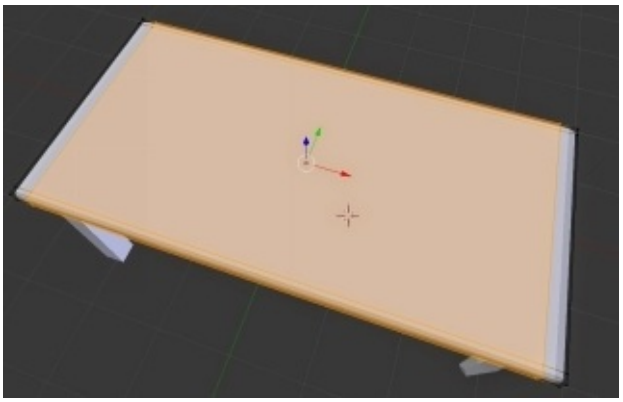
Step 4: Duplicate the new object using **Alt+D** (instead of **Shift+D**) and then immediately press **X** to move along x-axis. Position the second leg in the opposite corner. Then select both legs and position them via y-axis to the opposite end. Note: We use **Alt+D** to duplicate since this will preserve more memory and allow you to edit just the one leg instead of all 4 legs.



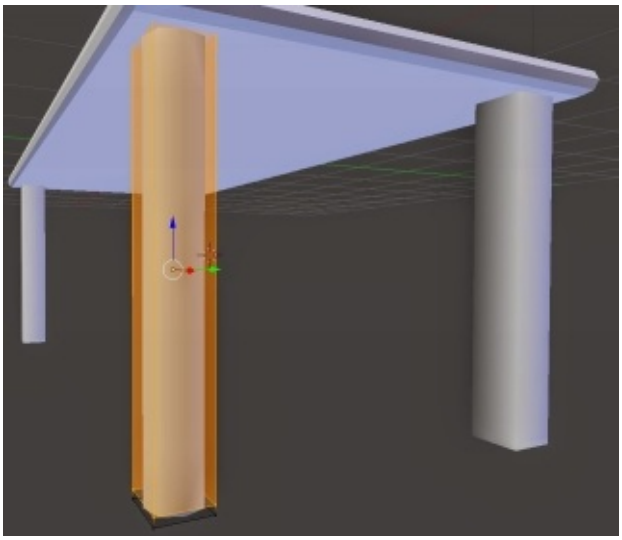
Step 5: When rendering hard surface objects in 3D, it's always better to add bevelling to give smoother edges compared to sharp edges. In real life, nothing is 100% sharp (even knives!). Adding bevelling will add more realism to your hard surface models. To do so, add a SubSurf modifier to the table top and one of the table legs.



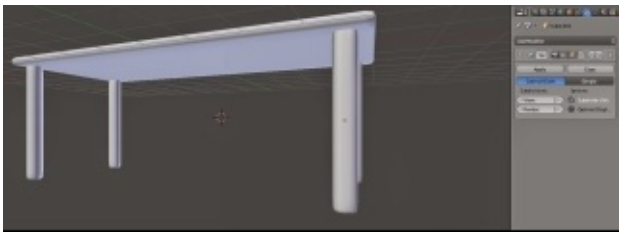
Step 6: Tab into edit mode after selecting the table top and add two loop cuts (**Ctrl+R**) along the length and width of the table top. Then scale along the length of the table until it nearly reaches the end. Do the same for the width. To finish, hit the smooth button to give a smoother, more polished look.



Step 7: Repeat Step 6 for the leg. Only this time, create loop cuts along the length and that's it. Also, increase the subsurf to 2 for more rounded appearance.

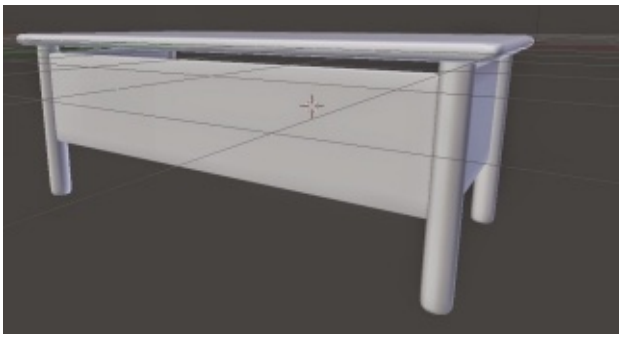


Step 8: Select all the leg posts and the SubSurfed leg post LAST. Then hit **Ctrl+L** and then select 'Modifiers'. This gives the same modifier in the LAST selected object to ALL the selected objects.

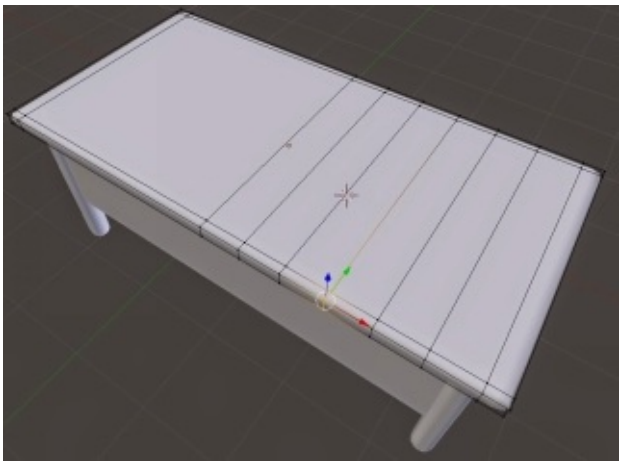


Additional:

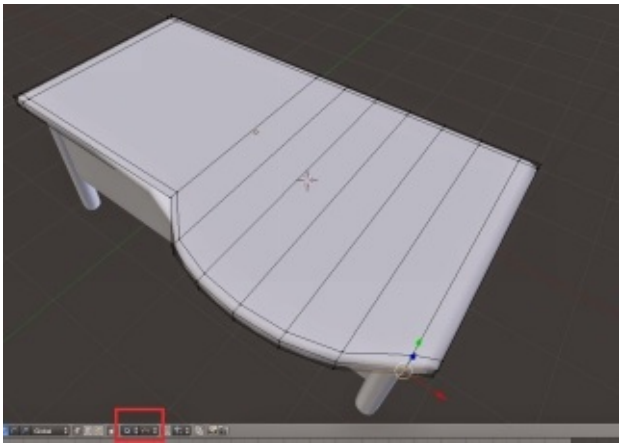
Step 9: We'll now make the table look less…boring…. Duplicate the table top and create the panel thingies like from the image below. I used **Shift+D** for the front panel and left panel. Then **Alt+D** for the opposite right panel. This way, I don't have to texture twice.



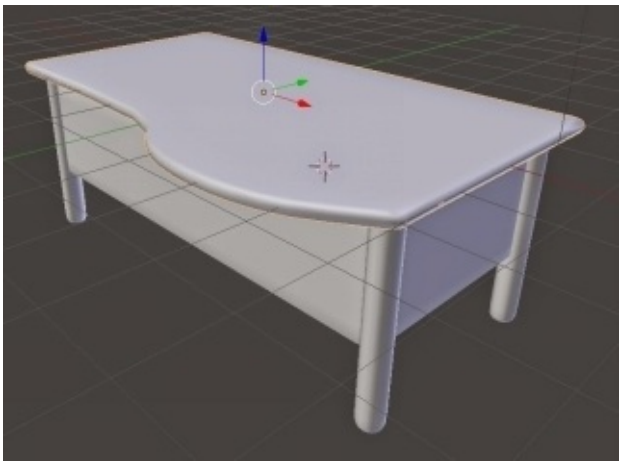
Step 10: To make it look even better, add a loop cut somewhere in the table top (I chose the middle). Then add a few more on the right or left, whichever you prefer.



Step 11: Enable proportional editing (**Alt+O**) and change the falloff to ‘Sphere’. Select middle vertices and pull along the y-axis to a level you like. Scroll to make the influence bigger or smaller as you prefer.



Step 12: And there you have your simple table!



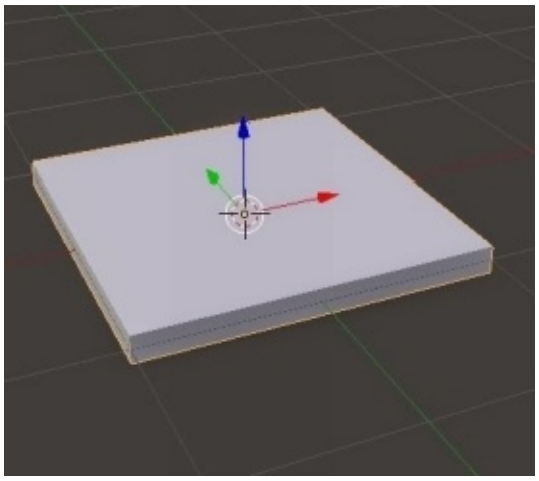
This table is good to go for an office table or some sort of study desk.

Modeling A Chair

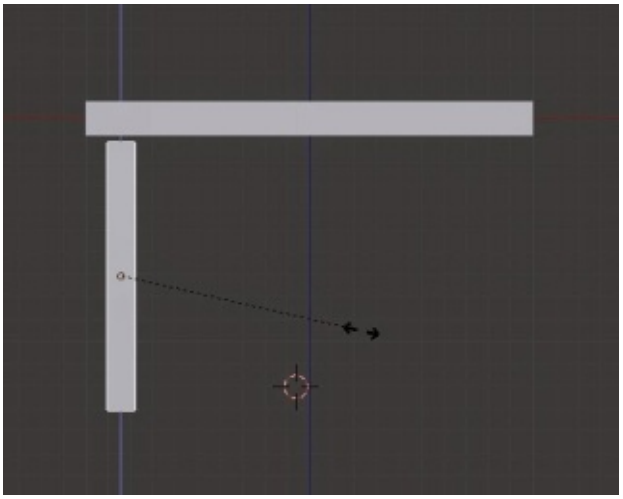
With our table now done, let’s give it matching chairs.

Step 1: Open up Blender and select the default cube.

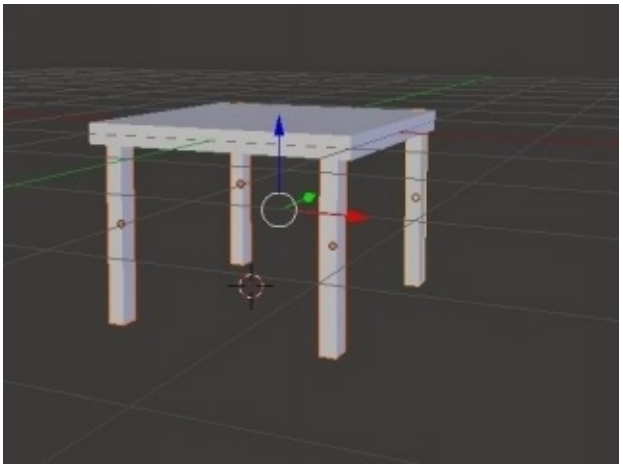
Step 2: Scale the cube to fit the size of the seat.



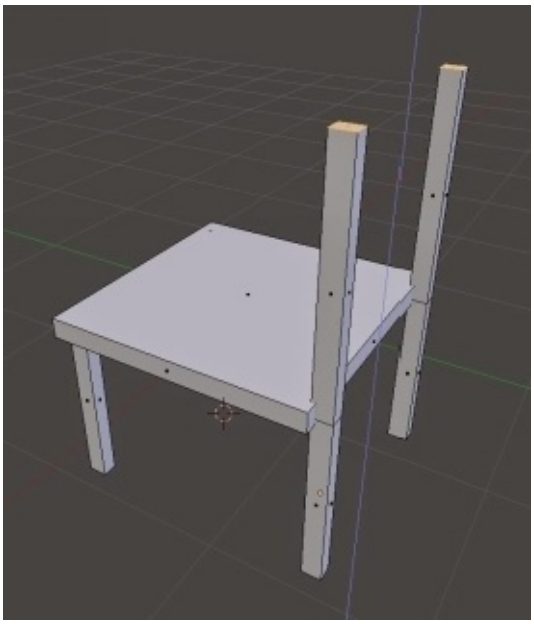
Step 3: Go into edit mode and duplicate the cube via **Shift+D** and scale the cube to fit the size of the chair legs.



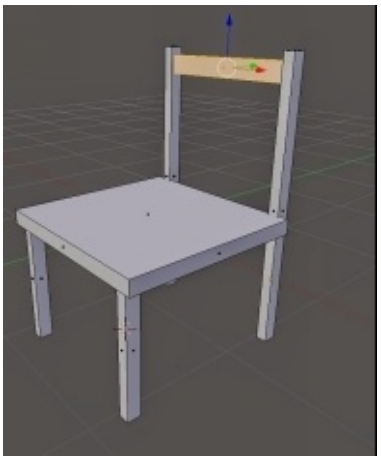
Step 4: Duplicate the chair legs via **Shift+D** and position them in the corners of the seat.



Step 5: Extrude the top faces of the back legs to a level that represents the height of the chair.

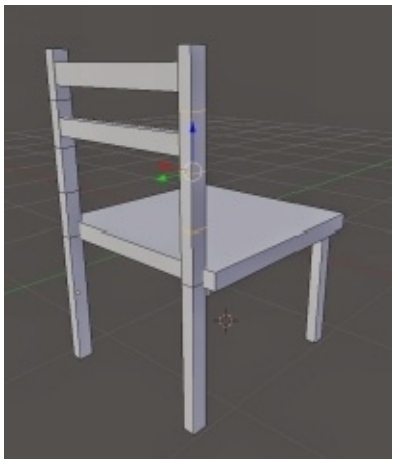


Step 6: Duplicate one of the front chair legs again via **Shift+D** and rotate it 90 degrees (**R + Y + 90**). Position it to the height of the seat and in line with the back legs. Adjust the proportions to whichever you feel comfortable. I increased the scale on the z-axis slightly.

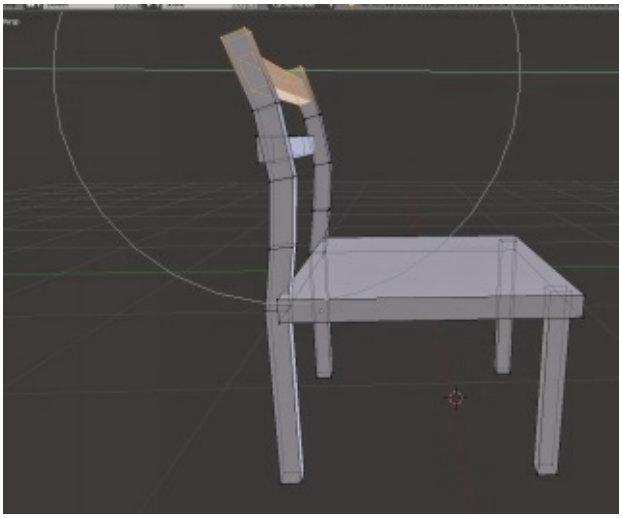


Step 7: Duplicate again via **Shift+D** and place slightly below. This time decrease the scale via the z-axis.

Step 8: To add a nice finishing touch to the chair, we'll add a slight bend to the back. To do this, add a few loop cuts (pressing **Ctrl + R** and scrolling) in the back legs in Edit Mode.

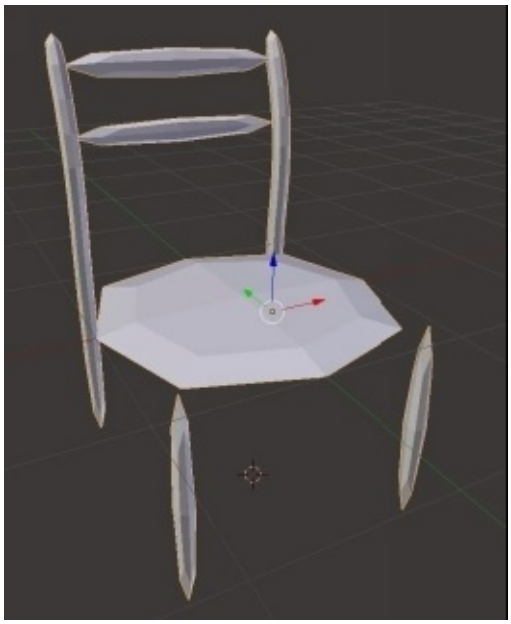


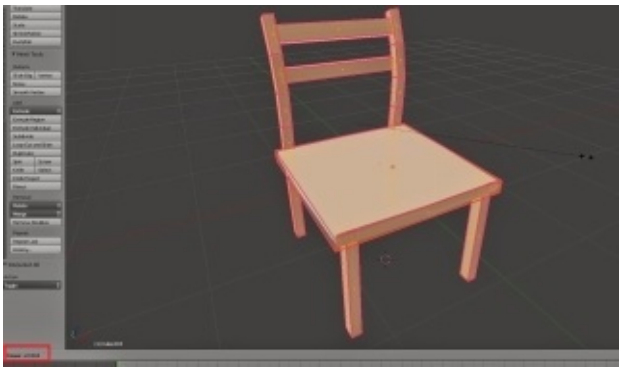
Step 9: Then select the top row of vertices of the back legs and the nearby cube. Enable proportional editing via **Alt+O** if not already, and pull the vertices back to a level of bend that you're happy with. You can also add bending near the bottom of the chair if you wish. Feel free to be creative here. (You may also need to rotate the cube if it extends beyond the back legs)

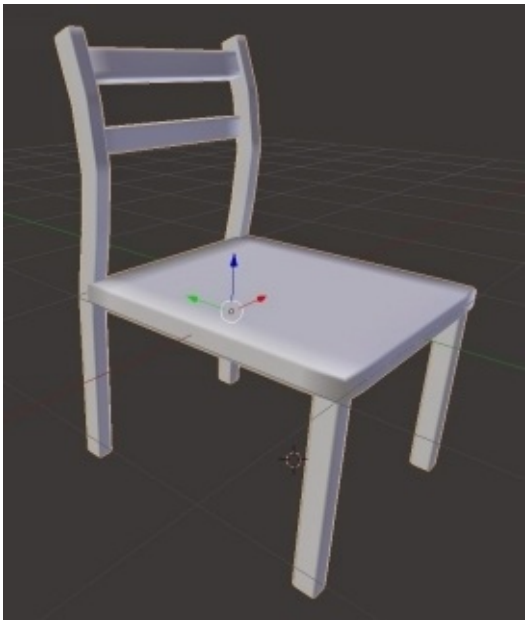


If you can't select the top cube, you can go to face mode, hover over the middle of the faces and then press **Ctrl+L**. This will select all connected vertices and in this case, just the cube.

Step 10: To smooth everything out and get rid of those sharp corners, you can either go into edit mode and select visible edges and press **Ctrl+B** to add bevel to the corners (Blender's bevel function is not 100% perfect so you will need to do this smartly). A better way instead would be to apply a SubSurf modifier on the chair. Adding a SubSurf modifier will suddenly make your chair look a bit…odd. You can then fix this by adding edge loops everywhere there's too much smoothing, or a lazy way is just selecting all vertices and pressing **Shift+E** (I used a crease value of 0.934 as highlighted in the red box). Then dragging to a level that looks smooth enough.







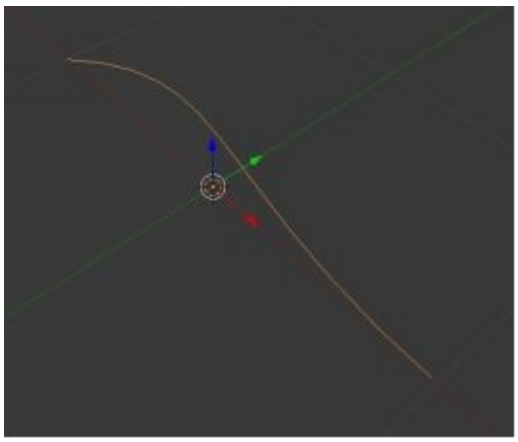
Step 11: Final steps would involve UV-unwrapping everything (for texturing purposes) and applying a wooden texture to the chair. Then, simply add and duplicate your chairs around your dining table and you have yourself a basic dining table set.

