

SSEC Tech Camp - Day 3

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Schedule

9:00am	WxSatS Scavenger Hunt
10:15am	Break
10:30am	Intro to Web Development / Make Your Own Web Page
11:45am	Lunch
12:45pm	CAVE Tour at the Wisconsin Institute for Discovery
1:45pm	Intro to Blender / Make Your Own Satellite Model
2:30pm	Break
2:45pm	WxSatS Virtual Reality Demo

WxSatS Scavenger Hunt

Instructions

- Open the following URL in a new tab :
<https://qcweb.ssec.wisc.edu/wxsats2/#resolution:4k;>
- Locate the following things in WxSatS.

Things to Find

- Find the satellite GOES-15.
 - This is a geostationary satellite.
 - Take note of its orbital properties and position with respect to the Earth.
- Find the satellite METOP-A.
 - This is a polar satellite. Also called a Low-Earth Orbiting Satellite.
 - Compare this satellite's orbit and position with that of the geostationary satellites.
- Find the satellite DSCOVR.
 - This satellite is neither geostationary or polar.
 - DSCOVR is positioned at one of the Lagrangian Points between the Earth and the Sun.
 - A Lagrangian Point is where the net gravitational pull from the two bodies is zero.
- Find the satellite FENGYUN2G and turn on its path.
 - The path for this satellite is vertical with respect to the Earth.
 - This is due to the inclination of the satellite's orbit.
 - The greater the inclination, the greater the change in latitude.
 - As this satellite orbits, it stays fixed to a given longitude.

- Find the satellite NOAA18 and turn on its path and swath.
 - This satellite's orbit allows it to cover the Earth multiple times throughout the day.
 - However it only sees small pieces of the Earth at a given time, as shown with its swath.
 - As this satellite orbits, the Earth rotates beneath it.
- Through the menu, find the Ground Station for Madison, WI.
 - In order for satellites to get data to us, they need to transmit it to a ground station.
 - For a satellite to do so, it needs to be within a certain radius of a ground station.
 - These boundaries are visualized by the bright green cones for the ground stations.
 - When a satellite is inside or above that cone, it is then able to transmit data to the ground station.
- Find Pluto through the menu.
 - Pluto is classified as a dwarf planet, not because it is too small, but because of its 5 moons.
 - Pluto has not cleared the neighborhood around its orbit, which is one of the criteria of being a planet.
 - Due to the 5 moons, the center of mass of the system is actually outside the body of Pluto.
- Find the moon Io through the menu.
 - This moon is known for its large quantities of sulfur, which gives it a yellowish surface, and volcanic activity, which is visible in the dark spots on the surface.
- Find the moon Deimos through the menu.

- Not all moons are spherical. Many moons are irregularly shaped, like Deimos.
- Deimos is a very small moon, with a mean radius of 3.9 miles.
 - Given its dimensions, Deimos could actually fit inside Lake Mendota.
- Find the asteroid Ceres through the menu.
 - Ceres is the largest asteroid in the asteroid belt.
 - Ceres accounts for about 30% of the mass in the entire asteroid belt.
 - However, the total mass of the asteroid belt is about 4% of the Moon's mass.
- Go to the Earth and select the Rocket through the menu.
 - Use the W key to accelerate, the A key to stop, and the mouse to steer the rocket.
 - Fly around to some of the satellites to get a different perspective of their relative orbits.
- Find the Go To Location feature in the menu and pick a location on Earth to visit.
 - This feature is still under development, so it may be slow or not work at all.
 - If it does eventually work, use the arrow keys to move around with the toucan.

Takeaways

- There are a lot of things you can do with web programming and 3D computer graphics.
- A lot of projects you may end up working on will never actually be complete.

