



Mars Climate Monitoring Mission

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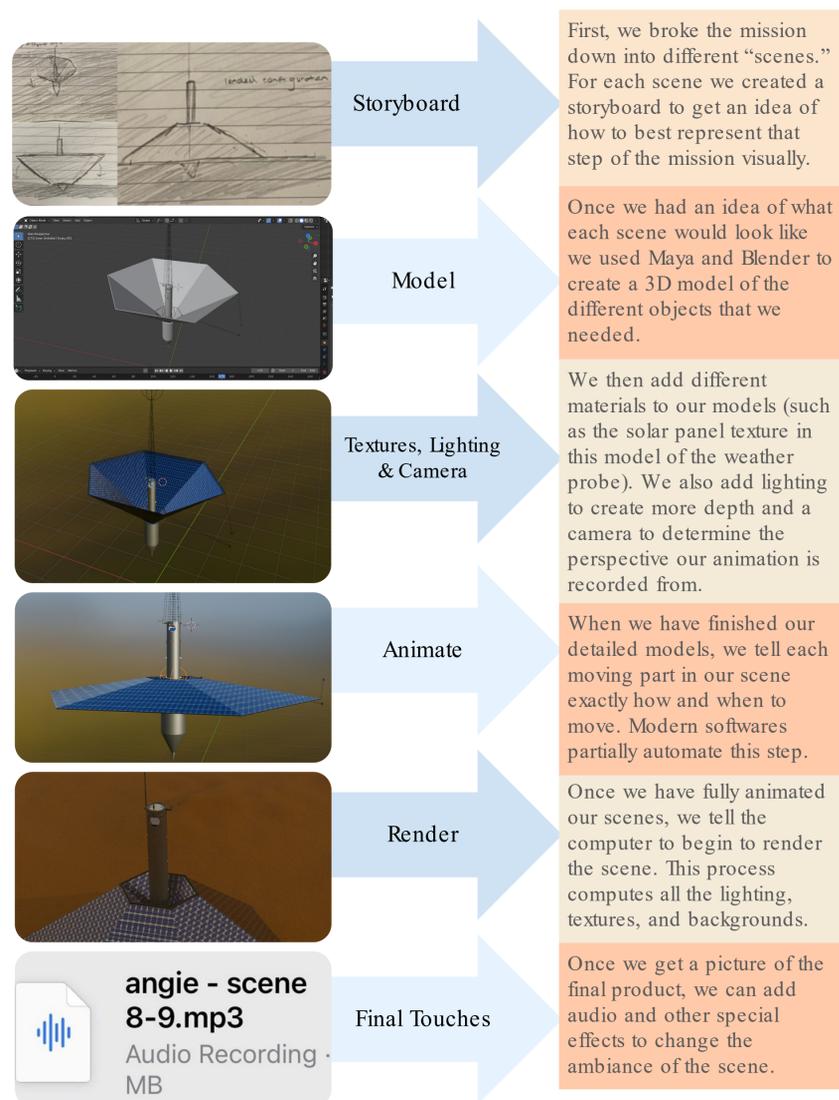
Mars Mission Animation 2024



INTRODUCTION & BACKGROUND

For future missions to Mars, Nasa wants a better understanding of the regular weather patterns on Mars. Current models of martian weather are not up to the task of predicting weather that could impair future martian prospects. To improve our models, we need accurate data, measured directly from orbiters or surface stations, like rovers or probes. One solution is to send a web of permanent surface weather stations to various locations on the surface, in order to get accurate data about large-scale martian weather patterns. Such data could be used to improve our models which could greatly aid in improving the safety of future exploration. Such a mission, though, would have countless moving parts, from launch till landing. We created this short animation to demonstrate how such a mission might be carried out, what it might tell us, and how that information could prove critically useful for future martian exploration, including human missions to the surface.

OUR PROCESS (for 3D animations)



OUR WORK BROKEN DOWN

Annecy Jiang



- Using a procedural Mars model, I enlarged the planet and added the orbiter close to the camera. I then used paths for the stowed configurations to follow to visualize the transit from the orbiter to Mars and the process of fanning out to different locations. This scene is used to show the stowed configurations of the weather station moving all around Mars to collect data in different locations.
- Combining the weather station model made by Ethan with a Mars landscape model made by Aurora, I animated the weather station moving towards the surface and its eventual landing. The scene starts with the weather station moving towards the surface from space, then a view of Mars' landscape is shown. The weather station changes angles as it comes down as a result of (technical name). The scene then shows the weather station landing as sand particles shoot out from the impact. The panels come down and the weather station is fully landed.