Modeling A Vase

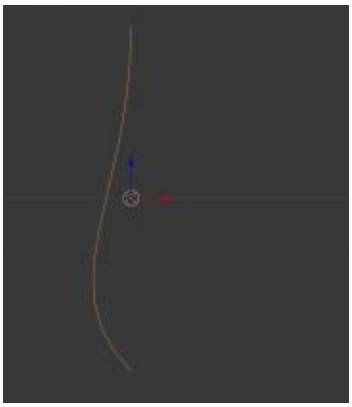
We've looked at modeling some hard-surfaced models using mostly the Box Modeling technique. Let's now try to create a model using the Curve Modeling technique.

Step 1: Open up Blender and delete everything (**A** **X** **Delete**)

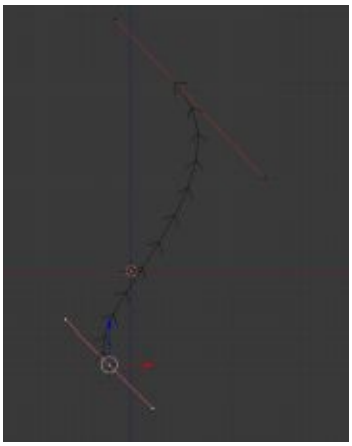
Step 2: Add a Bezier curve by pressing **Shift+A** **Curve** **Bezier**.



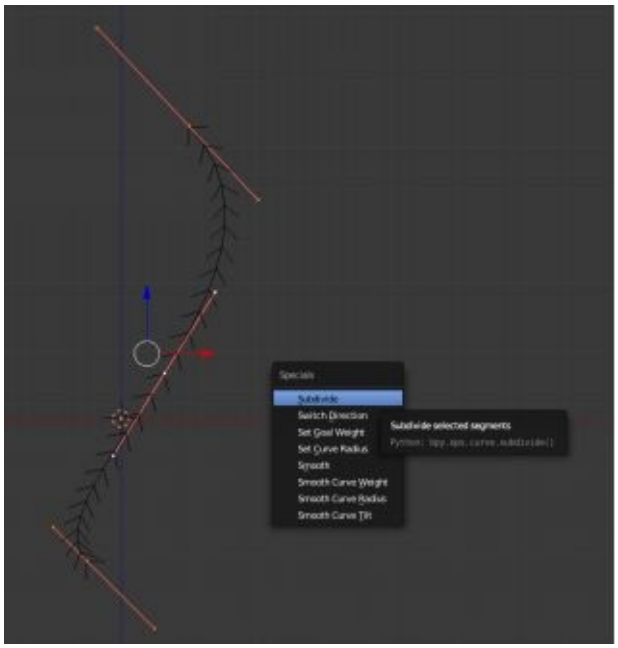
Step 3: Go to the Front view (pressing **Numpad-1**), and then rotate the curve to look like below. (I did **R + X + 90** and then **R + Y + -90**)



Step 4: Tab into Edit Mode and select any handle (by **right-clicking**) and rotate (**R**) or move (**G**) them wherever or however you like.

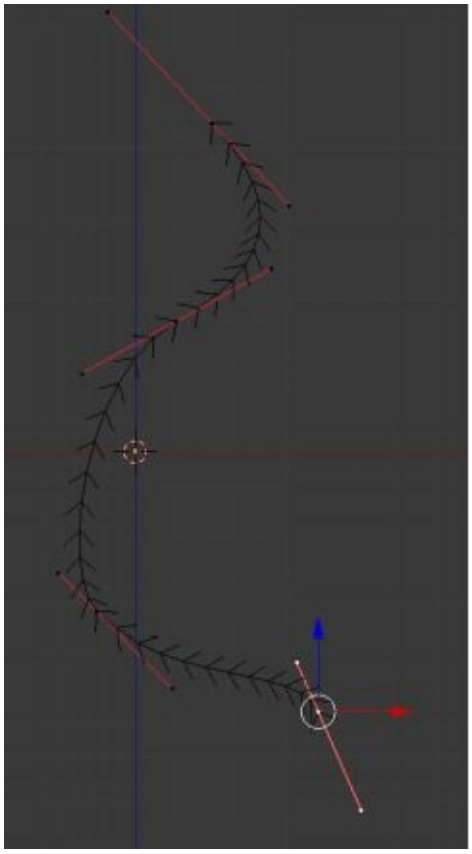


Step 5: Select both handles by **Right-Clicking** one handle and **Shift+Right-Clicking** the other. Alternatively, you could just press A to select all. Then press **W** **Subdivide** to get a new handle between the selected ones.

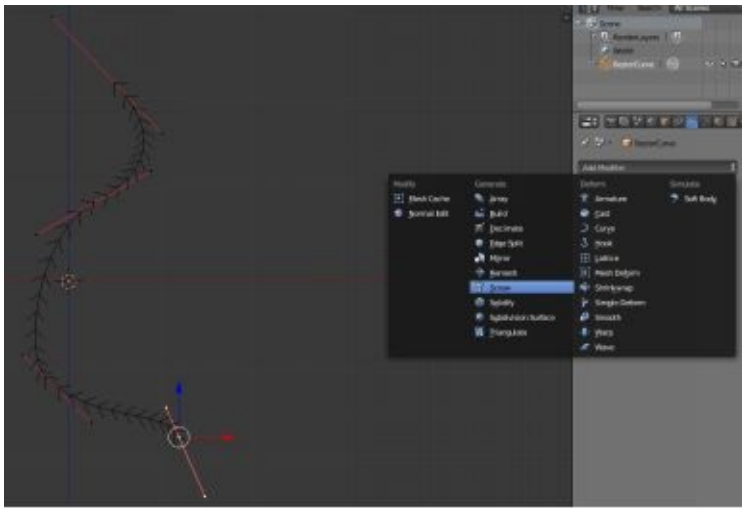


Step 6: You can also extrude to extend the length of your curve. You just need to select a handle and press **E** to extrude. Then move them however you like.

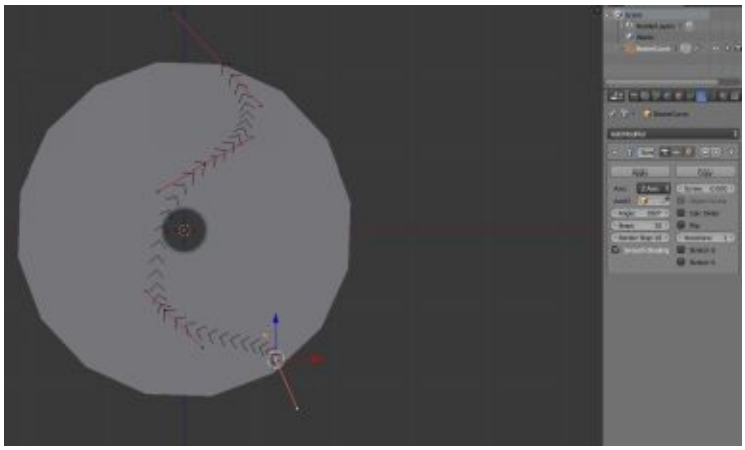
Step 7: Keep extruding the extend the length of your curve if you want, or add more handles in-between by selecting existing handles and subdividing. Then adjust and play around with the location, rotation and scale of the handles until you have half the silhouette of a vase. Here's my result:



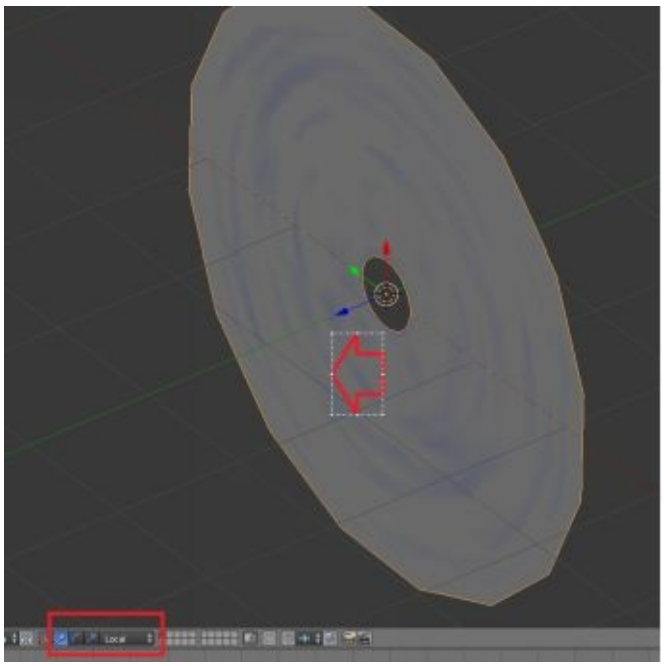
Step 8: Now for the magic! Go to the Modifiers panel in the Properties window (the one that looks like a spanner). Then press *Add Modifier* and select *Screw*.



Step 9: The below should be your result. And there you have your vase! I kid of course. The reason why it looks a little weird is because the Screw modifier doesn't know which axis to spin your curve around. At the moment, it's spinning around the curve's local Z-axis which is not the right direction. The reason why the curve's Z-axis is facing the wrong direction is because we earlier rotated the curve to face the front view and thereby also changing the rotation of the curve's local axes.



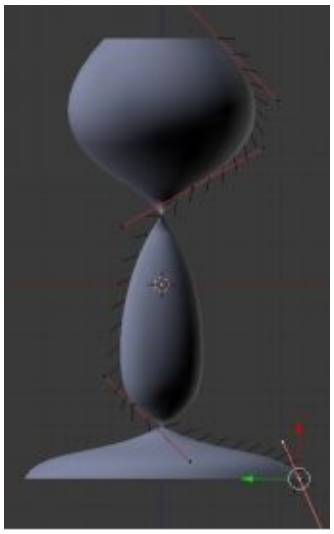
Thus, in this case, the curve's Z-axis coming towards the front view. Now, imagine spinning the curve on this axis. You will of course, get a circle and nothing more.



So by observing the local co-ordinates of our curve, we need to change it so that our curve spins around the local X-axis as this will create the vase the way we want it to.

Step 10: In the Screw modifier settings, simply change the axis setting from Z-axis to X-axis.

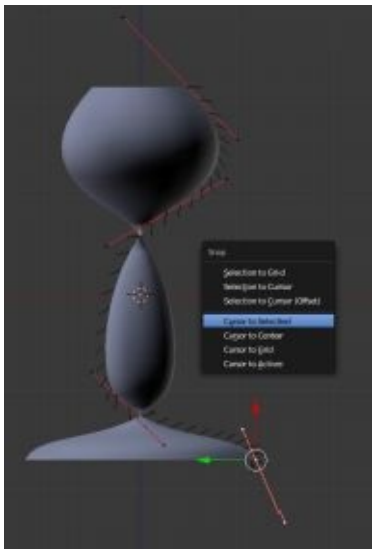
Step 11: Now we get something that looks like a vase!



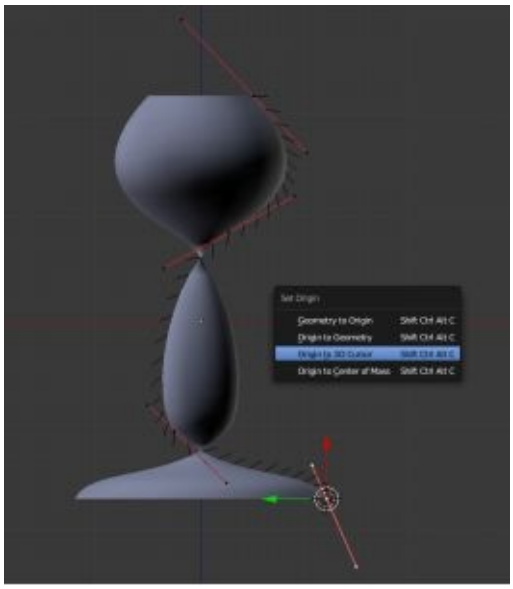
But it looks a little odd. The reason is, we want our curve to spin from the selected handle in the image above. At the moment, it is spinning on the right axes, but it is spinning around the middle of the curve where you can see the 3D cursor. In the middle of the 3D cursor, you can see an orange dot. This is the currently defined as the center of the curve. We'll need to change it so that the center is adjusted to where the bottom first handle is.

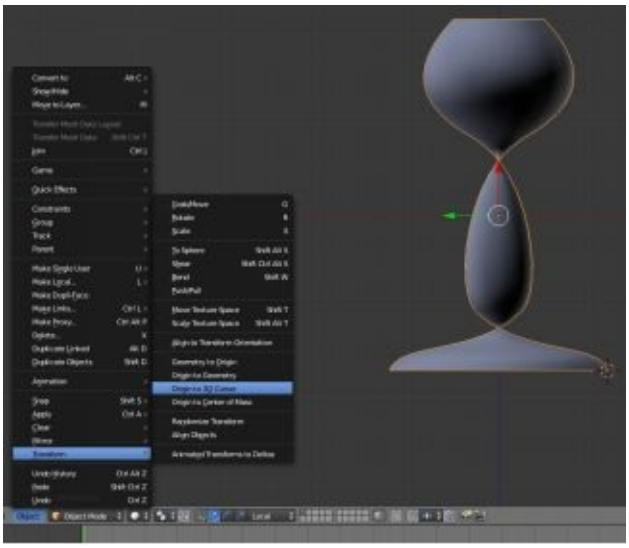
There are 2 ways to do this. You can select all handles in Edit Mode and move them so that the bottom-first handle is in line with the orange center dot. Or an even better way, move the center straight to where the bottom-first handle is.

Step 12: To do this, select the bottom first handle and press **Shift+S** **Cursor** to Selected. This will move the cursor straight to where the handle is.

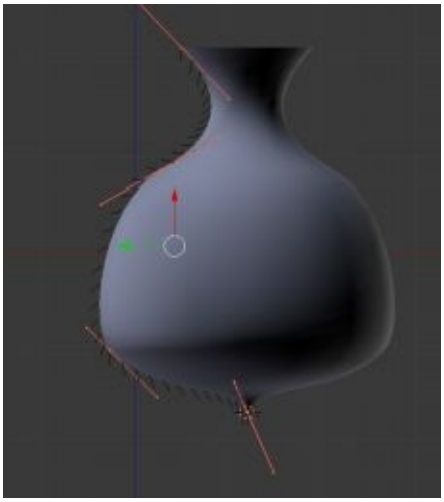


Step 13: Now we can move the center of the object to the cursor. To do so, press **Shift+Ctrl+Alt+C** **Origin to 3D Cursor**. Alternatively (if you hate all these shortcut keys), change from or **Tab** out of Edit Mode back to Object Mode. Then press **Object** **Transform** **Origin to 3D Cursor**.



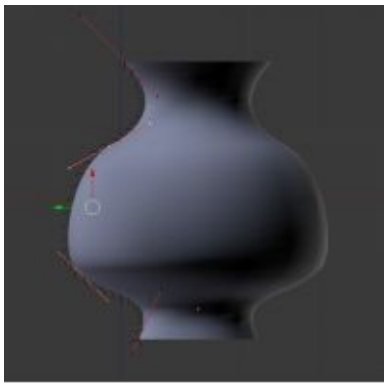


Step 14: You should now have a better looking vase!

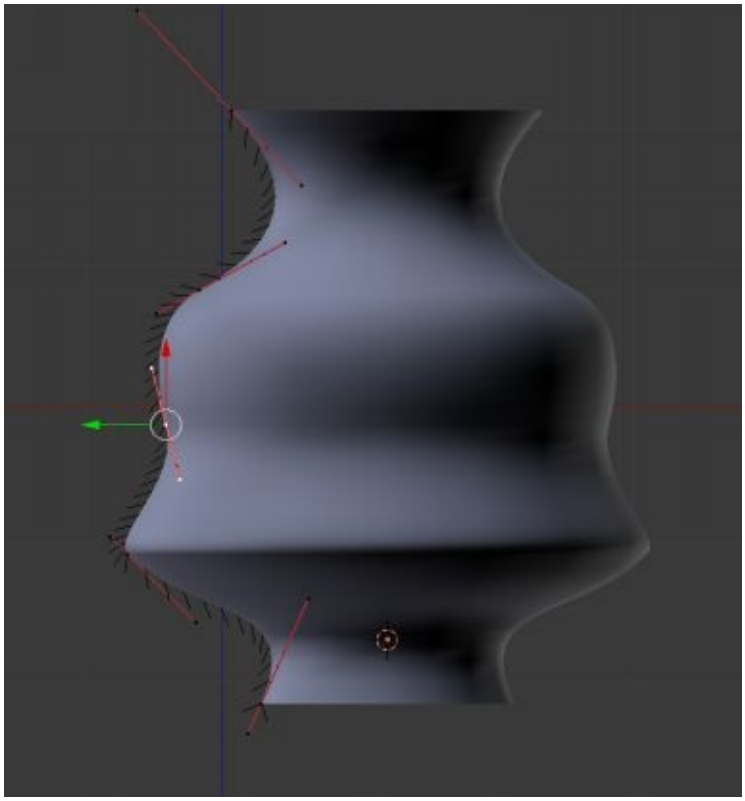


Step 15: In my case, the bottom-first handle was causing the case to be pointed at the end and thus creating a vase that would be impossible to stand upright on its own. To fix this, I

selected all handles and moved them a little to the left until I was happy.



Step 16: I went ahead and added more handles and tweaked them to create more interesting vase shapes,



And there you have your vase! It’s interesting to see how powerful some of these modeling tools can be. It is possible to model this by hand, but this would involve starting off with a cylinder, adding a bunch of loop cuts, selecting loops and enabling proportional editing and then spending time adjusting the loops till it looked like a vase. Using the Screw Modifier is much faster and can save you heaps. It is best to utilize modifiers whenever you can as it can save you a lot of time.

Summary

In this chapter, we learnt about hard-surfaced modeling. We went through the techniques of approaching hard-surfaced modeling and their uses. We looked at modeling a few hard-surfaced objects such as tables and chairs, fences, buildings and a simple vase. In the next chapter, we will focus on organic modeling to create organic lifelike objects.

Chapter 6. Organic Modeling

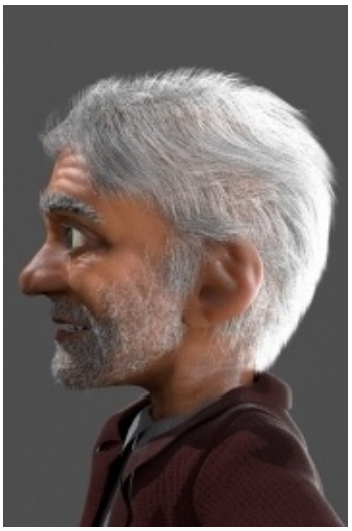
In this chapter, you will learn the process and techniques of approaching the modeling of organic objects. This chapter will contain exercises similar to the previous chapter but due to the slightly advanced nature of the process, we will simply explain how it is done rather than show you step-by-step. An entire book would be needed to show this process step-by-step.

What Are Organic Models?

Organic models are different to hard-surfaced models. We saw that hard-surfaced models were models that had a hard-surface and were generally lifeless and flat. Organic models tend to have life in them. They tend to also be naturally rounded and soft. Due to this, the modeling of organic models can be quite complex compared to hard-surfaced models.

Here are some examples of organic models:

- Humans
- Animals
- Beasts
- Plants
- Fruits
- Vegetables
- Planets
- Trees
- Grass
- Organisms



While they are all mostly rounded and curved, the can still have a hard surface. Like dragons for examples. Or you could be creating a statue of a human. Your own intuition should be able to differentiate between a hard-surface model and an organic

model. Just think of organic as having life and hard-surface as rigid and still. Yes, even fruits and vegetables have (or had) life in them.