- You are probably going to keep adding on features as they are thought of.
 - Keep your code clean and organized.
 - You may be revisiting your code months or years later and not remember exactly what you were doing.
 - Try to write your code as if you are expecting someone else to be editing it.
 - Geostationary satellites are further from the Earth than polar satellites.
 - Geostationary satellites are fixed with respect to a given point on the Earth.
 - Polar satellites are always moving with respect to the Earth, orbiting from pole to pole.
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Intro to Web Development

Introduction

- How do you create a web page?
 - Use HTML.
- What is HTML?
 - HTML is the standard markup language for web pages.
 - HTML stands for *Hyper Text Markup Language*.
 - A web page can consist of text, images, and other media.
 - HTML is used to help define a structure for those things.
 - The following is an extremely simple HTML web page.

```
1 <html>
2   Hello World!
3 </html>
```

- What are those "<html>" and "</html>" things?
 - Those are HTML tags and that is how HTML formats text, images, and other content on a web page.
- What is the difference between "<html>" and "</html>"?
 - "<html>" is the starting HTML tag and "</html>" is the ending HTML tag.
 - Most HTML tags come in pairs and have starting and ending tags.
 - Anything you put in between the start and end tags will inherit the format of that tag.
 - For example, the text in between the following <h1> (large header) tags will inherit the large header format.

```
1 <h1>
2   My Web Page
3 </h1>
```

- There is a wide variety of HTML tags that you can use.

- Some common ones include:
 - `<html>`
 - This is the root element for an HTML page.
 - Everything will go inside these start and end tags.
 - `<head>`
 - This tag contains underlying information about the web page that won't be displayed.
 - For example, you can define custom styles for certain HTML tags here.
 - `<style>`
 - This tag goes inside the `<head>` tag.
 - You can put custom stylings for other HTML tags inside the `<style>` tags.
 - `<body>`
 - This tag contains all the things you will display on your web page.
 - `<h1>`
 - The large header tag.
 - Usually used for the title of a web page.
 - Content inside this tag will have a larger font size and have bolder text.
 - `<div>`
 - The division tag.
 - This tag is used to create a section for your HTML content.
 - This tag doesn't do a lot of formatting, so it usually has some custom styles applied to it.
 - ``

- This tag is used to group elements that are on the same line of the web page.
- Similar to <div>, except that it keeps things on the same line.
- <p>
 - The paragraph tag.
 - These tags are used to format text into paragraphs.
- <!-- comment -->
 - All text between the "<!--" and "-->" will be treated as a comment, which means it will be ignored by the computer when displaying the web page.
 - Comments can be useful for keeping your code organized.
-
 - The image tag.
 - This tag is used to put an image on a web page.
 - Note : this tag does not have an ending tag pair, it is only the start tag.
 - In order to get the tag to work, you need to provide the source URL or path to the image.

```
1 <!-- For a local image -->
2 
3 <!-- For a remote image -->
4 
```

- How do I add custom styles to these HTML elements?
 - Use CSS.
- What is CSS?
 - CSS is used to describe how HTML tags will be displayed.
 - CSS stands for *Cascading Style Sheets*.
- How do I apply CSS styles to HTML tags?

- There are several ways to apply CSS styles to HTML tags, we will cover two of the ways (inline and internal).
- Using CSS with the Inline approach:
 - This is done by setting the style attribute in the given HTML tag.
 - For the following example, all text in the div will be the color red.

```
1 <div style="color:red;">
2   Red text.
3 </div>
```

- Using CSS with the Internal approach:

- This is done by using the <style> tag inside the <head> tag.
 - For the following example, all text in all divs will be red.

```
1 <head>
2   <style>
3     div{
4       color: red;
5     }
6   </style>
7 </head>
```

- In order to specify a particular div with the Internal approach, you can use an id.
 - This is done by setting the id attribute on the given HTML tag.
 - You can then refer to that element in CSS by putting a "#" in front of the id name.

```
1 <html>
2   <head>
3     <style>
4       #my-div{
5         color: red;
6       }
7     </style>
8   </head>
9   <body>
10    <div id="my-div">
11      Red text.
12    </div>
13  </body>
14 </html>
```

- When should I use the Inline or Internal approaches?
 - In general, it is better practice to use the Internal approach.
 - It allows you to modify lots of tags more quickly in larger web pages.
 - It also keeps all of the styles in one place, which helps with organizing your web page.
 - However there are times when the Inline approach makes more sense.
 - Usually with smaller or static web pages.