Erin Dong



- Dust storms are a major component of the climate on Mars, and I animated how the weather station models and orbiter will attempt to gather data on them. Through multiple rounds of trial and error using various techniques, I was able to find a simplistic and practical method of modeling and animating a dust storm surrounding one of the weather stations using a procedural texture and animated its movement by adjusting the x axis positioning.
- I combined the procedural model of Mars made by Annecy and the Boeing 702 launcher model made by Ethan to generate multiple scenes of the orbiter receiving data around Mars. I made the orbiter revolve around Mars using a path animation, and experimented with lighting options to best display the textures on the orbiter. I also combined these Blender files with 2D animations from Procreate to create the final product.

Aurora Campbell



- I directed the launch scene. This scene was a big group effort with Annecy and Ethan animating the launch vehicle (and Atlas V 400 series) in different stages of the launch sequence. I added in backgrounds to their animations, spliced the videos together, and did some final editing. The animation gives a basic overview of some of the steps involved in launching a spacecraft in this order; the lift-off, SRB jettison, 1st&2nd stage separation, payload fairing jettison, and finally the payload separation.
- I animated data being sent back to Earth. I combined 3D animation (the orbiter, Mars, and Eth), 2D animation (the data symbol animated by Erin), and archival footage (the DSN satellite dish). To send data back to earth the Mars orbiter would transmit data which would be picked up by extremely powerful satellite dishes which are part of NASA's Deep Space Network (or DSN).
- I used 2D animation to display scientists back on earth collecting and analyzing data in order to find patterns in weather on Mars. To visually represent how data from the weather probes could be useful in predicting weather on Mars, we decided to create a newscaster giving the "Today's Forecast on Mars."

Angelina Heller



- I created the introduction. I hoped to create an introduction that was simple, yet encompassing of the project at hand. Having background in the sciences, I took interest in the scientific measurements that the Mars mission utilized. Therefore, I focused on the "why" of the Mars mission, trying to visualize how various gasses make up an atmosphere, and how planets' seasons are mediated by the position of a location in reference to the sun. Since I also am interested in scientific instruments, I included some of the instruments such as the thermometer and the mechanism of spectrometry in the animation.
- I originally created animations using autodesk MAYA software, but I had issues compiling frames in the correct order. Given the time required to invest into rendering and troubleshooting, I decided to use procreate 2D animation to create a simple animation for the introduction.
- I am fortunate to have access to audio recording and editing equipment, so I was able to record the background audio for the video, and also string together the animation scenes on software, and edit them with effects using Microsoft Clipchamp.

Ethan Shankman



- I modeled and animated the probe on the surface, taking measurements. This is everything after touchdown, to the probe sending data back to the orbiter. This scene includes the antenna deploying, the wind sensor spinning up, and all the various sensors taking measurements. Those sensors measure temperature, pressure, wind speed, and sunlight brightness. The probe also measures airborne dust levels, not featured in the animation.
- I modeled and animated the final scene that doubles as credits, and shows how future missions, namely, a crewed mission to Mars, could use this data to their advantage. The scene shows astronauts inside of a martian habitat receiving a martian weather report, that tells them that dusty conditions are expected in the near future. Thanks to data from the weather probe, they know to cover their solar panels to protect them from the approaching dust.

WHAT WE LEARNED

Technical Skills :

To create our animation we used a combination of modeling softwares, mainly Blender and Maya. We first created 3d models of the objects that we wanted to animate (as well as models made by our mentors). The objects we modeled includes the Atlas V-401 launch vehicle, the Boeing 702sp orbiter, the weather station probes, Mars, and Earth. Once we had all of the components we wanted, we used Blender or Maya animation tools on Blender and Maya to create a final rendered animation, or for 2D animations, ProCreate.

Mission Design / Planning

In order to create an accurate depiction of a mission to Mars, we learned the fundamentals of how such a mission would be carried out in the real world. We watched archival footage to get a reference of what our animations should generally look like. We also learned about how interplanetary flights work, such as with Hohmann transfers and other orbital mechanics.

REFERENCES

Tutorials: Ryan King Art
NASA Ames Spaceflight Division Planning Documents