Techniques

The Box Modeling or Polygonal Modeling approach was generally used to create organic models. Now, it seems that the most popular way to create organic models is via the Sculpt Modeling technique. But this produces models with bad topology. This is where retopology comes in. You can also use 3D scanning of a real person for instance to get a far more accurate and realistic organic model even though this will also produce a bad topology model. But then again, you would need accessibility to a 3D scanner in the first place. The *Sense 3D Scanner* looks like it could do the job, but I don't own one of these so I don't know too much about them.

By the way, this only applies to organic models with complex forms. A fruit or a planet can get away with simple Box Modeling, except instead of a box, you would start with a sphere.

Uses

Organic modeling lends itself to high demand in the following industries:

- Film Development – Animated film companies value good organic modelers. The much loved characters from Shrek, Avatar, Toy Story, Finding Nemo and Kung Fu Panda are the result of a bunch of awesome organic modelers' effort. By learning organic modeling skills and mastering them, you will have many potential film companies knocking on your door (even if it isn't Pixar).
- Medical/Dental Fields – Hospitals benefit from having organic modelers as they typically require organic modelers to help them create a reconstruction or simulation of the human body. You need to understand the anatomy of humans (or teeth as they apply to dentists) and ensure you know the correct proportions. As such, accuracy is important in this field and may not be as relaxed or flexible as film industries.
- Crime Investigations – Similar to hard surface modeling, crime investigators can use organic models to help them piece together a crime. Accuracy or realism might not be as important but it depends on their requirements.
- Architectural Visualization – This might be surprising. I actually planned to leave this one out. But in recent times (as of 2016), there have been higher demand by arch-vizers to have human models in their visualizations. There is actually a growing demand for this.

Approach

We will only be focusing on creating one model; a human. And while we won't show you step-by-step how it's all done (as this will require an entire book on its own), we will highlight the process and aim to be as detailed as possible. We will be leveraging a hybrid technique with Sculpt Modeling and Retopology to create a film-ready human.

We will show the process using Blender, but you should be able to imagine this begin done in any other 3D software. By the end of this short how-to, hopefully this would be an eye-opener for you on the process of how characters are made and how to transfer this process to other complex organic models like dragons for example (or your pet dog).

But first, let's deal with them human species. And there I go again, treating humans as another species.

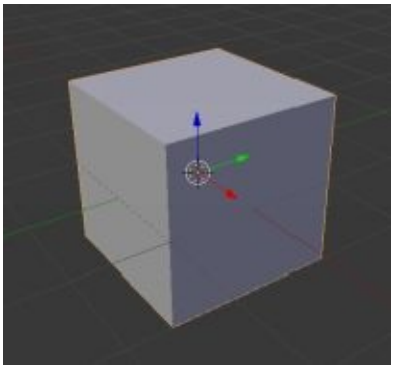
Creating A Detailed Human

The process is generally as follows:

Step 1: You would first sketch out what your character would look like. Drawing skills can come in handy here. Unfortunately, I don’t have many tips on good drawing but there are resources out there if you need help with this.

The final result!

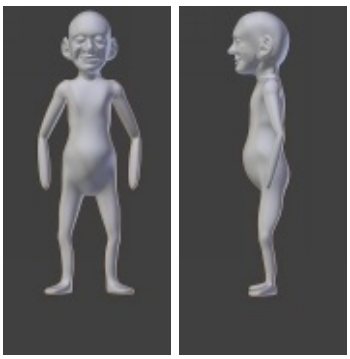
Step 1: You could now start working in your 3D software. And you would also start off with a simple object like a cube.



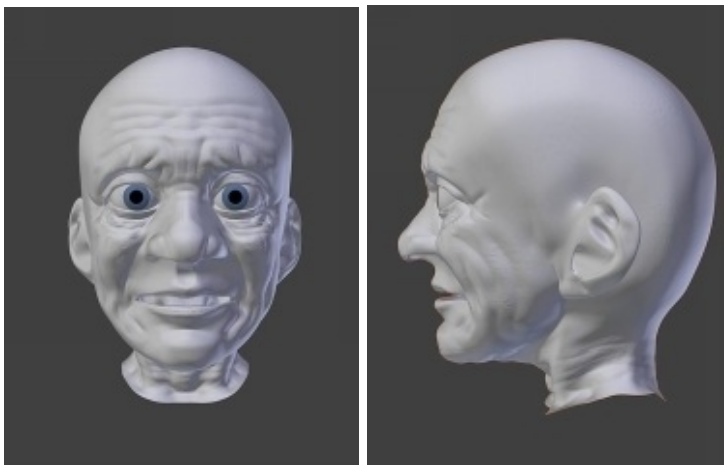
Step 2: Using dynamic sculpting, you would sculpt and mould your organic being. You can make use of your school clay modeling experience here. It will be even better if you have a touchscreen or one of those Wacom Bamboo tablets to make your sculpting life easier. It will be better to have your drawings loaded into your 3D software application for easier reference. It will be even better if you can load front, side, back and top views of your drawings in their respective 3D views as this gives you a better chance of replicating more accurately your character in 3D.

In Blender, I used the Skin Modifier to help quickly shape out the body. Remember, at this

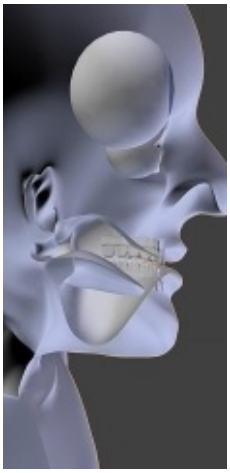
point, you don’t really care about topology. Just try to make your character look as good as possible. Bring out the inner artist in you.



Step 3: Once you have the form created, you can go and create tiny details that make your models look super awesome. You can use sculpt brushes to add in pores and wrinkles and other details. The result would usually look amazing dependent on your experience level.



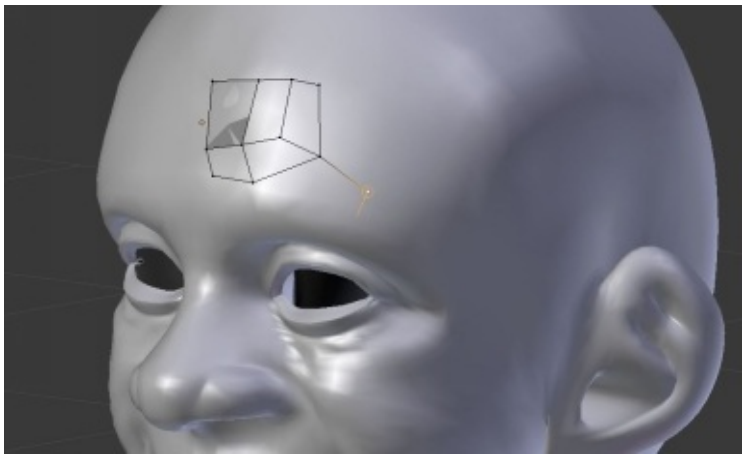
You would then go and add eyes and teeth using Box Modeling and/or Polygonal Modeling technique.



In the above image, the model is still sculpted but is hidden since I can toggle off the display of the modifier that adds the super details (called the Multires Modifier). Once you have shaped your final masterpiece, you would notice that your vertices look messed up and there's way too many of them. It won't be exactly too friendly to make adjustments and tweaks to your model by manipulating these vertices alone. And since organic models would likely be animated, it needs to deform well at the joints.

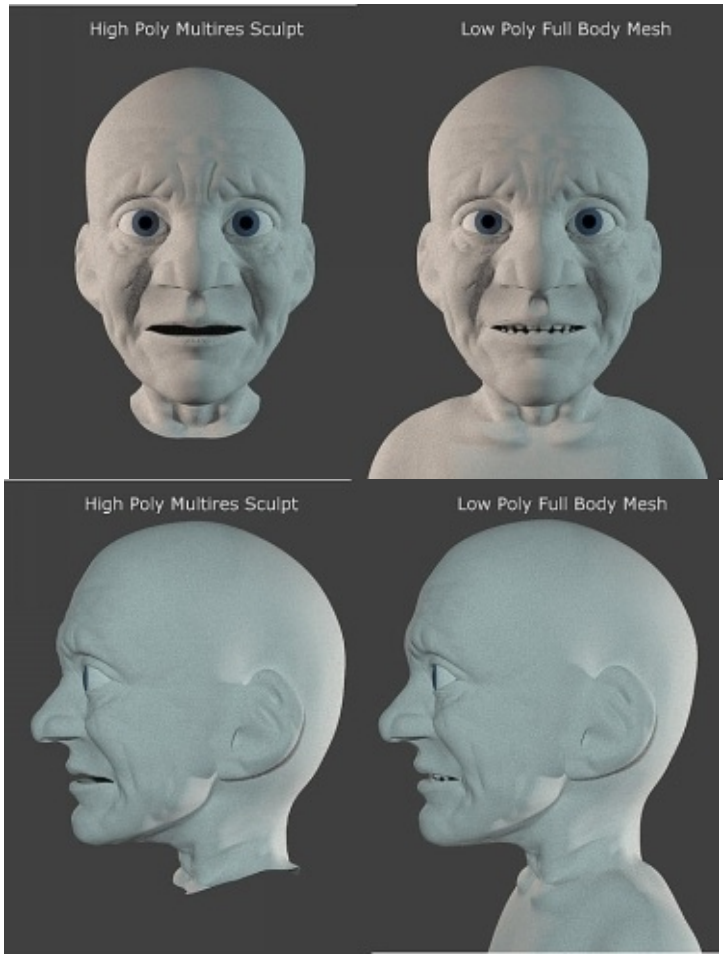
I'll just briefly explain what deformation is. Deformation is when your 3D model appears to adjust or bend within itself via the altering of the location of vertices, edges and/or faces. So when you animate, you won't animate that entire object, but just some vertices, edges and faces in that model so that it looks like it's bending (or deforming). When the topology of your vertices are messed up and placed randomly, the deformation won't look right. You'll get weird artifacts like awkward sharp pointy edges and so on.

Step 4: This is where retopology comes in to save the day! You create a new mesh on top of the detailed mesh and stick vertices on top of them. Just like taking a mini-statue and putting dots on them. You then join up the dots (vertices) and fill in faces to have your completed lower-resolution mesh with good topology incorporated in. The vertices (dots) must be placed in such a way that allows natural deformations.



Step 5: Retopology will throw away those super little details that you sculpted. But don't think that all that was a waste. We can still re-use those sculpting details in our low-poly retopologized mesh. You would bake the sculpted version of your model into a bump and displacement map. The more advanced 3D software applications have this, including

Blender. You place your sculpted model directly over your retopologized model and then hit the ‘Bake to Normal Map’ button. In the texturing world, a normal map would fake the look of bumps on your model when it actuality, there aren’t any bumps on your model. It bends the light in a way to make you think that the model is bumpy when it really isn’t. The normal map would thus be perfect to simulate the detailed bumps on our human such as pores and wrinkles and we don’t have to add in all those vertices and model those bumps to get that look. From my own results, I’ve found that the low-poly model with the normal map applied looks almost unnoticeable from the high-poly detailed sculpt mesh. This is perfect as the low-poly mesh with the bumps can save a lot of memory while being simpler to work with compared to a very detailed high poly mesh.



Step 6: Once you have the retopologized mesh completed, you can work on things like rigging the character and testing out the deformations. If all deforms well, your topology is excellent. You can start adding clothes. Best way to do this is by duplicating parts of his body where the clothes would be and puffing them out a little. If your character is already rigged, you don’t need to worry about rigging the clothes as well since this will be already rigged when you duplicated the mesh and hence should also deform nicely.

To add a nice finishing touch to the clothes, you can sculpt in the wrinkles and bends you would usually see in clothes. If you want super detailed wrinkles in your clothes, it would be best to use the detailed sculpt and normal map method. I find adding wrinkles in bends in clothes makes it look a lot better than without. It just drastically reduces that uncanny CGI look. It’s no good creating a super detailed character with very low poly clothing.

Step 7: Now you can spend time texturing and shading your character. If your topology is good, the textures will line up properly and look good. Texturing and shading is out-of-scope for this book but I show you the results regardless.

Step 8: What good is a character without a hair and beard? To create hair, you would go into the Particle Settings and create strands to represent hair. You would then comb the hair to a style that matches your drawings.

Step 9: Finish off your character by giving him/her extra props. Like a watch, a pair of glasses, and in my case, a walking stick.

Topology Of The Human Face

Good topology is always important. Particularly, when you are creating a face. Before concluding this chapter, I will briefly discuss the topology of the human face. There are hundreds of tutorials out there that shows you the steps needed to create a face. However, I'll discuss the foundation of creating a face with good topology so that you have a better understanding of what's going on without blindly just following some tutorial and not knowing the why behind the educator's steps.

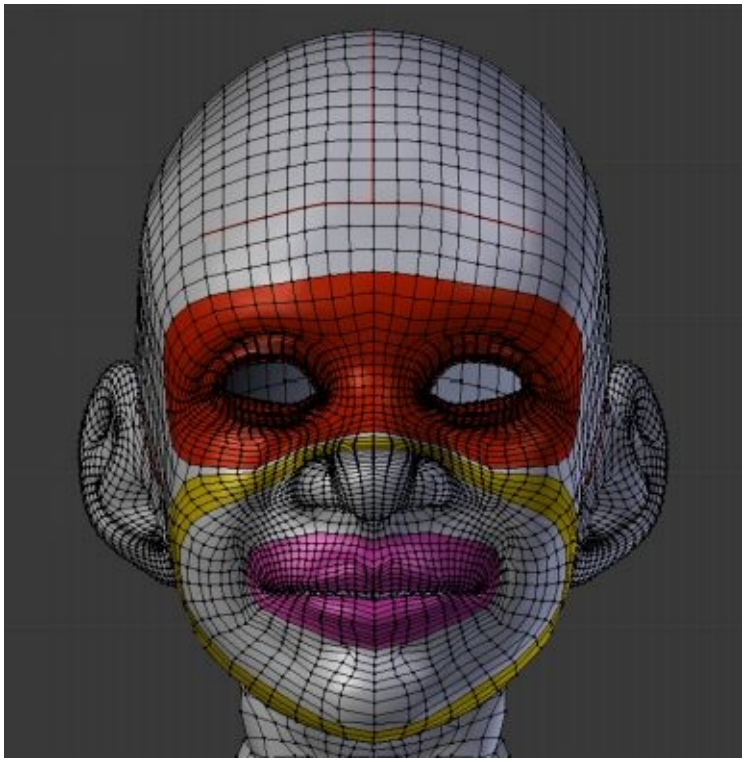


Figure 18. The topology of a face

Figure 18 shows you a face with good topology. It's probably not the best in the world, but it works. A face with good topology has loops going around the eyes, the lips and the bridge of the nose.

When crafting your own face models, it is best to always follow these rules. I'll mention that rule again. A face with good topology has loops going around the eyes, the lips and the bridge of the nose. The reason why you need loops like this, is to ensure that your model deforms nicely when animated and that texturing the model will be a more seamless process. It also looks a lot cleaner overall. In reality, there are more advanced rules when modeling the face, but at this stage, you should aim to follow this very basic rule.

In terms of deformation, it is fairly easy to visualize this character smiling or frowning or even blinking with this topology. The vertices would generally play nicely without overlapping over each other and squeezing/stretching or pinching unnaturally.

Now imagine a face with bad topology. That is, a face with vertices placed wherever and where the basic rules aren't present. No loops around the eyes, the lips and

the bridge of the nose. It is hard to picture how the face would then deform nicely. There would be weird pinching effects, overlapping vertices as well as sharp, abrupt and unnatural deformation overall. Figure 19 shows you exactly what bad facial topology looks like.

Another tip I'll share with you regarding good topology is, try to maintain faces that have roughly equal squares. You don't want parts where faces are too small and other areas where faces are huge. Try to maintain the same size throughout. That's one of the reasons why my face model in Figure 18 isn't the best. The nose area has faces that are too small compared to the rest of the face. When you have equal squares all throughout your model, it just tends to look cleaner and textures will appear beautifully without much stretching and squeezing.

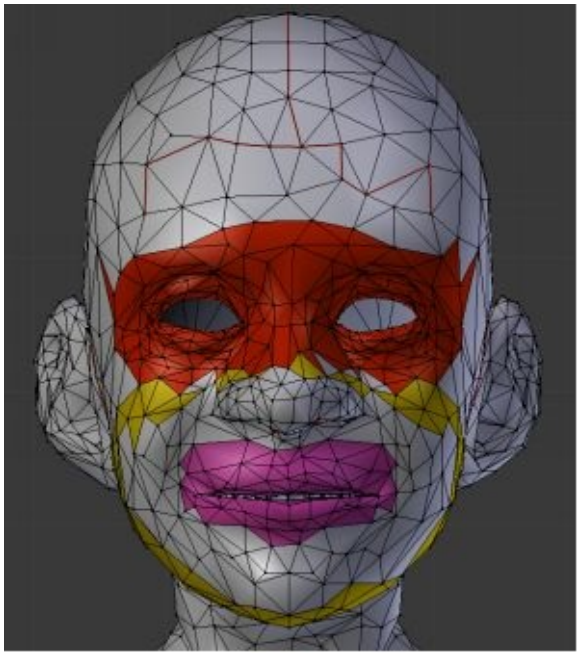


Figure 19. Bad facial topology

Summary

In this chapter, we learnt about organic models and their difference with hard-surface models. We looked at the techniques to approach the modeling of complex organic objects. We finally followed up showcasing the process of creating a human. In the next chapter, we will focus on the creation of environments and sets.

Chapter 7. Environment Modeling

In this chapter, you will learn about the process of building environments and sets. Similar to the previous chapter, it may be a bit infeasible to go into detail the step-by-step making of a set in Blender, but we will provide a detailed process of doing so.

What Are Environment Models?

Environment models are models, or elements that can be combined to make up your “world”. The world where your hard-surfaced and organic models live in. You could have your 3D models float around in 3D space. But maybe for artistic purposes or some other purposes, you’ll want to give your 3D objects an environment to live in. The environments you create are your environment models. Perhaps you want to have your 3D objects in a park, or a mountain, or near the sea. You will create your park/mountain/sea using environment models. The environments models themselves can be either hard-surfaced models (like a house) or an organic model (like trees and plants).

Here are some examples of environment models:

- A room
- A hall
- A corridor
- The streets
- A cityscape
- A mountain landscape
- A forest
- A desert
- Outer space
- Another dimension
- A plain square
- Iconic locations of the world

There’s literally millions of different examples you can probably come up with. Unfortunately, you’re 3D software will not have a “3D World” inbuilt that you can just import and add 3D objects in. You will need to create your world manually.

Actually, I’ve heard Google Earth had some feature that allows you to export parts of our real Earth as 3D models. You can import this 3D data into your 3D software and BAM, you have yourself an environment which is an accurate representation of a real place on Earth. There’s also a feature where you can import buildings and iconic landmarks, which is pretty cool in my opinion.

TECHNIQUES

With environment modeling, the technique used really depends on the type of scene you are working with. One way would be to create each element of your environment one at a time and then combine them together and organize them in one file. I'll document the process that I generally use, but really it depends on your own preferences. Have fun with this and experiment to see what works best for you.

Here is generally the technique I use:

- Draw and sketch out your environment. A simple sketch would probably do it. If you wanted to do something advanced or ambitious like a futuristic city or house, then you might draw some more images. Perhaps a drawing of an aerial view as well to map out your city.
- Block out your environment. Start with a series of shaped cubes and spheres to quickly build and outline your scene. This is similar to the Box Modeling technique. The aim is to quickly experiment and see whether you like the composition, the organization and the final look of your environment.
- Work on each element individually. Now, I would go in and model, using either Box Modeling or the Polygonal Modeling technique, each of the blocked elements one by one.
- By now, you should have an environment that looks final. If you want higher detail, this is where I may go in and sculpt certain parts of the scene, like the bumps of a tree trunk. I don't usually mess much with retopology since the models stay mostly idle and aren't the main focus most of the time. If they were to be animated, then I may consider retopology. I may also consider retopology if my PC memory starts choking out. This would generally be the case if I were to create a grand, epic landscape environment.
- To finish up, I'll add some final little touches. For instance, I might add bits of rubble and stones on the ground to add that extra bit of interest to the scene.