Takeaways

- HTML and CSS are the primary tools for making a simple web page.
 - If you want to do more advanced things with web development, you will want to look into using JavaScript with HTML and CSS.
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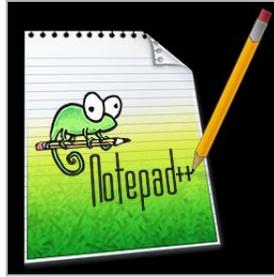
Make Your Own Web Page

Instructions

- Choose one of the satellites in WxSatS and make a web page about that satellite.
- Try experimenting with different HTML tags and CSS properties.
 - Here is a good resource for HTML tags :
 - <https://www.w3schools.com/tags/>
 - Here is a good resource for CSS properties :
 - <https://www.w3schools.com/cssref/>
 - Here is a good resource for CSS color names:
 - https://www.w3schools.com/tags/ref_colornames.asp
- Do some research about the satellite you picked.
 - Look up information about the satellite.
 - Wikipedia will probably be useful for this.
 - Try to find some images of the satellite to include in your web page.
 - You can use results from Google searches or screenshots from WxSatS.

Getting Started

- Create a new folder on your desktop
 - Name the folder "satellite_project" (without the quotes).
- Open Notepad++
 - The icon looks like this:



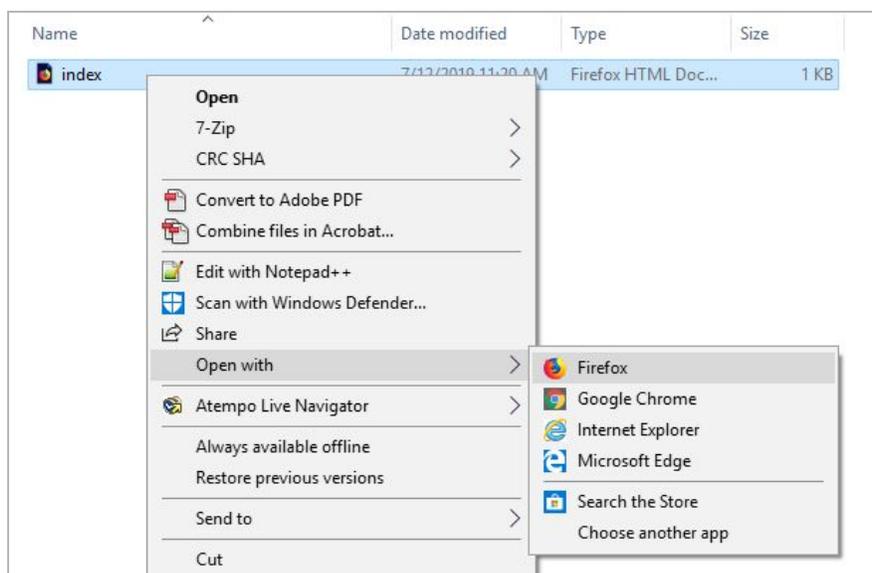
- Type in the following lines of HTML.
 - Use tabs to indent where needed.

```

1 <html>
2     <head>
3         <style>
4         </style>
5     </head>
6     <body>
7     </body>
8 </html>

```

- Save your file as "index.html" in the satellite_project folder.
- Go to the desktop on your computer and open the satellite_project folder by double-clicking on it.
- Right-click on index.html, hover over "Open with", and select the internet browser of your choice (ex: Firefox, Chrome, etc...).