Of course, this approach only applies if you want your environment to look quite advanced. If your environment is basic, you don't need to follow any of this. For instance, if you just want your character to stand on a plain square, then just go ahead and add a square and call it done. No drawing, blocking, detailing or any of that stuff needed. Even for slightly medium-level environments, just follow your intuition. Especially if you know what you're doing or if you've made environments like this before, you can just follow your creative spirit. It's all good.

Here are some environments I've created:

Uses

There are a number of uses for environment modelers in a number of industries:

- Films – Environment modelers are valued for animated film productions as well as some live action film productions. There are many talented environment modelers who can create awesome photorealistic environments. Did you know, a lot of the environments in the flying sequences in Spiderman were all CG? I was mind-blown when I was first made aware of it.
- Games – Game developers need environments for their games. They tend to prefer low-poly models to save on memory. If you show that you have the ability to create good, low-poly environments, you will have many requests from various game developers begging you to make environments and other assets for their games. It's a nice way to make some extra little income on the side!
- Virtual Reality/Augmented Reality – Many organizations are leveraging VR, and are looking for environment modelers as VR requires environments. It will help if you can produce 360 degree environments and not those partial environments film modelers tend to make.

Approach

We will be focusing on creating a simple outdoor nature environment. I will show you the basic steps needed to create the elements using the technique we discussed. Try to follow along as well and feel free to create your own version.

Again, I will be using Blender for the creation of the environments, but you can use whatever you are comfortable with. By the end of the exercise, you will understand the process of environment modeling and if you follow along, your skills as an environment modeler will improve.

Creating A Nature Environment

Let’s now look at the steps of creating a nature environment.

Planning and Blocking Out

Before you start creating your nature environment, it would be good to have an idea of what you want your environment to look like. You could draw out a sketch or if you have a vivid imagination, then that might be good enough to go. In this instance, we are going to create a simple backyard which has a tree, grass and a few rocks. Very basic but enough to show you the idea.

Creating Trees

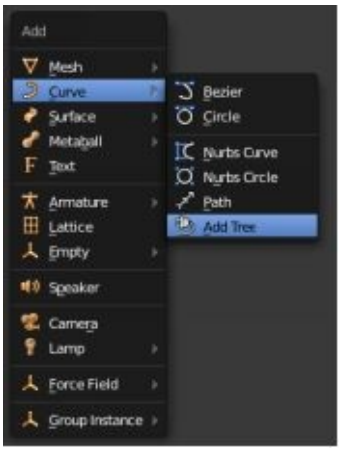
To create trees, we will be using Add-ons in Blender.

Add-ons in Blender can be visualized as plugins to a software application. People who are good at coding create add-ons that do something to make the user’s life a little easier. When a user finds an add-on they like, they can simply tick the box and it will immediately be enabled and ready to use.

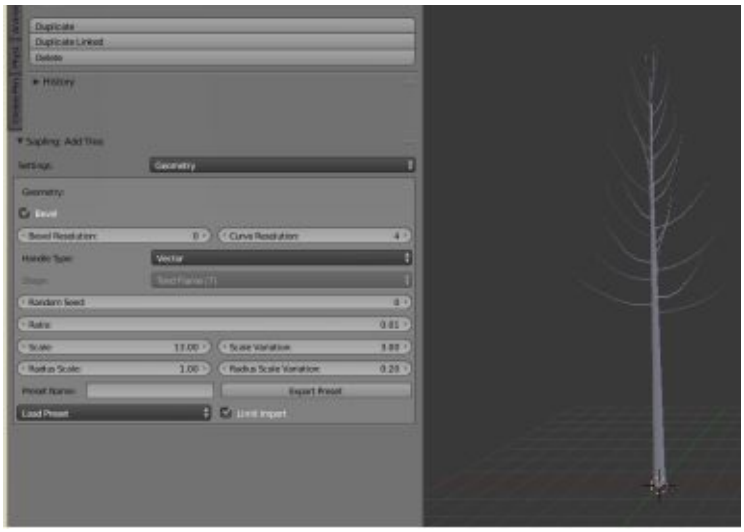
We will be using the Sapling add-on created by Andrew Hale from TrumanBlending. This add-on allows you to create a variety of trees and you can tweak settings in the add-on panel to make the tree look the way you want it to.

To enable the add-on, go to *File User Preferences*. Then type in ‘sapling’ in the search bar and tick the box for *Add Curve: Sapling*.

Let’s now add a tree to our scene. You can add a tree by pressing **Shift+A Curve Add Tree**.

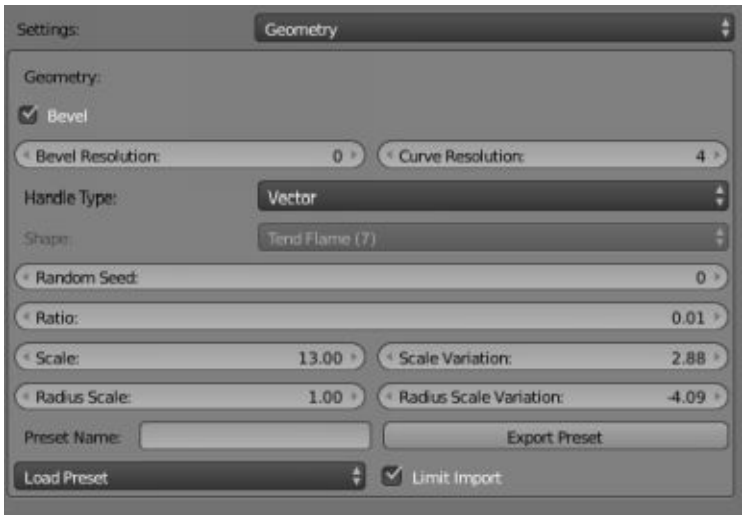


You should now find a stick looking tree figure in your scene. But it doesn't look like a full tree yet. We'll need to play a bit with the settings. Press **T** to bring up the settings and under *Sapling: Add Tree*, you'll see a bunch of settings.



These settings allow you to control exactly how you want your tree to look. One of the first things I always do, is enable Bevel. This gives my tree some thickness instead of looking like a stick figure.

There are way too many settings to play around with, so I will briefly explain the most important ones.

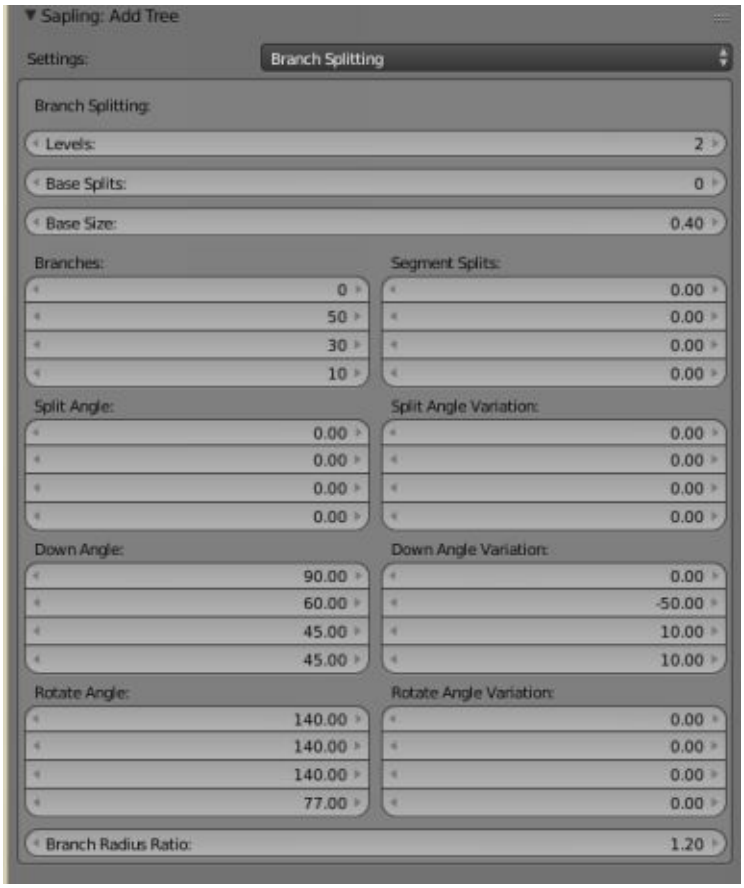


- Bevel resolution determines how smooth and detailed your tree branches will look. The higher the value, the smoother the tree but the more memory it will

take up.

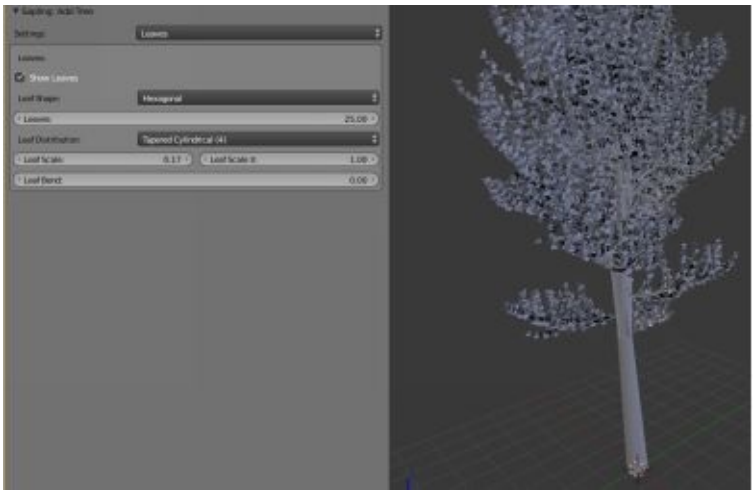
- Random Seed gives you a unique tree every time you change this value.
- Scale determines the height of your tree.
- Radius Scale Variation determines the thickness of the trunk.
- Load Preset allows you to choose pre-loaded styles of trees such as the oak tree or the willow tree. You can also save your own presets if you have created a setting that you like.

If you change over from Geometry to Branch Splitting, you will find a whole new set of settings.



- Levels determines how levels of branching you have. If you have 3, then you have the trunk as level 1, the child branches that connect to the trunk as level 2 and the child branches that connect to the branches on level 2 as level 3. The higher this value, the longer it will take to generate.
- Base Splits split up the branch into more parts so that you have more segments of branches.
- Base Size determines where the branches will start. If the value is low, the child branches will begin toward the beginning of its parent branch, and if it's high, it will start toward the tip of the parent branch.
- The other values below them determine the overall angle and bending of the branches.

Let's now create leaves for our tree.

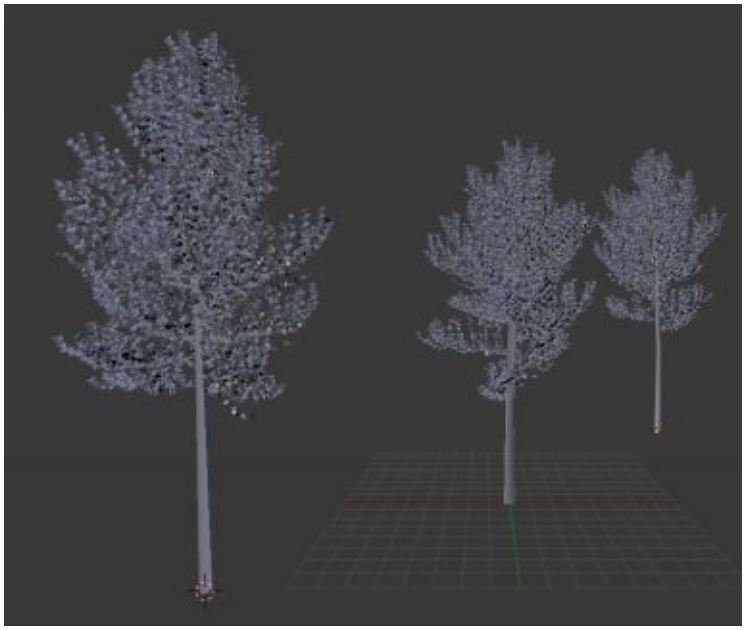


Before I started with the leaves, I changed the Levels to 3 and the Base Splits to 2.

To add leaves, change the Settings from Branch Splitting to Leaves.

Now you can control things like the leaf shape, how many leaves you want per branch, its distribution and scale.

Create a few more trees, changing the settings each time. Here are my results:



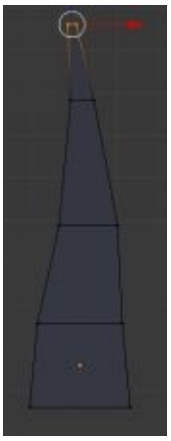
And that’s how you quickly create trees in Blender. A manual way of modeling trees (for those who don’t have Blender), would be to start off with a curve to represent the trunk. Then you would the curvature to look like a tree and add more curves to represent the branches. Finally, you would tiny plane meshes as a particle system to the branches to represent the leaves.

Save you work as a .blend file once you’re done.

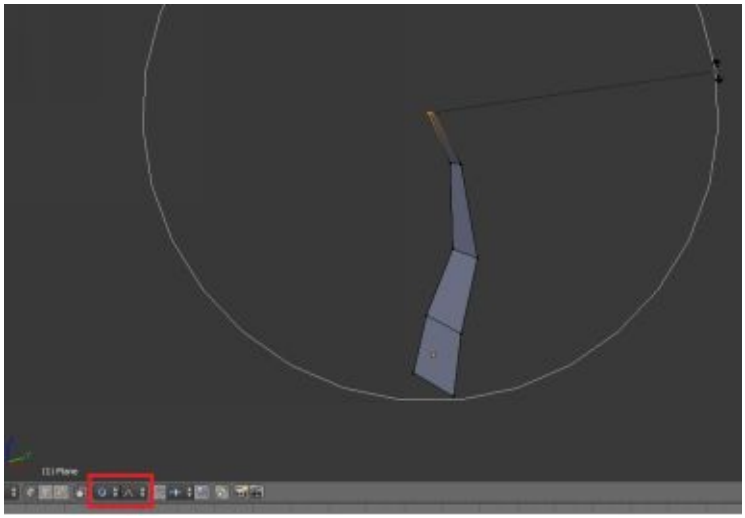
Creating Grass

Open up a new Blender instance.

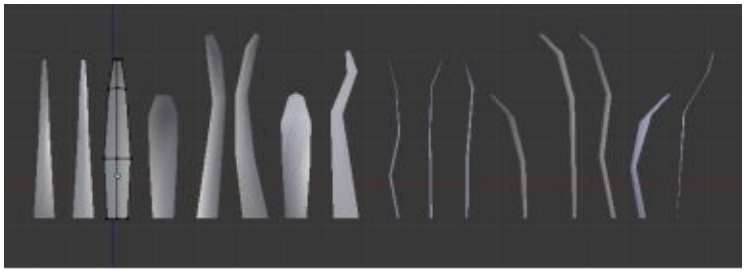
Creating grass is quite simple. You simply start off with a plane mesh. Then you scale down the top vertices slightly and then extrude the top vertices up. You would then scale these down and then extrude again and repeat the process.



For more believable grass, we can add curvature to them. Enable Proportional Editing by pressing **Alt+O** or alternatively doing it manually by clicking the area shown in red and selecting *Connected*. You can then rotate (pressing **R**) any vertex and see the grass bend.



Now create a bunch of variations of the grass by duplicating and changing the look. Here are my variations.



It’s best to have a lot of variations. The more variations you have, the more believable it looks. Around 20 is a good number. If you have only 2 or 3, then it would be obvious that it looks fake since you will see a lot of repeating patterns in the final grass.

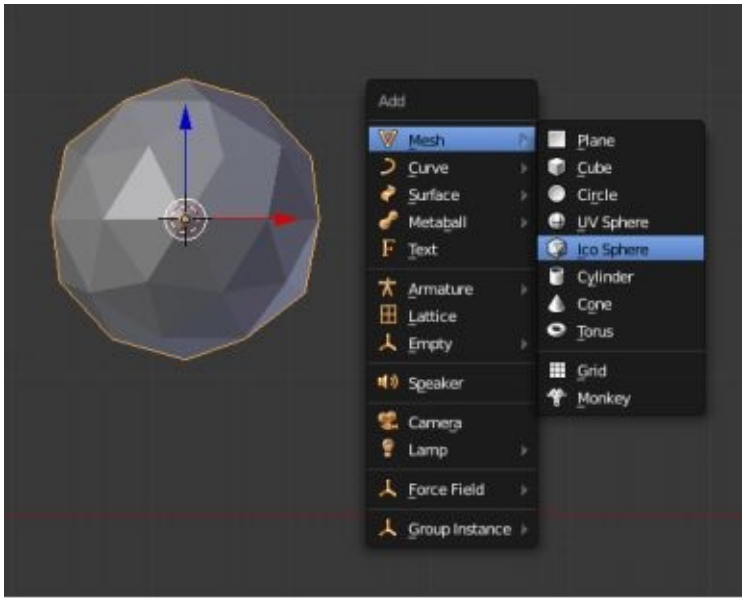
Select them all and add them to a group. You do this by box selecting all your grass meshes (press **B** and then left-click drag around all your grass meshes). Then press G to create a group and name it something like ‘grass’ or ‘grass blades’ so that it would be easier for you to refer back to later.

Remember to save your .blend file once you're done.

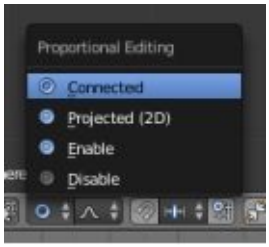
Create Rocks

Open up a new Blender instance.

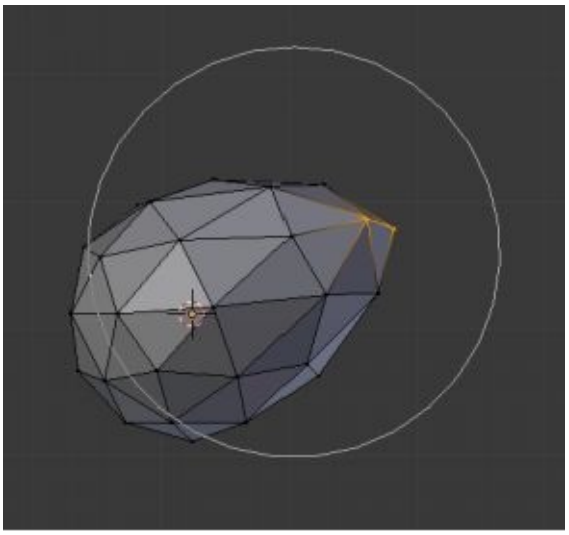
For rocks, I generally prefer to start off with an ico sphere. You can create one by pressing **Shift+A** **Mesh** **Ico Sphere**.



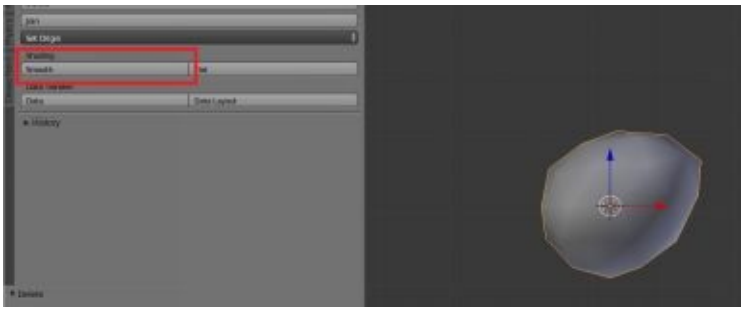
Tab into Edit Mode. Then, enable the Proportional Editing tool and select Connected. Alternatively, press **Alt+O**.