- And now you should have your web page opened in a browser.
 - While you are working on your web page, you can see what the page currently looks like by saving index.html through Notepad++ and reloading your page in the browser.
-

Intro to Blender

Introduction

- What is Blender?
 - Blender is a free computer program that can be used to produce 3D computer models.
 - The Blender icon looks like this:

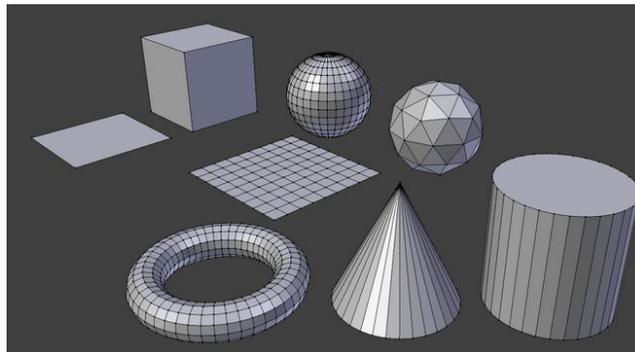


- What is a 3D computer model?
 - A 3D computer model is a mathematical representation of a surface of an object.
 - It is usually characterized by vertices in Cartesian Coordinates and faces, which are usually sets of 3 vertices that form a triangle.
 - The following are some examples of 3D models:

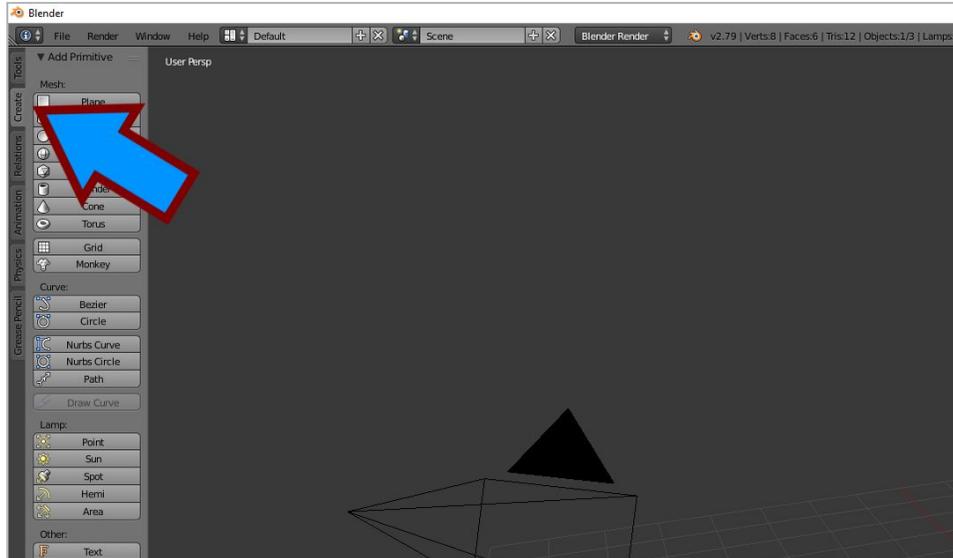


- Why use Blender?
 - Because making a 3D model from scratch would take a very long time and be very tedious and difficult.