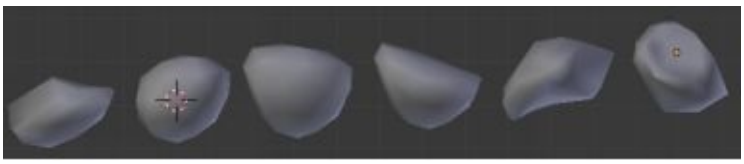
Select a few random vertices and move them around to get rock-like shapes.



Tab out of Edit Mode and set the shading to Smooth from the Tool panel.



Now do the same thing with the grass. Create a bunch of variations, select them all and add them to a group. Name it something like ‘rocks’ or whatever you like.



Once done, remember to save your .blend file and then close.

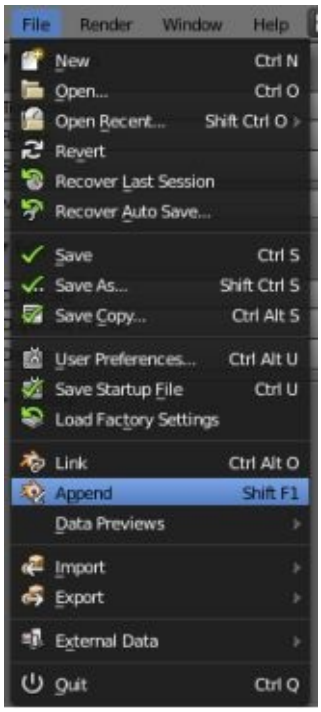
Putting Them Together

Open a new Blender instance.

It’s time to put everything together to create our environment!

Before we start, we need to bring in our trees, grass blades and rocks that we saved in their respective .blend files. First select an empty layer to dump all our elements. I chose the last layer since that won’t interfere much with our work and I’ll easily be able to identify where I kept those elements.

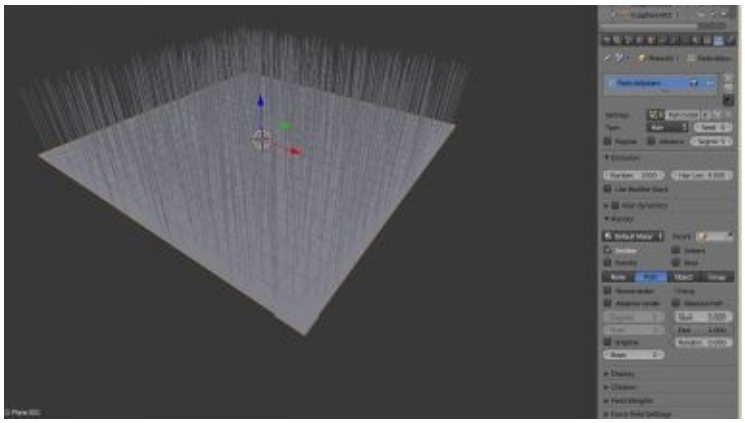
Next, press File Append.



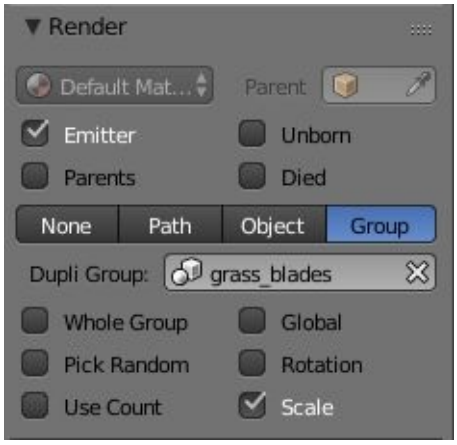
Locate the file where you saved your elements. Select it and you will see a new set of folders. Select *Group*. This is where you can import the groups you created. Select the group you created (e.g, grass blades) and then press *Append from Library*. The group will then be imported into the layer you selected (the last one). Do the same for the other groups. If you didn't put your trees in a group, you can go to the *Object* folder instead of Group and find your tree objects manually. Or you could go back to you tree .blend file and save them all to a group.

We don't want to see the objects we imported in our final scene, we will only use their groups. So we can hide them. So simply change back to the first layer. The layer that will contain our final environment. This will keep the last layer hidden.

Start off with a plane. Add a new Particle System to the plane and change the Type to Hair instead of Emitter.

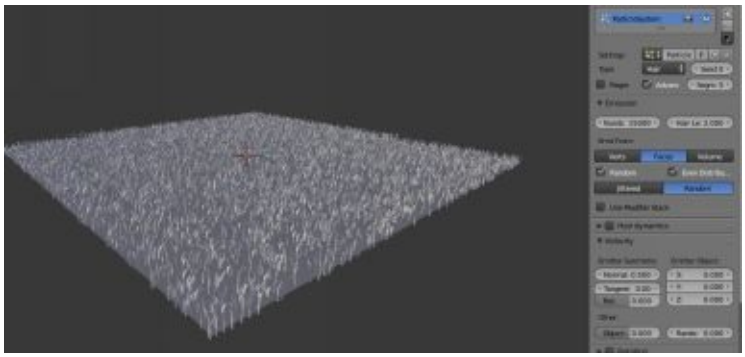


Under the Render part in the Particle System settings, change from *Path* to *Group*. Then select your grass blades group.



By playing around with the particle settings you can get a full set of grass on your plane.

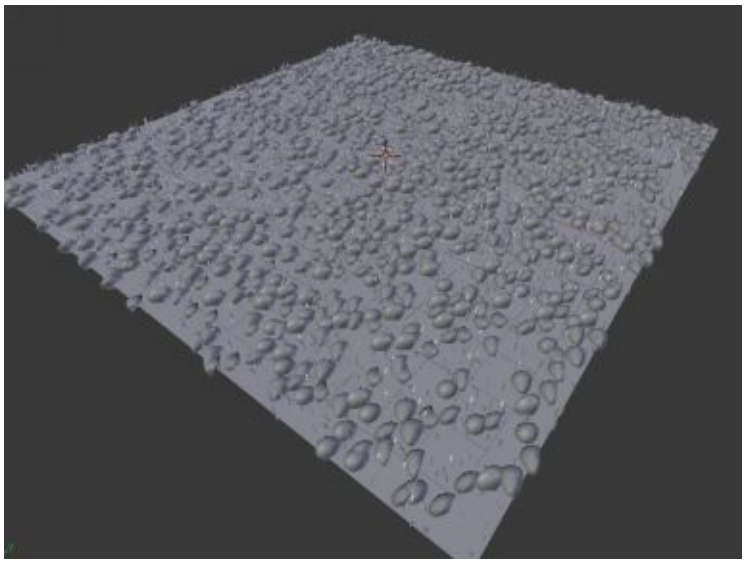
In this example, I increased the number of particles to 15000 and reduced the hair length so that the grass appears more dense and smaller in size.



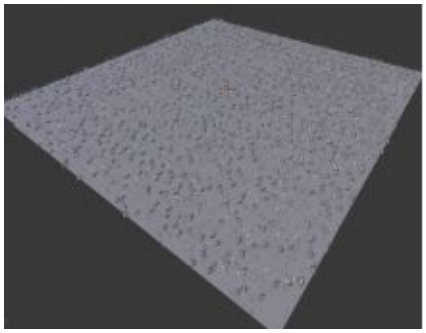
Keep playing with these till you get grass that looks good.

Now do the same for rocks. Add a new particle system, and while you're there, change the name of the particle system so that it is easier to identify.

If you've played around with the settings a bit, you may have something similar to the below image.

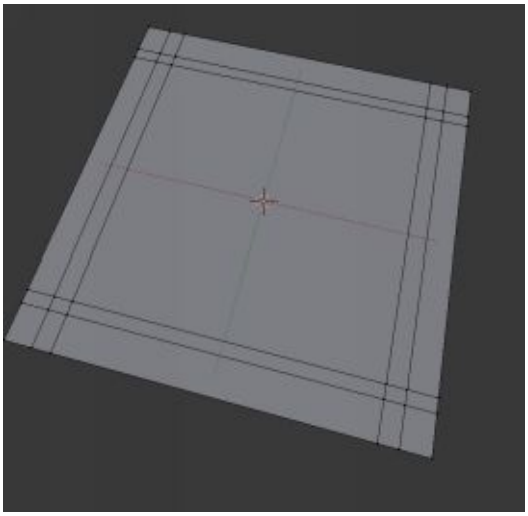


The issue is that 1) the rocks are too big, and 2) the rocks are everywhere. 1) is easy to fix. Change the hair length to something realistic.

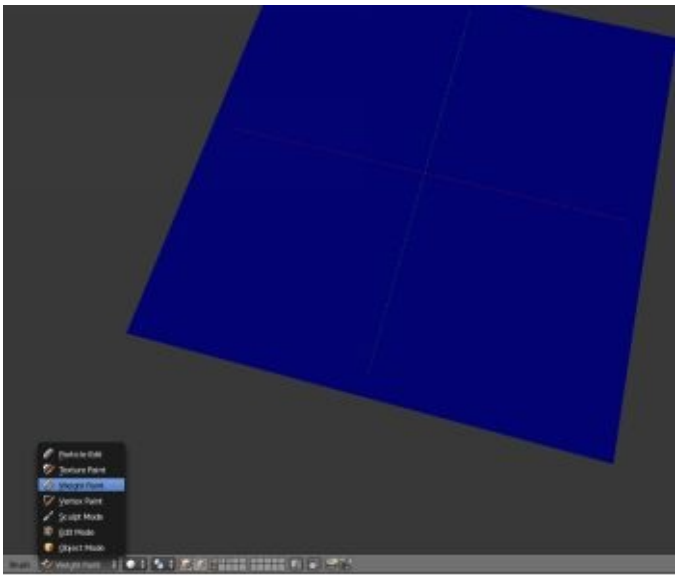


To fix 2) we need to define where we want the rocks to occur. In a backyard, we may design the rocks to be toward the edges of our backyard, where the fence is. We can do this.

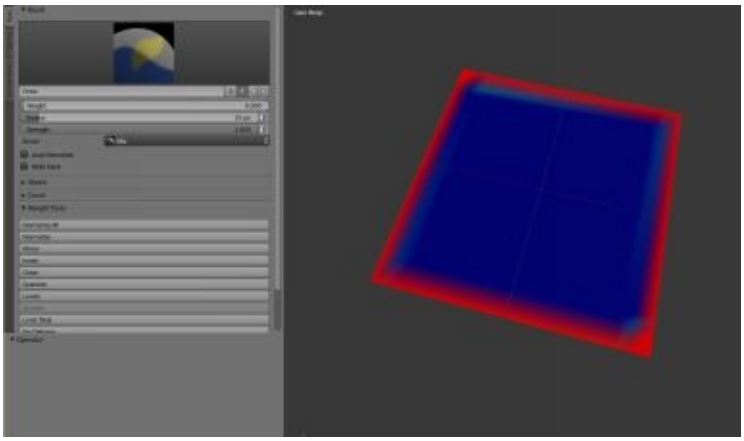
Tab into Edit Mode and add 4 loop cuts across and 4 loop cuts in front. Arrange them so they look like this:



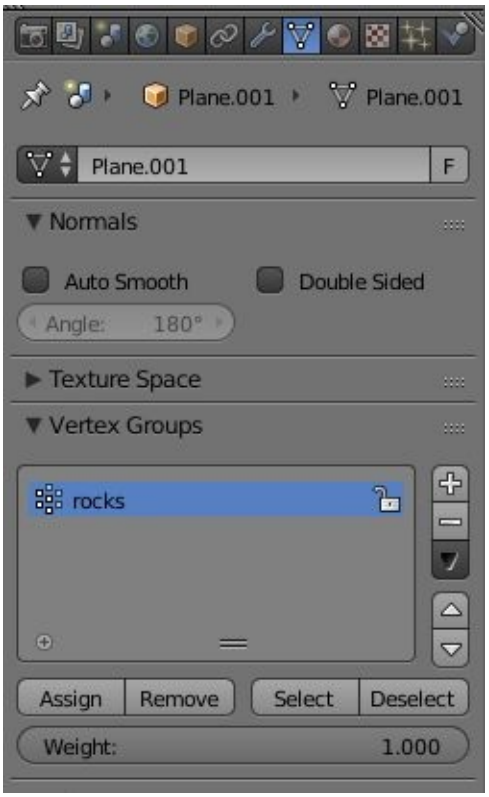
Now go to Weight Paint mode. This is where we define where our rocks will live.



Press **T** to bring up the Toolbar if you haven't already. Make sure you are using the Draw brush and set the Weight to 1. Now paint around the edges of the plane and you should see it turn red. This is defining a new vertex group. The red is equivalent to a weight of 1 and the blue is equivalent to a weight of 0.

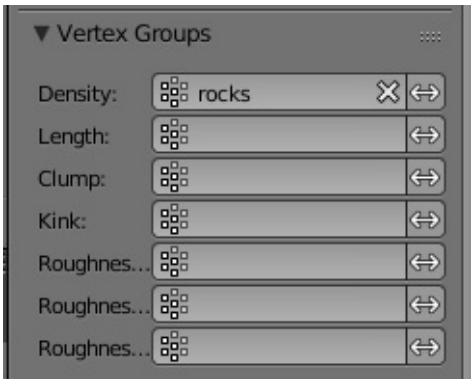


If you go to the Vertex Group settings found in the Object Data panel in the Properties window, you will notice a new Vertex Group created for the plane. Change this to rocks for easier reference.

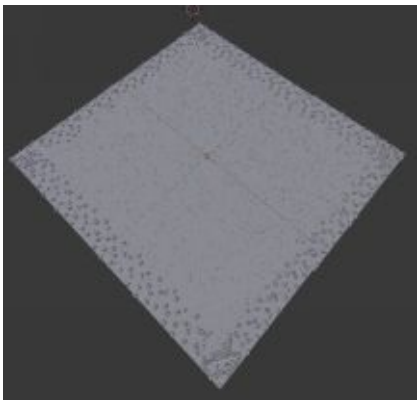


There is a Weight setting as well here. You could have alternatively gone into Edit Mode, selected the vertices along the edge of the plane and then with the Weight set at 1, press the *Assign* button just above. If you check in Weight Paint mode again, you will see the changes being reflected immediately. Make sure to go back to Object Mode once you're done.

Now if you go back to the Particle Settings, under Vertex Groups, select your rocks group for the *Density* field.

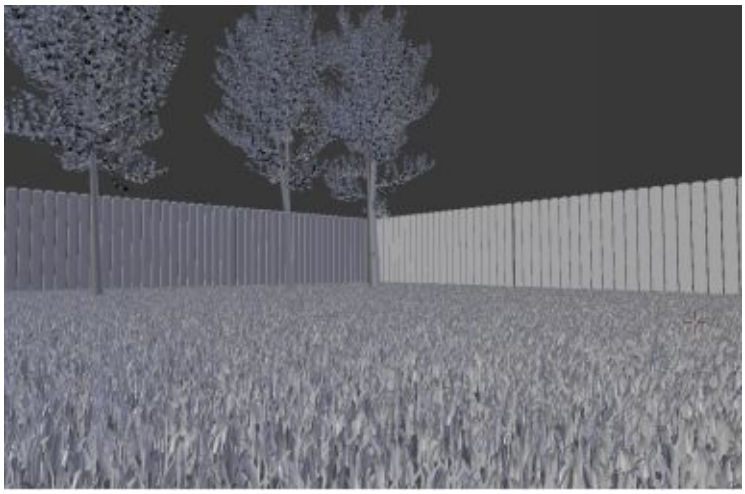


This will distribute your rocks at places where you vertices have a weight of 1 and thus, your rocks should now be dispersed along the edges of your plane.



Move your trees from the last layer to the first layer and you have your final environment scene. To move layers, go the layer where the trees are, then select all the trees and press **M**. Select the first layer. The trees are now on the first layer.

To add a nice finishing touch, why not add a fence and tweak the grass settings a bit more to make it really look like a fence?



Don’t worry, I cover the creation of the fence in step-by-step detail in the next chapter.

Here are a few scenes that I’ve created using the techniques and the models we looked at in this subsection.

And that’s how you basically go about creating an environment scene! You may have wondered why I created the rocks, grass and trees in separate .blend files. This is to save memory and keep our workflow clutter free. Especially if you’re working on an epic environment, you don’t want to have hundreds of elements everywhere. It’s better to separate them in its own file and then bring the final versions together once done. It’s just a lot neater that way.

Keep practicing by creating variations of what we looked at and remember to have fun with it.

Summary

In this chapter, we learnt about environment modeling. We looked at what environment modeling was, the techniques to approach modeling environments and the demand for environment modelers in several industries. We also applied out techniques and went through the steps to build an outdoor nature scene from scratch. In the next chapter, we will introduce and discuss high-poly and low-poly models.

Chapter 8. More Exercises

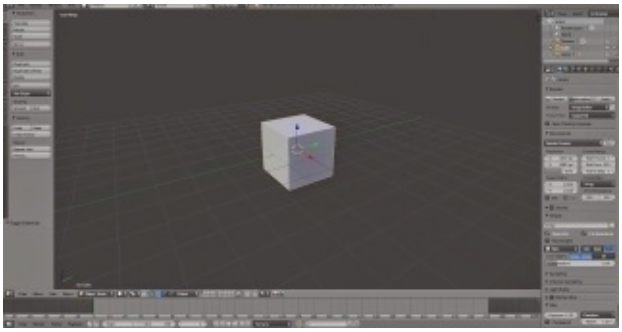
In this chapter, we will work on a few more exercises to learn how to create a few more objects in 3D as well as give us that essential practicing time and try to more comfortable using a few modeling tools.

Modeling A Fence

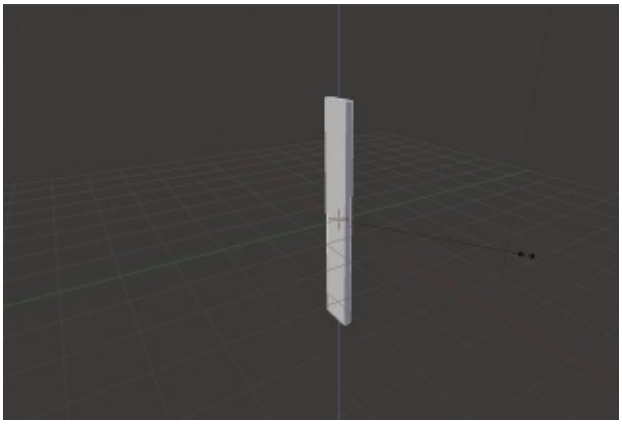
Let’s now move onto creating a fence. The sort of fence that you may have in your backyard if you live in a suburban area. We’ll be creating a wooden backyard fence.

Step 1: Fire up Blender. You should see a default cube.

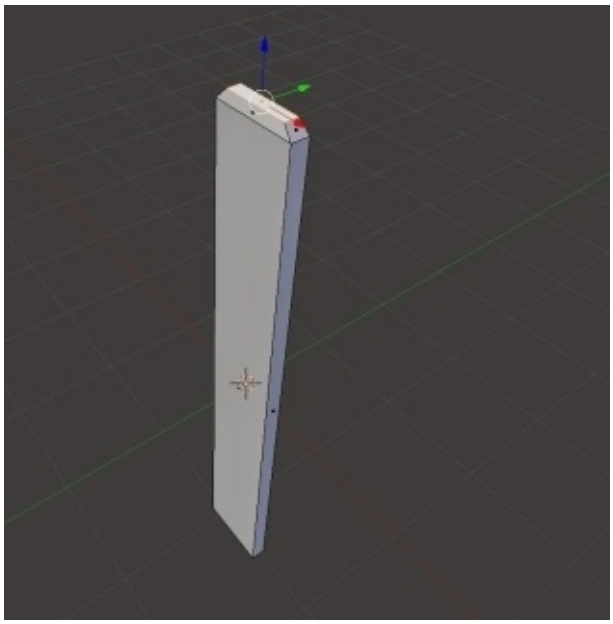
Step 2: Select the cube by **right-clicking**.