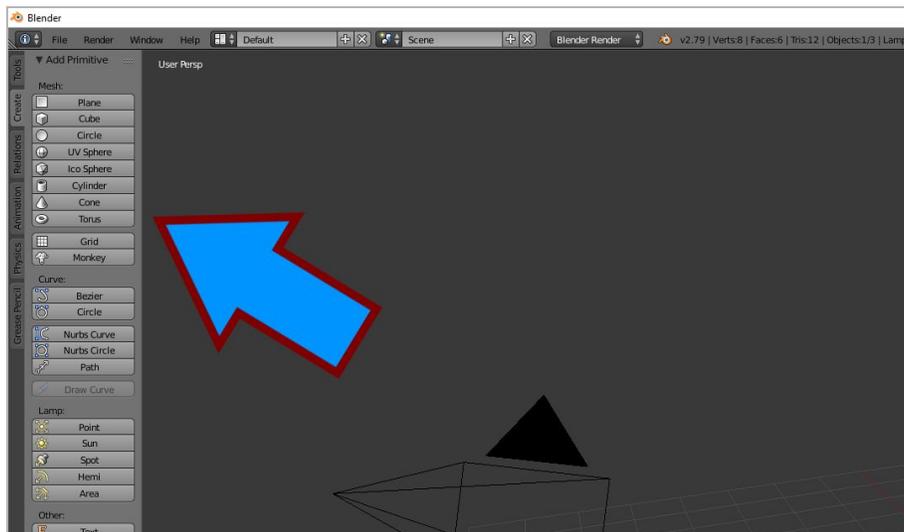
- Blender makes it a lot easier by allowing you to create models from basic shapes, or primitives, with a click of a button.
- What are shape primitives in Blender?
 - Primitives are simple shapes you can use as a starting point for creating more complex models.
 - You can create more complicated models out of multiple primitive shapes.
 - You can manipulate the vertices, edges, and faces of the primitive shapes to create more complicated shapes.
 - We won't be covering this approach today, but that is how you are able to get more detailed models.
 - Some primitives are spheres, squares, cubes, and cones.
 - The following diagram shows some of the primitives you can use.



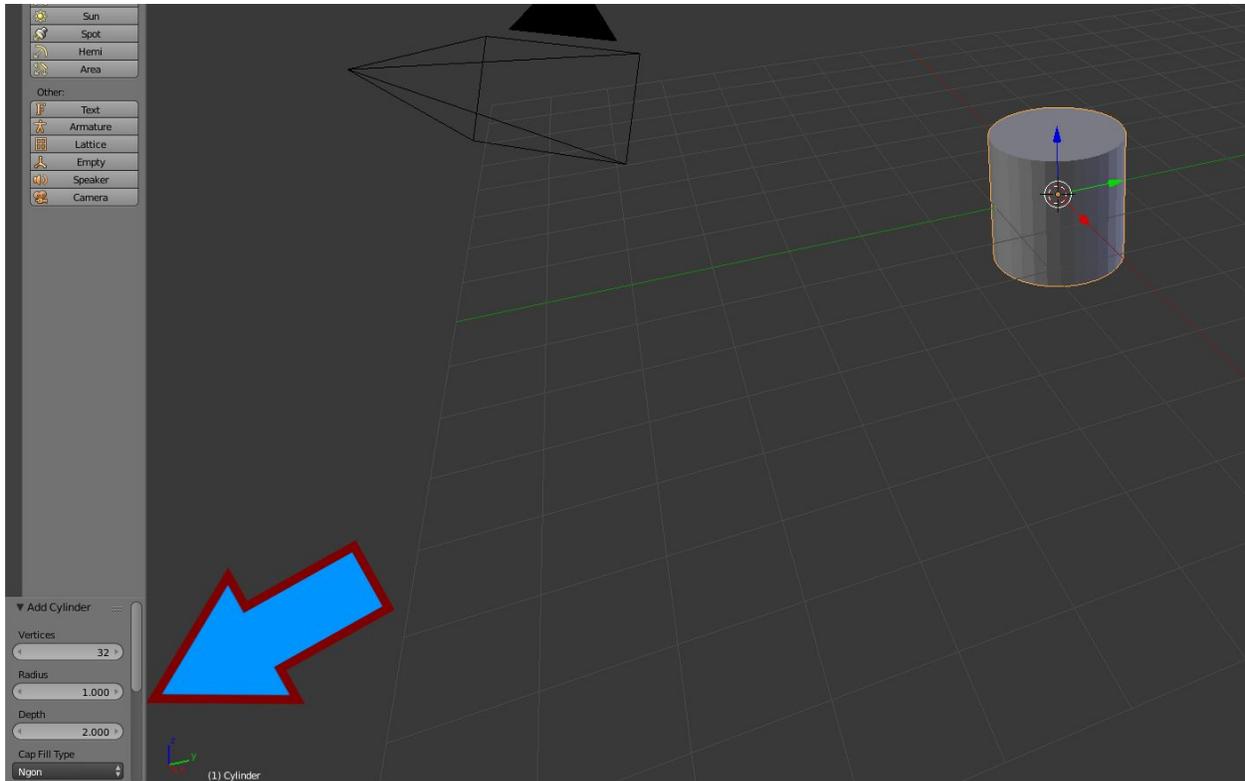
- How do you use a primitive in Blender?
 - In your scene, you can add a shape by doing the following:
 - Select "Create" in the menu on the far left.