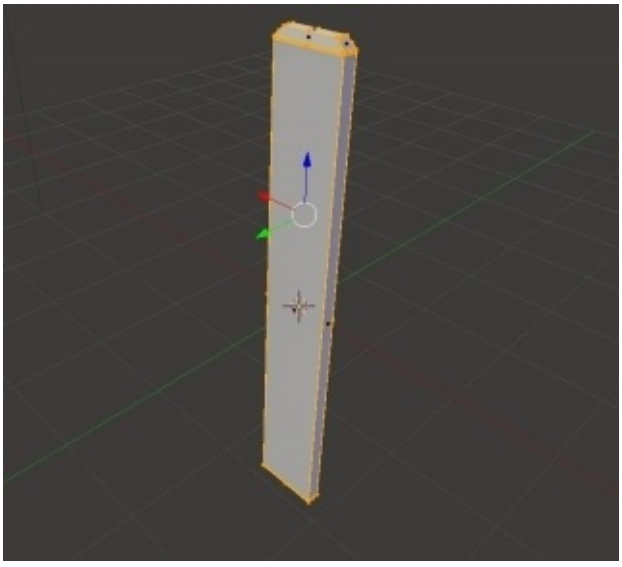
Step 3: Scale the cube to look like the shape of a fence post. To do this, scale on the y-axis to and make the post as thin as you like (Press **S** and then **Y**). Then, scale on the z-axis to make the fence post as tall as you like (Press **S** and then **Z**). Finally, scale on the x-axis to make the fence post as wide as you like.



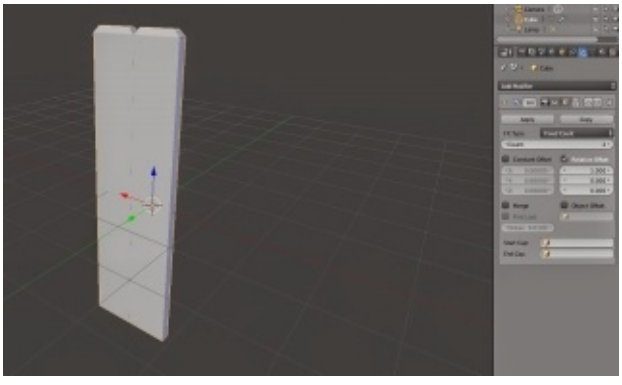
Step 4: Extrude the top face by pressing **E** and then scale it in by pressing **S**. You should now have a basic fence shape.



Step 5: To give a nicer look to the fence, you can optionally **Tab** into Edit Mode, select all vertices by pressing **A**, and then adding a VERY subtle Bevel effect by pressing **Ctrl+B**. You can also add a SubSurf modifier to create an even smoother effect but is not recommended if you are going to have a lot of these fence posts.

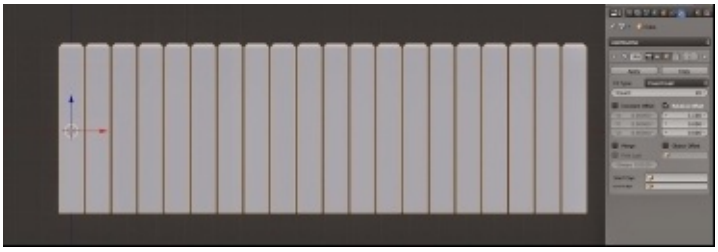


Step 6: To finish off, we need to duplicate the fence posts along a line to give the look of a fence. But duplicating via the usual **Shift+D** is tedious and takes a lot of time. Instead we can use the Array Modifier to duplicate the fence posts to save time. Add an Array Modifier to the fence post.



Step 7: Change the count to however long you want your fence to be.

Step 8: Also change the x-distance amount to give your fence some gap in between. And that’s it! You have your fence!

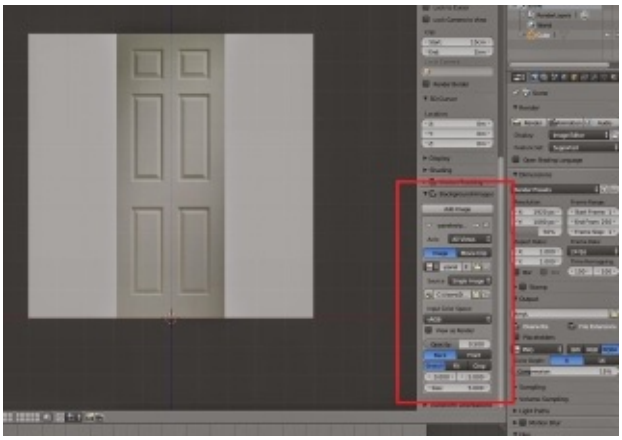


Model A Door

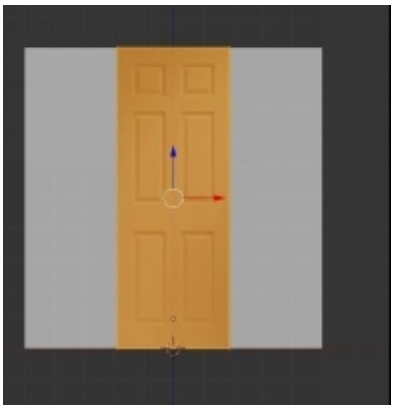
We'll be doing something a little different in this exercise and something slightly more advanced. It will be great if you know your way around Blender by now. We'll be creating a door and setting it up for animation. This may not be a 3D modeler's job but it doesn't hurt to know how to setup models so that they will be ready-to-go when an animator needs them.

Step 1: To begin with, I recommend downloading a reference image of a door from somewhere like Google Images. This makes the process of modelling so much easier and you don't have to always guess proportions.

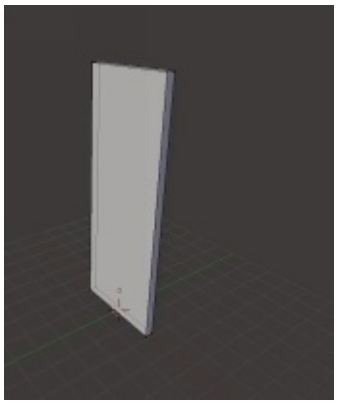
Step 2: Enable Background images (**Ctrl+T Background Images**) from the sidebar and add your reference image. Select the viewpoint to be 'Front' and scale/position to the relevant size of a door.



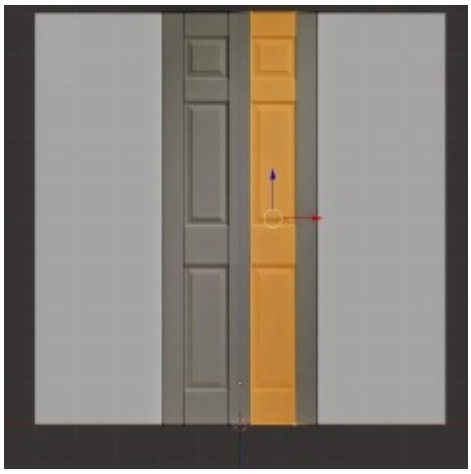
Step 3: Position the default cube around the base of the door. Then go into Edit Mode and scale the cube to fit the door. You may need to see through in order to see the reference image, press z to show wireframe mode. Now you should be able to see the reference image easier and scale and position your vertices better according to the reference image.



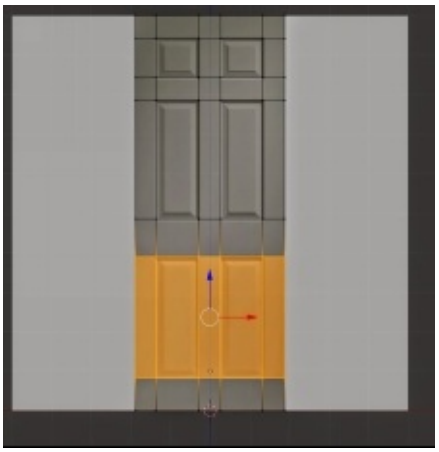
Step 4: Also remember to scale the door on y-axis to match the thickness of the door. If you have a reference for this you can use it, but in my case I sort of just guessed it.



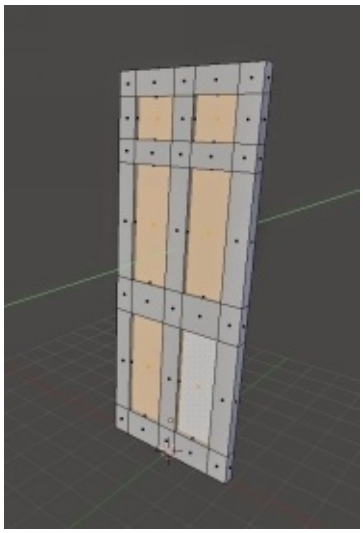
Step 5: Assuming you're using the same reference image as mine, add 4 loop cuts by pressing **Ctrl+R** and hovering around the base of the door. Before clicking, scroll to a value of 4. If you don't have a mouse scroll (like laptop users for instance), you can also press the '+' symbol 4 times. Make sure to position the loops to fit the door design thingy (sorry, not sure of the actual name for it).



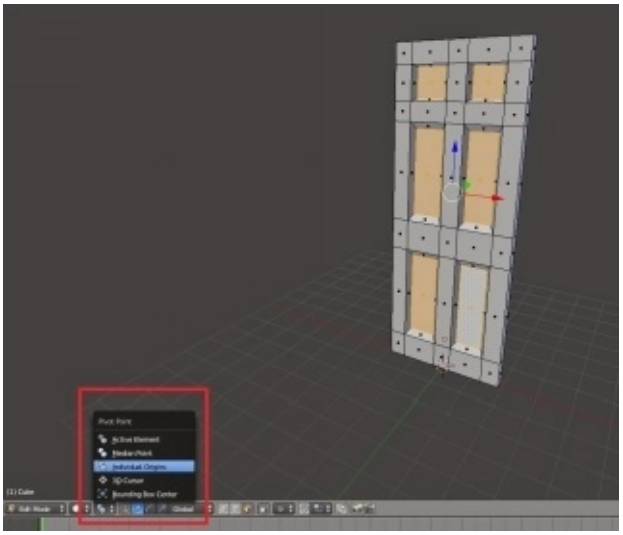
Step 6: Also add loop cuts horizontally about 6 times and position them as well.



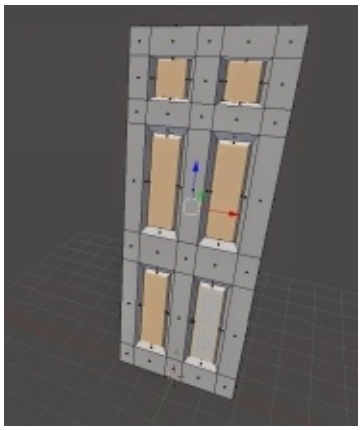
Step 7: Select each face where the design thingies occur and extrude back a little bit.



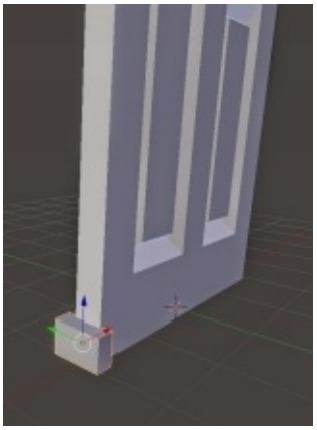
Step 8: Change the pivot center to ‘Individual Origins’. This way any scaling you do to the faces for instance, will scale along the midpoint of the faces you’ve selected and not around the overall midpoint of the doors, if that makes sense. You can try with/without this to see what I mean. Now scale inwards by simple pressing **S** and choosing an appropriate scaling.



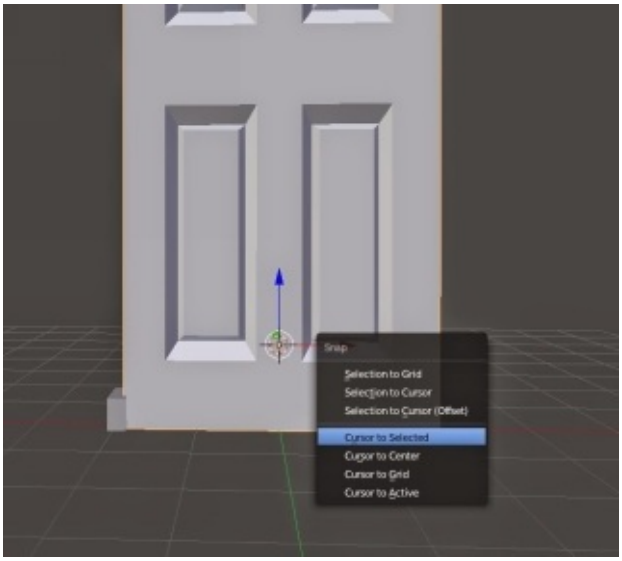
Step 9: Extrude once more outwards and scale in a bit as well.



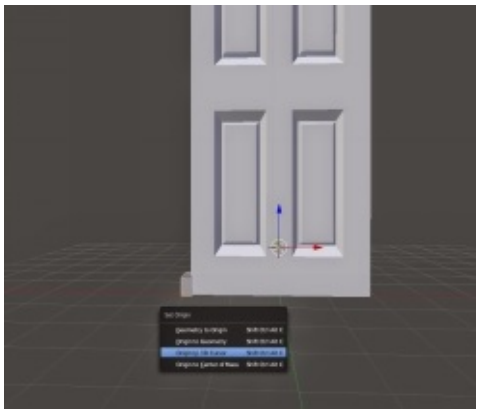
Step 10: We'll also quickly create a **very** simple door frame. Start out by adding a cube and scaling it so that it is thinner overall, but thicker than the door. Position it to the side of the door and the bottom.



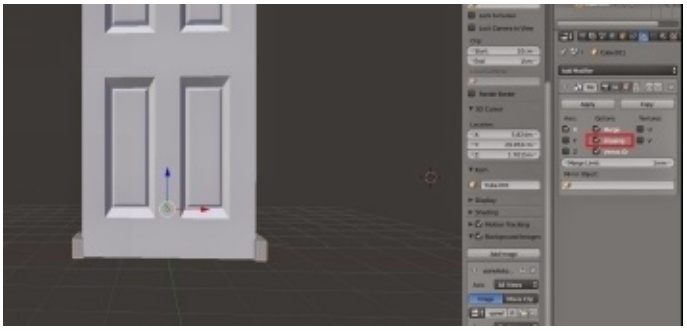
Step 11: Select the door itself and press **Shift+S** and then 'Cursor to Selected'.



Step 12: Select the door frame and press **Shift+Ctrl+Alt+C** and press 'Origin to 3D Cursor'. This now places the orange dot, and thus makes the center of the door frame the same position as the center of the door.



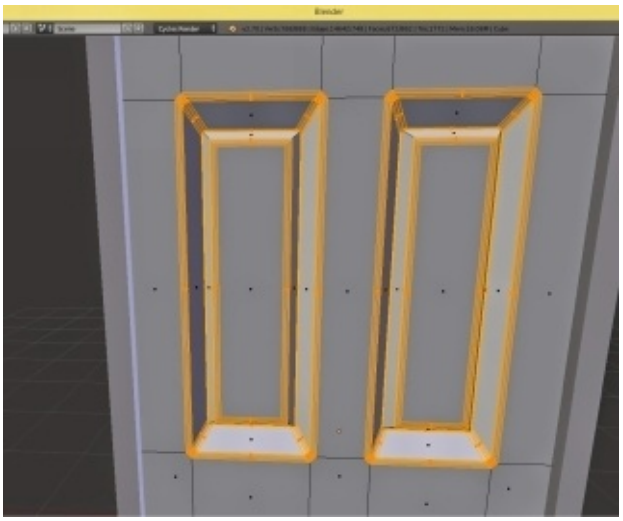
Step 13: Add a mirror modifier and enable clipping. You should see the door frame fitting perfectly across the other side of the door.

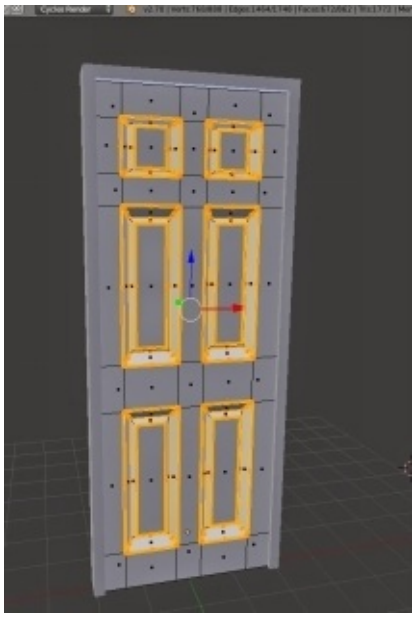


Step 14: Go into Edit Mode and select the top face. Move the top face to just a tad bit above the height of the door. You don't need to move it a tad bit above the door, but I just find it adds a bit more realism.

Step 15: Now extrude the top face a bit. Select the left face of the newly created extrusion and extrude that all the way till it collides with its mirror. Since you enabled 'clipping', it should lock together nicely.

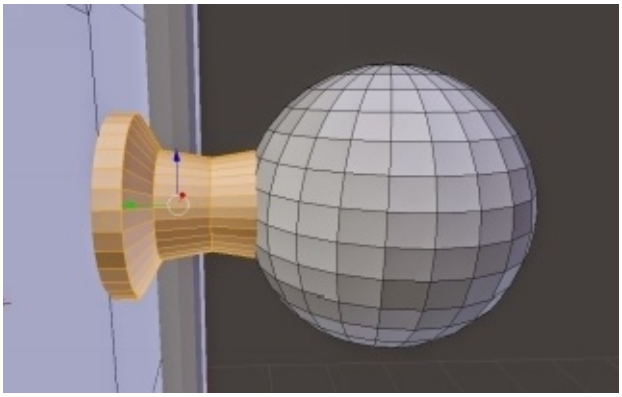
Step 16: Our door is pretty much done! We can now focus a little more on the details. Select all the faces of the door design boxes and also the faces of the original extrusion boxes (like in the image below). Then add a bevel to smooth this out. This helps enhance realism better. Do this by pressing **Ctrl+B** and dragging. Only drag a tiny amount. Don't overdo it or it might look too smooth and more cartoony. Scrolling or (or **+ing**) will add more segments and thus more smooth curvature to your bevel.



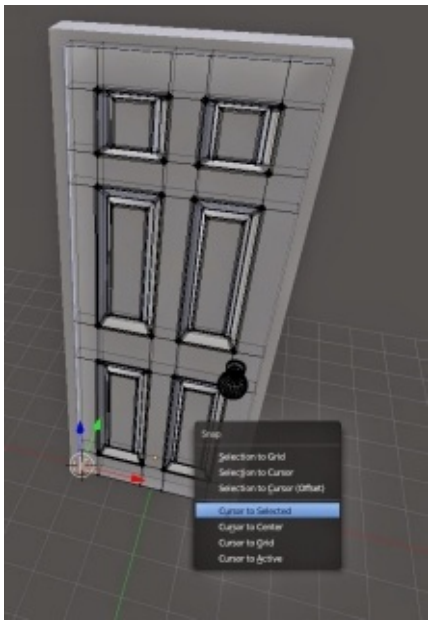


Step 17: Add some beveling (**Ctrl+B**) to the inner edges of the door frame as well.

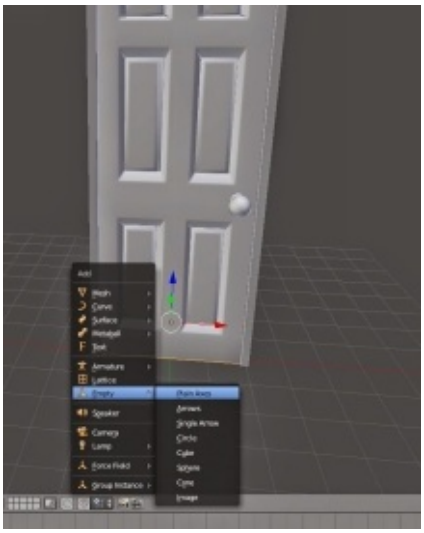
Step 18: Add a simple door handle. Start with a cylinder, then scale, then extrude a couple of times to create the base of the door handle. For the handle itself, just add a UV sphere.