- Select the shape you want to add to the scene.

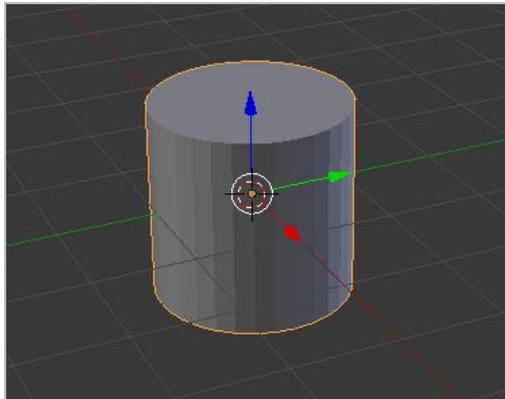


- After adding the shape to the scene, you can adjust its parameters in the lower left corner.



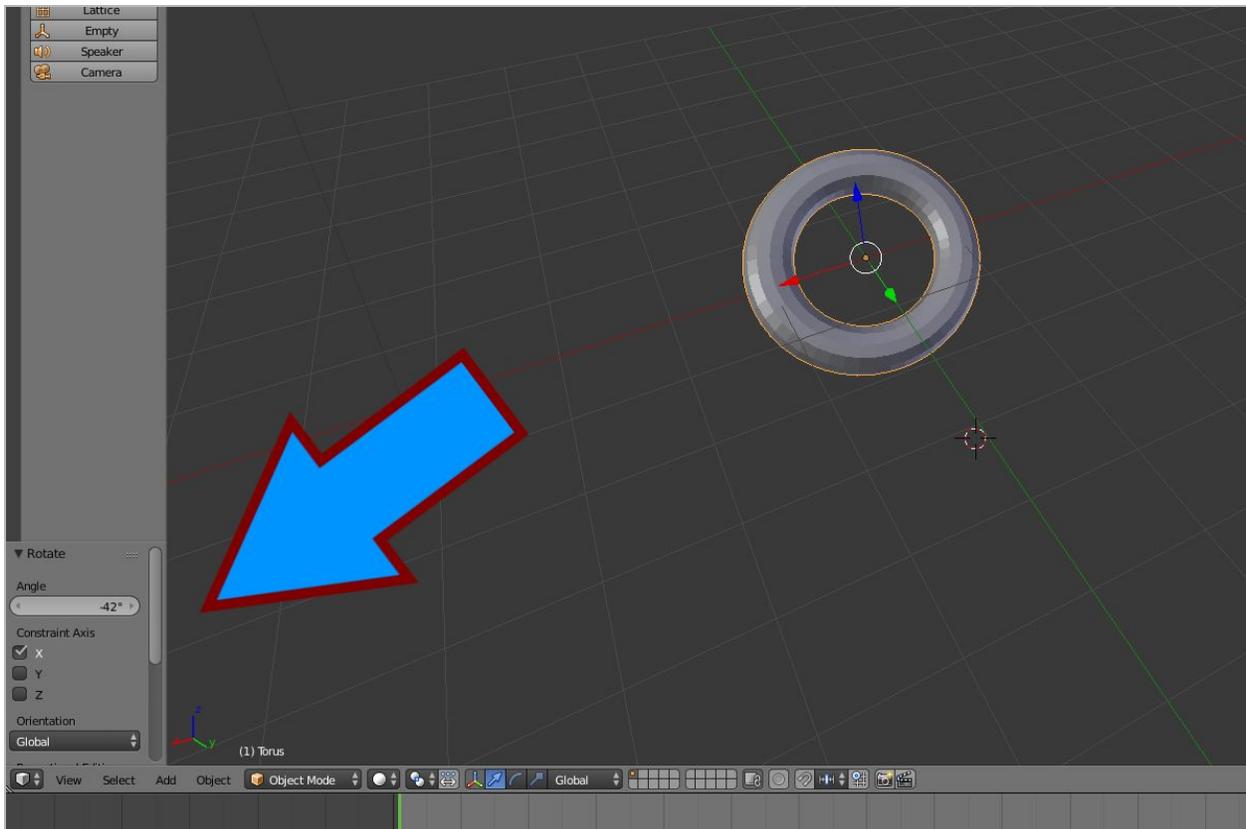
- After you add your shape, you can do different things to it, like rotating, scaling, and translating.
- How to manipulate shapes in Blender?
 - In order to move shapes around in Blender, you will need to be able to move yourself around first.
 - To rotate yourself around in the scene, click in and hold down the mouse wheel button and move your mouse.
 - For moving yourself around, you hold the SHIFT key, click and hold down the mouse wheel button, and move your mouse.
 - For zooming your camera in and out, you scroll with the mouse wheel.
 - You will also need to be able to select a shape if you want to manipulate it.
 - To select a shape, right-click on it with your mouse.

- It should become outlined in orange and have a little XYZ axis pop up over it when you do so.



- Note: left-clicking on the object doesn't select anything. It only moves your cursor in the scene.
 - To select (and deselect) all shapes, press the A key on your keyboard.
 - To focus on the shape you have selected, press the Period key on the number pad of your keyboard.
- For manipulating shapes in Blender, there are 4 things we will go through.
 - Translating (moving around)
 - Select the shape.
 - Left-click, hold, and drag the axis you want to move the object along.
 - Rotating
 - Select the shape.
 - Press the R key on the keyboard.
 - Then press the key of the axis you want to rotate around (either X, Y, or Z).
 - Move your mouse around to rotate the object.
 - Press ENTER when done, or ESC to cancel the rotation.
 - Scaling (making bigger or smaller)

- Select the shape.
 - Press the S key.
 - You can scale along one axis by pressing the X, Y, or Z key after the S key.
 - Move your mouse to adjust the size of the object.
 - Press ENTER when done, or ESC to cancel.
- Deleting
- Select the shape.
 - Press the Delete key on the keyboard.
 - Press the ENTER key on the keyboard.
- When manipulating shapes, you can usually modify the values numerically in the lower-left menu after applying the transformation.



Takeaways

- Blender is a useful tool for creating 3D computer models.
 - Making 3D models is a skill that can be applied to a wide variety of fields, like data visualization, special effects, advertisement, and video games.
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Make Your Own Satellite Model

Instructions

- Create a 3D model of the satellite you chose for the "Make Your Own Web Page" project.
- Create the model in Blender by translating, rotating, and scaling primitive shapes.

Getting Started

- Open Blender and create a new scene.
 - Note : all new scenes start with a cube in the middle. If you want, you can select and delete that cube.
- Add a shape to your scene.
 - I would recommend starting with what would be the "body" of the satellite.
 - It will probably be a cube or cylinder. You may need to rotate and scale the shape, depending on what the satellite looks like.
- Save your project as "satellite.blend" in your satellite_project folder.
 - I recommend that you save early and often.
 - Blender has a lot of keyboard shortcuts and commands.
 - Sometimes you might accidentally hit one that could mess up your project and there might not be a good way to undo it.
 - As a reference, the undo command is CTRL followed by Z on your keyboard.