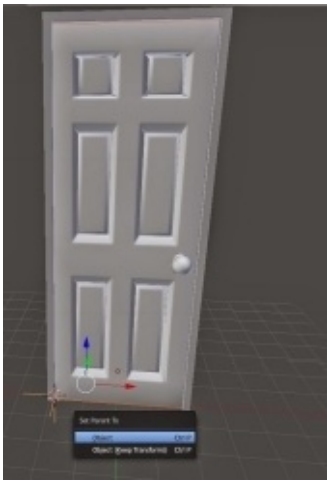
Step 19: Now select the bottom corner 2 vertices of the door itself in Edit Mode and snap the cursor to that position.



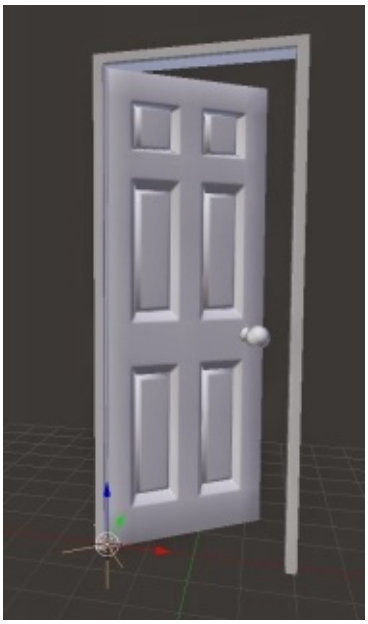
Step 20: Add an empty.



Step 21: First select the door, and then select the empty. Press **Ctrl+P** and select Object. This parents the door to the empty. The ordering is important here, selecting the empty first would parent the empty to the door which is pointless.



Step 22: You can now rotate the empty on the z-axis and your door should open and close! Your door is now ready for an animated environment!



Create A Mountain

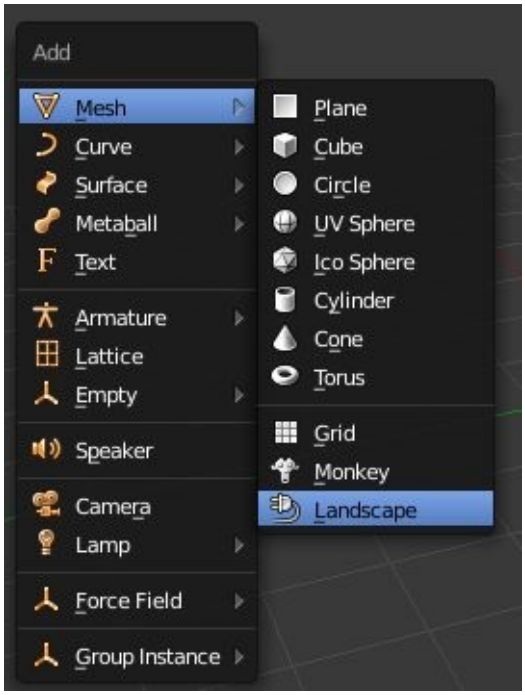
In this final exercise, let's veer away from the modeling techniques and have a bit of fun with generators. You've already worked hard at this point. Making use of generators in 3D modeling can be a great timesaver as most of the modeling work is already done by the person who created the generator. While modeling things yourself is great to get that sort of personal touch, the use of generators can be helpful when having to model many things of the same type. We will now look at creating a basic mountain in Blender.

Step 1: Open up Blender and delete everything.

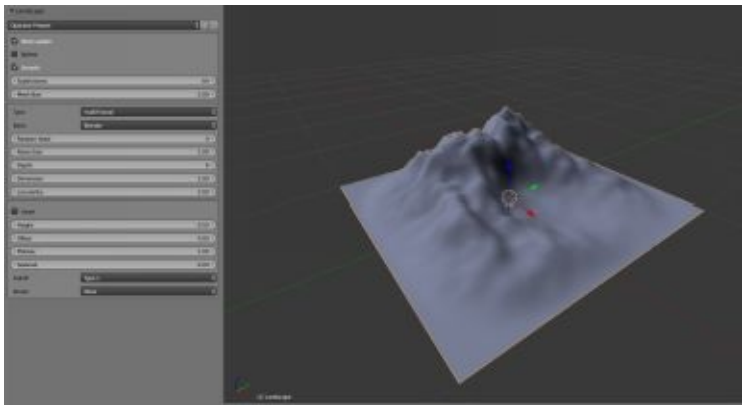
Step 2: Go to *File* *User Preferences*. From there, select the *Add-ons* tab and type in 'ant' in the search bar. Then tick the *Add Mesh: ANT Landscape* add-on.

The ANT Landscape is an add-on created by Jimmy Hazevoet which enables you to quickly generate unique mountains, terrains and landscapes.

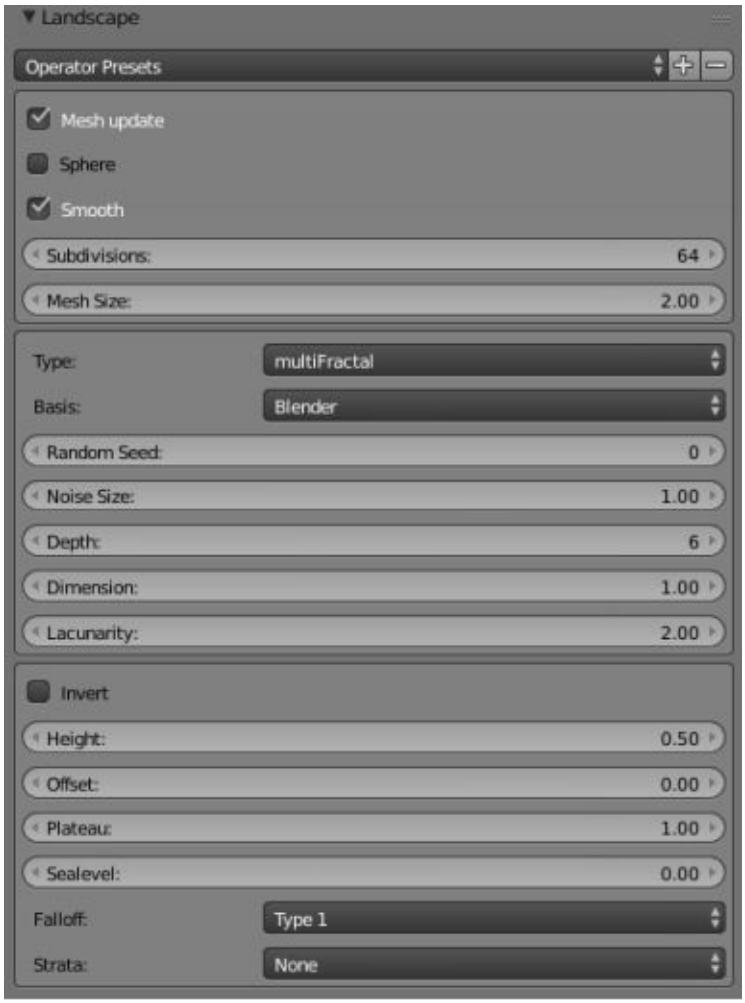
Step 3: Add a landscape by pressing **Shift+A** **Mesh** **Landscape**.



Step 4: And there you have your mountain! Press **T** to open up the toolbar. You will see a section called *Landscape*.



Step 5: These settings can be used to modify the look of your mountain. Play around with these settings and see the different styles of mountains you can generate.



I'll briefly describe what some of these settings do.

- Subdivisions define how detailed your mountain looks. Higher subdivisions will make your mountain look very detailed and high-poly, while lower subdivisions will lack the detail and look low-poly.
- Mesh Size defines how big your landscape is.
- Type changes the look and style of your mountain based on procedural functions.
- Basis seems to do the same thing as type but appears to be defined by textures instead of procedural functions.
- Random Seed gives you a random unique mountain every time you change the

value. Your mountain will still look similar in style if all the other settings are the same but won’t be identical.

- Noise Size controls the amount of tiny bump details on your landscape.
- Height defines the height of your landscape.
- Plateau defines where the maximum height should be before it starts to plateau or straighten out.
- Sealevel defines where the landscape should start.

Have fun playing around with and creating a few mountains. This can be great for environment modeling.

Summary

In this chapter, we practiced creating a few more 3D models. We specifically looked at creating a wooden backyard fence. We then looked at creating and setting up a door for animation. In the next chapter, we will look at the difference between low-poly and high-poly models and why we should make full use of them.

Chapter 9. High-Poly vs Low-Poly

In this short chapter, you will learn the difference between low-poly and high-poly models. You will learn the advantages and disadvantages of each and when to use them. By the end of this chapter, you will have a better understanding of the difference between low-poly and high-poly models.

What Is The Difference?

Low-poly models are models that have a low amount of polygons, or in other words, a low amount of vertices, edges and faces. The model can appear as having a lack of detail and the edges quite rough, sharp and clearly showing. Whereas, high-poly models are models that have a large amount of polygons, or a large amount of vertices, edges and faces. There are various advantages to this and we will now look at each type one at a time.

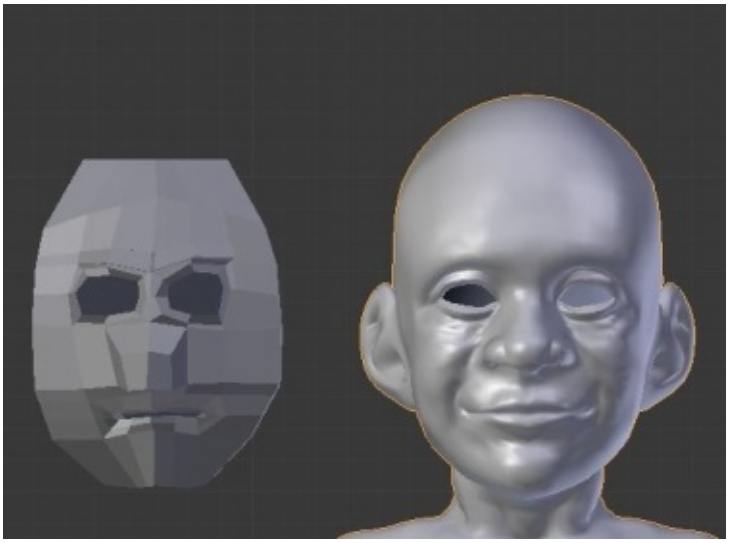


Figure 20. Low-poly (left) model and High-poly model (right)

Low-Poly Models

As I mentioned, low poly models are those that have a low polygon count overall in that one model. Hard-surfaced, organic and environment models can all have a low-poly look.

Advantages

There are various advantages of utilizing low poly models in your work. Some of these include the following:

- **Save memory:** Your computer will love you as it doesn't need to keep all those polygon data in memory. This allows you to work with models smoothly without lag and provide a smoother experience compared to modeling high poly models. With the extra available memory, you can push the epic-ness of your scenes.
- **Save Storage:** Due to the low amount of polygons, your model won't take up too much space in your hard drive. Having more storage space is always good as it allows you room to fit in more models in comparison to high poly models (which tends to hog up storage space).
- **Can look stylistic:** It seems, nowadays, that low-poly art is all the rage. This growing trend seems to be up there with the latest in modern, contemporary art. Even TV ads are starting to use low-poly models to showcase their products. There's just something appealing about low poly art I guess. Must be that simplistic, minimal design look that everyone is into these days.

Disadvantages

There are also a number of disadvantages in using low-poly models:

- **Lacks detail:** Since there aren't so many polygons, the lack of detail will be quite obvious. The sharp edges may be visible and won't look really convincing. It is very obvious that it looks CGI.
- **Not as popular yet:** High-poly models still seem to be more popular still. As more and more people strive to reach photorealism, low-poly modeling tends to get overlooked.

When To Use?

So when should you use low-poly models?

- **Low-poly art** – As you may have guessed, low-poly models will suit low-poly art. Since it seems to be one of the more trending types of art today, it will be advantageous to get on the bandwagon and create some yourself.
- **Games** – Low-poly models perfectly suit game development. It's pretty much necessary that the models in games are low poly, unless it's one of those epic games played on one of those monster-powered PCs. Games require low-poly models since the extra memory and storage will provide a smoother gaming

experience for gamers. They rarely ever use high-poly models unless if it’s absolutely necessary. They do, however, tend to create a high-poly version of game characters for trailers and promotions purposes.

One of the ways you can convert your high-poly model into a low-poly one in Blender is to use the ‘Decimate’ modifier tool. Just select your mesh, apply the Decimate modifier. Set a ratio of how much percent you want to decimate, and then BAM, you have yourself a low-poly model.

High-Poly Models

High-poly models are models that have a high amount of polygons. High-poly modeling can also apply to all types of models, including hard-surfaced, organic and environment models. The models appear smooth, highly-detailed and just plain awesome if done right! Photorealistic models tend to leverage high-poly models as it's pretty much necessary. While there are awesome advantages, there are also disadvantages to high-poly models.

Advantages

There are a number of advantages of leveraging high-poly models in your work. They are as follows:

- **Exquisite and detailed models:** High-poly models, if done well, can look beautiful and highly detailed. For example, a character with a million polygons might be a strain on the PC, but you will be able to see not just a nice, smooth and realistic-looking character, but even micro-details like the pores on his skin, or the wrinkles on her face. None of which would look as convincing on low-poly models,
- **Realism:** Realistic models tend to be high-poly. A low-poly model rarely ever looks realistic unless you are creating something as basic as a table for example.
- **Great for realistic animation:** With the high amount of vertices available, your animations will tend to deform nice and smoothly and this can look pretty realistic. Low-poly models also bend smoothly and perhaps easier to control for the animator, but is far from deforming realistically.

Subdivision is one of the modeling tools use to increase poly count in a model and allows you to add further details to your models.

Disadvantages

There are some disadvantages to using high-poly models. Here are a few:

- **Hogs up memory:** Due to the high amount of polygons in a high poly model, you may find that working with your model may be a slow, laggy experience. If you have super details with tons of polygons, you may even experience frequent crashing, since your PC can't keep up with the memory requirements needed to load your model on screen. Just one model alone, may contribute to most of your PC's memory being used up and the best option would be to simply get a stronger PC.
- **Hogs up storage:** Since there are so many polygons in high-poly models, it will take up a lot of storage space. If you're working on a film project which requires high amounts of detail, you will be surprised how much storage space you've used up quarter way through your production. High-poly models may not be a good idea if you have very limited storage space. It may be better to utilize some type of Cloud storage service if you plan to make a ton of high-

poly 3D models.

When To Use?

So when should you go for high-poly models?

- **Films** – High-poly models are almost a necessity for animated films. Just to be able to see the intricate details will add immensely to the film experience. Since animated films require animated models, good deformation should be possible. Thus, high poly modeling suits films greatly.
- **Simulations** – Whether it be for hospital, dentists or crime investigations, highly accurate and detailed models are a necessity. Simulations generally rely on matching the real world identically and the real world is a lot more detailed than what low-poly models can offer.
- **Architectural visualization** – Some architectural visualizers require high-poly models. Architecture in general may not require that many polygons but by utilizing higher-poly models for bumps and details as well as improving the smoothness of edges can contribute to the final “wow” factor of these models.

So which one should you pick? There’s no real winner here. Just pick the one that suits whatever you are making the model for. Each has a unique look and can contribute to making your models stand out.

Summary

In this chapter, we looked at the difference between low poly and high poly models. We saw the advantages and disadvantages of each as well as the best scenarios to use them. In the next chapter, you will learn how to finalize and polish your 3D model.

Chapter 10. Texturing Your 3D Model

In this chapter, we briefly look at giving materials to our 3D models and making it look and feel right when rendered. By the end of this chapter, you will learn about how to setup a model for texturing as well as learn about shaders in Blender.

MATERIALS

The concept of materials may be new to you but shouldn't be too hard to grasp. Materials simply give your 3D models color, look and feel. Materials are what your 3D model is made of. For instance, you could model a human character, but without giving the human a material, it would be a little hard to guess what the human is made of. Is it made of concrete or fleshy skin? Materials don't just define color and texture. It defines what your object feels like, and whether light can penetrate through it, or bounce off of it. As 3D modelers, we don't need to go into details about materials, as that's probably the job of texture artists, but it doesn't hurt to know a bit about it. Knowing a bit about texturing can also make your Texture Artist's life easier (or yourself if you're doing everything on your own). I say that since, as a 3D modeler, you can setup your 3D models in a way that will be efficient for Texture Artists' to go in and texture your models. This goes back to good topology. Good topology plays a strong part in this as well. With good topology, the texturing process will be smooth and the end result will look nicer. Your Texture Artist will thank you for this. A model with bad topology may reflect in the texturing as you may get a textured model with some parts overstretched and some parts a little wonky looking.

There are a few types of materials available in Blender Cycles. You can add them by ***Shift+A*** ***Shader*** in the Node Editor and selecting the shader you want. Here is a summary of the main shaders in Blender Cycles.

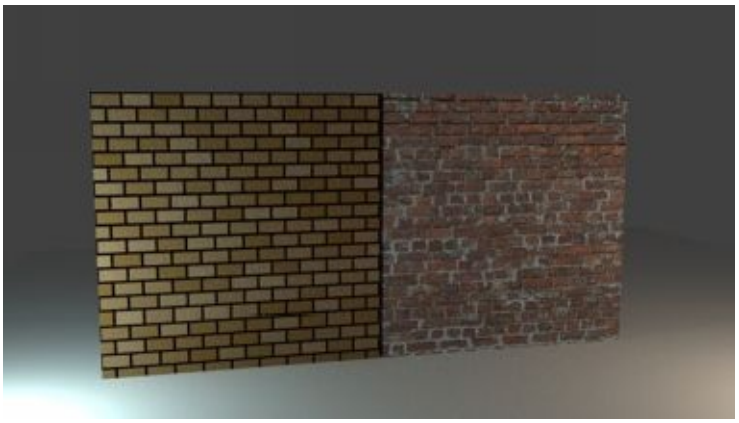
- *Diffuse Shader* – The default shader in Blender Cycles. It takes a color input and just displays it as it is. You can select any color you want or you could input an actual image texture.
- *Glossy Shader* – Makes your objects shiny and reflective. A roughness of 0 will give you a mirror and higher than that will give you blurry reflections.
- *Glass Shader* – Makes your 3D object see-throughable (if that's a word) like glass. Higher roughness values will give you blurrier glass.
- *Transparent Shader* – Makes your object invisible. You can control the opacity using image textures.
- *Translucency Shader* – The lights will penetrate through your 3D object and the back of your 3D object where there is no light will be partially lit up. Great for leaves, grass and ears!
- *Subsurface Scattering* – Makes your 3D object look like skin. Great for human skin, jelly, milk, and other gooey kind of stuff!
- *Velvet Shader* – Gives you a cloth like shader.
- *Mix Shader* – Mixes 2 different shaders together.
- *Add Shader* – Adds both shaders together.

Each of these materials (also called ‘shaders’) gives your 3D model a certain look and feel. There’s a bit of science behind each of these shaders but it shouldn’t be too hard to see the difference in the final results.

Procedural Vs. Image Textures

Creating plain default shaders for your 3D models sure isn't fun. You would have played around with different colors for your diffuse shaders, glossy shaders, or whatever to make it look more interesting. Apart from just changing colors, you can use textures. In the Node Editor in Blender, if you press ***Shift+A*** ***Textures***, you will be presented with a few different texture types. These should be really obvious what they do. For example, if you choose *Brick Texture*, then you will get a brick like texture on your 3D models. If you select *Noise Texture* then you will get this colorful cloudy type of texture (Ok, that probably wasn't as obvious, lol). These textures are called **Procedural Textures** (except the *Image Texture*). In other words, these textures will look good and consistent from any angle (as long as you set it up right). Procedural Textures are basically computer-generated textures.

However, sometimes you just don't want that procedural look. Adding image textures instead of procedural textures tend to make your 3D models look a lot more appealing and just well, better. If you're aiming for photorealism in your renders, you would certainly need to use real-world image textures a lot in your 3D models. The below image shows a procedural brick texture (left) and a real-world image texture of a brick (right) applied to a mesh. Clearly, the real-world image texture will look better on your 3D models than the procedural one.



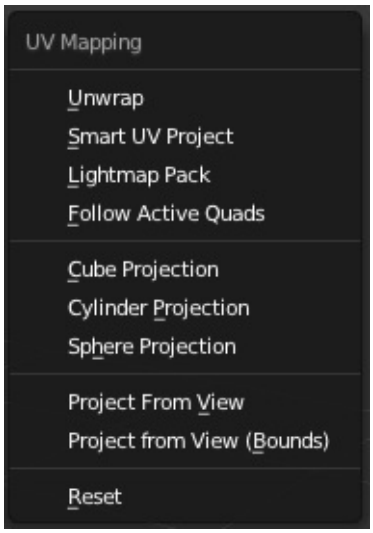
But how do you define where the image texture maps to your 3D models. What I mean is, say you're working on this really bad and buff 3D dude. And you want to add a tattoo on his arm. Firstly, procedural textures won't cut it. A computer cannot generate a tattoo. Actually, it might if you use some complex algorithm but what I mean is, you probably want to design the tattoo yourself using Photoshop or GIMP or something. Secondly, it will be difficult to tell the computer to put the tattoo specifically on the arm and nowhere else. Procedural textures tend to distribute the texture all over the model.

UV Mapping

So if you want to define (or paint) your 3D models, you need to use image textures. But how would you map the image of the tattoo to the buff dude's arm? It's not like Blender's thinking "Oh yep, this is a tattoo image, so let's stick it on this dude's arm and hope my master approves". You would need to do this mapping by yourself. This process is called *UV unwrapping* in Blender. The idea is that the vertices, faces and edges (coordinates) will be arranged in a 2D mapping grid. When you place your own image on top of the 2D grid, the coordinates in the grid containing the image will copy over the image to the corresponding coordinates on the 3D model. That was a bit difficult to explain. Here is a simpler explanation. Think of it like your 3D object wearing a full body suit. That suit is then squashed and arranged in a way that you can paint on it like a canvas. Sometimes you would cut pieces of the suit that are a bit difficult to paint on and put it on another vacant part of the canvas.

Blender UV Mapping Types

There are various types of Blender UV mapping options available. To see them, select your 3D model, tab into Edit Mode, make sure all vertices are selected and press ***U***. The ones you would most likely be using throughout your Blender life is *Unwrapping*, *Smart UV Project* and *Project from View*.



- *Project From View* – Perhaps the easiest form of UV unwrapping for beginners. Based on whatever view you are currently in the 3D viewport (front, side, or on an angle), the selected vertices will be "snapshot" onto the map. In other words, where you stand when you see the body suit, you take a picture, lay the photo down and paint on top of it. This method is perfect for tables and buildings and other cube-like objects.

- *Smart UV Project* – The computer chooses the most optimum mapping based on the selected vertices.

- *Unwrap* – Great for precise and correct UV mapping. This is what is mainly used in industry and as an artist you are mainly in control of the texturing. You mainly see this method being used for character texturing. This works by first letting you, the artist, define seams. Then those seams are "cut" and arranged on the "canvas" in a way that is ready to paint.

Summary

In this chapter, we took a brief look at materials and textures. While not directly related to 3D modeling and perhaps a separate topic on its own, it helps to have some understanding in order to make the final finished models look professional. We looked at different types of materials, as well as procedural and image textures. We also looked at UV unwrapping a 3D model. In the next chapter, we look at ways to showcase your final 3D model.

Chapter 11. Showcasing Your 3D Models

In this chapter, you will learn about taking your final 3D model and presenting it in an appealing form. You will also find out ways to show off your creation to the world and also the possibility of making some extra side income selling your 3D models. By the end of this chapter, you will have a better understanding of ways to showcase your final 3D models to the world.

RENDERING

So you've finally completed your 3D model and now want to show it off. First of all, you're going to want to create renderings of your model. 3D rendering is the process of converting your 3D models along with light, material and scene information to produce 2D images that look either photorealistic or non-photorealistic (stylistic) and is carried out by rendering software. You would position your camera on the 3D models you want to render and then simply hit the 'Render' button. Just like taking a snapshot on a real camera. Both will give you a finished snapshot image. Here are some renders in 3D:

There are two types of renderings you can create; Photorealistic and Non-Photorealistic (aka stylistic). The one you choose depends on the whether you created a photorealistic or stylistic 3D model (remember Chapter 1?). However, this is not a strict requirement and it really depends on the look you are going for.

- Photorealistic – These types of renderings produce awesome looking results. By far, this types of rendering seems to be the most popular.

Your model can look very impressive when you set it up in a photorealistic scene. The downside to achieving photorealism is time. It takes an extremely long time to render

photorealistic images since it needs to calculate things like global illumination and other physically correct stuff. You also need to know how to set up global illumination and realistic lighting and so on. That is probably a topic for a later book. Achieving true photorealism has been made possible by a lot of artists and advances in 3D rendering technology but still not many can achieve awesome looking photorealistic imagery.

- Stylistic – These types of renderings produce appealing looking imagery. Employing this style of rendering of your 3D models can appeal to certain demographics, especially younger people. If you choose to do low-poly rendering, you can make your business look quite professional.

 Remember to take into account good staging and composition. That is, try to position your 3D model(s) so that it stands out and catches our attention. You can use photography techniques such as the Rule of Thirds to help you achieve this. You can also combine photorealism with stylized renders to get a unique type of look, but again, it depends on what you like and whether your intuition believes it fits.

- Compositing – You can enhance your renderings using compositing techniques. Either you can use Blender's in-built compositor, or an actual photo editor like Photoshop or GIMP. You can play around with adding effects like vignettes, glows, and lens flares to give your renders that final pop and make your 3D models really stand out that extra 20%.

Turntable Animations

Sometimes, it’s nice to create turntable animations of your finished 3D models. You do this by having you model positioned in the center, perhaps standing on a plane or a circle. You would then have the camera slowly spin 360 degrees around your 3D model. The camera should show a full view of your 3D model. This is a nice way to showcase your 3D model as people get to see a full view of your finished 3D work and can appreciate the amount of effort you put into it.

Turntable animations are quite common in the 3D modeling world and they are generally used as part of a 3D artist’s portfolio or demo reel. This is generally a good idea since your potential employer can see the amount of work you’ve done at a glance. The use of turntable animations increases one’s chances of landing a 3D modeling job.

Just a tip: Try to minimize the amount of white space in your rendered turntable animations. That is, show as much of your 3D model as possible, since it would be good to see all the little details of your 3D model. Refrain from using distracting backdrops. There is no need for high detailed backdrops, just use plain black or white backdrops since we only want to focus on your model and not anything else.

Where To Show Off?

So you're finally done with your model and renderings and want to show it off to the rest of the world. But where would we start? How do you put your work out there so you get noticed? Let's go through some great places where you can post your final finished works.

Forums

The number 1 place to post your finished works are in forums. Forums are not like social media sites like Facebook or Twitter. Posting your work will immediately put your post on the top of the front pages for that forum (or sub-forum). Everyone who frequents that forum will see your post when you put it up. Forums are great to get some good, honest feedback.

I recommend posting on 3D art or 3D modeling related forums since they are the most suitable for 3D model related works. One of the best (and most active) forums related to 3D works right now (as of 2016) is CGSociety (forums.cgsociety.org). This forum is used by a lot of really professional 3D modelers, some of whom have gone on to working in industry. Getting feedback from them can help you improve tenfold as a 3D modeler. Note that, you may get your feelings hurt as some of the feedback can be harsh. Try your best to take criticism and learn from it. Don't doubt whether you are a good 3D modeler or not, and don't believe others when they tell you that you aren't. The more you work on addressing your flaws, the more you get better. Simple as that! That being said, another forum that I frequent is BlenderArtists (http://blenderartists.org/forum/). This forum is for Blender users. I use this forum to post my works in progress and the people there have helped me improve my 3D models greatly. So I have to thank everyone on that forum for that!

Facebook Groups

Facebook Groups are groups that Facebook users join so they can share things in common. If you like movies, there's a group you can join for that. If you like sports, there's a group for that. And if you like 3D modeling, there's definitely a few groups for that. One caveat though, you need a Facebook account. You would then have to join a group that interests you and wait until someone accepts you before you can post or see anyone else's content (if it's a closed group). Once accepted, you can post your works and view/comment on others works. Post your final finished 3D model renders here and also get some useful feedback. Also, don't get too excited when you see that a group has 15,000 members. It doesn't really mean that 15,000 people will see your posts. A majority of them will disable group posts from showing up in their feeds. They have their reasons, mainly since group posts will end up clogging their feeds what with so many people posting many times a day. This would distract them from viewing personal photos of their friends and their cats. You will get people who check out your posts but, just like forums, it's the really active ones who are fans of the group who may check it out and comment. Some posts may not show up immediately when you hit post and may require a moderator

to approve the posts as this is to prevent spammy “Click here to see how I made a billion dollars in 2 hours with NO experience” type of posts.

I’m aware Facebook has a new feature which extends upon the “Like” button. There is now a smiley face, love heart button and some others as well. Good there’s no dislike button though. Would be such a massive blow to our motivation (just like Reddit at times).

Google+ Communities

This is similar to Facebook Groups, except you will need to sign yourself up for a Google account. With a Google account, you get your own Gmail account to view/send emails, a YouTube account to post and subscribe to videos and also a bunch of accounts on a host of other Google-owned sites.

In case you’ve never heard of it (and I don’t blame you if you don’t), Google+ is a social network just like Facebook. And just like Facebook Groups, Google+ has its own version called Google+ Communities. Even though Google+ isn’t as popular or as large as Facebook, it is growing and becoming pretty active in recent times.

I personally use Google+ a lot, as it helps me to build a following a lot quicker than Facebook. Perhaps this is due to the social network being relatively new and thus getting seen is more likely.

You can join Google+ Communities and you don’t need to wait until someone approves you. You can start posting straight away. It’s very easy to find a few Communities related to 3D modeling. You also have the ability to +1 someone else’s posts and get some +1’s yourself, which is the equivalent of a “Like” on Facebook. Good posts can also go viral as people may spread your posts like wildfire if it’s really good.

Sketchfab

This is a great way to showcase your 3D models. You’d be committing a crime as a 3D modeler if you don’t take advantage of Sketchfab (https://sketchfab.com/). Sketchfab allows you to upload and even share 3D models to the site. The site will then convert your model into an interactive view where visitors can see your model from all angles by dragging their mouse and rotating. They can even zoom in and out to get a better look of your model. Try it out and see other people’s works, it’s just simply amazing. Perhaps could be a lot more effective than turntable animations. Sketchfab, although largely in its infancy, is really starting to take off and make a name for itself now. You can have a completely finished and rendered model on Sketchfab and the site also has support for looped animations. In other words, people can interact with your models while it is animated and “alive”. For example, checking out a house with smoke animation coming out of a chimney. Sketchfab is similar to going to an antique shop and examining some of the antique stuff in your hands to observe the details. You control what angle you want to see your model. While you won’t gain as many friends or followers through Sketchfab, it is starting to grow and become more popular, so one day it may be the next big thing in 3D.

Your Own Website

As a 3D modeler, it's good to maintain a website to showcase your works. A website can be equivalent to a resume or a portfolio. You can use your site to your advantage to show off your best works and to post renders, models, turntables and demo reels.

Try to make sure your website stands out and shines. We won't be discussing good designs for catching people's eye or anything like that, but there are tons of resources on the Internet for this sort of thing. However, if you don't want to learn about web design, you can just purchase some CSS template or theme and apply that to your site.

When a potential employer sees your website, they may be stunned and will feel compelled to hire you compared to someone who looks like they made a website from Microsoft Word.

Where To Sell?

Selling 3D models can be a great way to make some passive income and give you the opportunity to earn much more than with YouTube or AdSense or whatever. Some 3D modelers make a living by selling 3D models. They pretty much quite their day job and focus on creating 3D models, at home and get paid (really well) for it. However, don't plan to quit your day job anytime soon. Making a living selling 3D models requires a lot of hard work, patience and dedication. Unfortunately, there are no shortcuts to earning good income consistently online, let alone 3D modeling. I repeat, it requires A LOT of hard work and perseverance, especially initially. Having said that, here are some cool places to sell your 3D models.

- **TurboSquid(http://www.turbosquid.com/)** – The number 1 market place for professional 3D models. There are hundreds of thousands of different 3D models on the site on nearly every category imaginable. From humans, to animals, to plants, vehicles, architectures, landscapes and so on. TurboSquid has a program where you can upload your 3D model and earn a percentage royalty of how much you price your model for sale. The royalty rate is pretty bad, like 20% or so, but is generally worth it in the long run when you start uploading a ton of models. It can really add up in the long term. A lot of people are making a decent living from this site but beginners will very likely have a hard time getting noticed due to the amount of models that get uploaded daily. Thus, beginners need to know a bit about SEO and that kind of stuff as well as try to convince a few people they know to buy and leave a comment to give them that social proof that the model is worth purchasing.
- **3D Ocean (http://3docean.net/) –** Another popular and growing site. This site is part of the popular Envato market. Yes, that place where you can buy background music and video as well as stock imagery. They also have a 3D model section where you can purchase 3D models. Not as big as TurboSquid but still worth giving it a try as it is growing. The one downfall with this site is you need to meet some strict requirements regarding quality as models are generally reviewed by moderators before they are made available for sale.
- **BlenderMarket (http://blendermarket.com/) –** This one is specifically for Blender users only. Just like the first 2, you can upload your 3D models to the site. The models have to be Blender compatible only and thus you can only upload .blend files. The models you upload will also be checked by moderators for quality inspection but are not as strict as 3D Ocean and are generally quite responsive within a day or two. They may ask you to make a few changes here and there and if you follow up on that, you will have your model available for purchase on the site shortly thereafter.

One other way to put your 3D modeling skills to use and make some nice side income is through **freelancing**. Freelancing means that you offer your 3D modeling skills on a site like Freelancer.com and whoever needs a 3D modeler for their project can contact you to work on a project for them. This may be either a short term project or a

long term project. Depending on your skill level, you could get paid well for doing something you love working on real projects. The main challenge is finding a job as competition is pretty high. You'll need to have a portfolio that stands out and shows your potential employer that you are worth their time more than other 3D modelers. Once you start getting a few projects under you belt, you may feel like you are running your own business and you may even develop your own brand and a site to offer your services.

Another way is selling online tutorials. You share what you know and get paid for it. You could either put your tutorials for free on YouTube and get paid via ads or sell your tutorials directly on your site or a dedicated learning site. You will need to have gained a lot of experience before you can venture into this however. I'd suggest wait a year or two and learn as much 3D modeling as you can before you think about entering this field. You probably won't make as much as freelancing, but again, it may eventually add up the more tutorials you share.

Don't make 3D models or offer 3D modeling services in the hope of quitting your day job. It's very rare that anyone ever achieves this. Most people earn enough to buy coffee for the week. If you put in a lot of hard work and maybe have a fanbase or a few connections, you might have a better shot. I'd suggest having fun with 3D modeling and use any money you make with it as extra pocket money you can use to spend on anything you like. Even though, having a large 3D model database for sale may not give you a bucket load of gold, you will still be able to gain more exposure in the 3D world just by having your collections available everywhere. Posting your 3D artworks, selling 3D stuff, working on ambitious projects and posting them everywhere may get the attention of people within the 3D modeling field and if you're REALLY good, you may even get Pixar's attention (but I won't guarantee this since it has never happened to me).

Summary

In this chapter, we looked at how to showcase our 3D models through photorealistic and stylistic image rendering and turntable animations. We then discussed ways to get our work seen by as many people as possible who would be interested. We also looked at ways to make some passive income selling our 3D models. All of this helps in securing that dream 3D modeling job. In the next chapter, we finally come to the end and close the book by recapping everything we've learnt in this book.

Chapter 12. Conclusion

Phew! We've finally come to the end of the book! Congrats if you've made it this far. You're one step closer to becoming an awesome 3D modeler. In this chapter, we recap everything we've covered in this book.

So What Did We Learn?

Let’s go chapter-by-chapter and review what we’ve learned.

- In Chapter 1, we were given a brief introduction to the world of 3D modeling.
- In Chapter 2, we learnt about ways to become a better 3D modeler and emphasized the importance of practicing and improving our 3D modeling skills.
- In Chapter 3, we were introduced to a number of concepts and terminologies as they apply to 3D modeling. We also covered the 3D viewport, 3D objects, and how to manipulate their location, rotation and scale. We also covered some popular and very commonly used modeling tools.
- In Chapter 4, we discussed the most popular techniques for approaching modeling in 3D. There are Box Modeling, Polygonal Modeling, Sculpt Modeling, Curve Modeling, 3D Scanning and Retopology. We also looked at why good topology was important to create clean and good-looking models.
- In Chapter 5, 6 and 7, we looked at the techniques of approaching hard surface modeling, organic modeling and environment modeling respectively. We looked at some uses for these types of models and there were some exercise for us to try out.
- In Chapter 8, we were given some more exercises to work on and gain essential practice time to help improve our modeling skills.
- In Chapter 9, we were introduced as well as looked at the difference between high-poly and low-poly models. We also looked at scenarios where it would be best to use these types of models.
- In Chapter 10, we applied finishing touches to our 3D models and briefly looked at texturing and shading.
- In Chapter 11, we looked at ways to showcase our finished 3D models as well as how to make some passive income with your skills.

Last Bits Of Advice

Now that you know a bit about 3D modeling, don't stop here! Your real journey begins now. This book may have been a stepping stone for you to get started. From here on in, it is up to you to continue learning. You have the skills now. You also have the tools now. And you also have the knowledge now. Continue to build upon these and keep learning, practicing and experimenting. Don't ever worry about failing. It's all part of the process of learning and growing. Remember learning to ride your bike. Take it one step at a time.

Try and take up some ambitious personal projects. When I first gained the basics of 3D modeling (and animation), I went straight ahead and made an ambitious 30 minute animated short film (called *Theevan*, it's still there on YouTube). While I admit that that was probably a bit too ambitious considering my limited skillset at the time, it did teach me a lot or valuable lessons from it. Wat the project a failure? Probably, I don't know, and don't think I even care. I was satisfied with it since I learned a lot about 3D modeling from it by constantly experimenting and only relying on tutorials if necessary. It made me a better 3D modeler overall. With each project, I can only get better. And you will too! In fact, I'm still learning new things about 3D modeling now, even after 5 years.

If you want to continue learning with me, I encourage you to connect with me at ThilakanathanStudios.com by subscribing to my email list. Whenever I learn something useful, I will be happy to share it with you for free! There's also a ton of posts right now which may be useful to your learning process.

That's It!

Well done! Now you've officially reached the end of the book. It has been my joy to teach and share with you the skills and techniques of being a 3D modeler. I had structured this book in a way that would be beneficial to helping you learn and maximize your potential to becoming an awesome 3D modeler. I hope you had a lot of fun reading and following this book and that it at least helped you out a little bit in your journey to becoming a 3D modeler.

Let's keep in contact as I will bring you more helpful and affordable books in future. If you subscribe to my email list, you will get future books for free.

Thank you for reading and good luck!

About The Author

Danan Thilakanathan is a self-taught 3D animator and filmmaker. He has 5 years of experience and has created 4 animated short films and a number of short comedy webisodes. He is also an educator and provides training materials to help 3D artists at all levels.

Danan hopes to one day create a full length animated feature film.

Visit Danan’s website at ThilakanathanStudios.com!

Other Books By Danan Thilakanathan

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Creating an Animated Short Film: A Beginner’s Guide

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