3D Modeling - Written Report

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Scene Statement of Hanley Weng

The scene I have chosen to construct is that of a space craft, the 'Space Shuttle Orbiter' with Earth as its background. In choosing this scene, I did much research into space crafts, with reference to a multitude of photos [1], documentaries [2], documents [3] and diagrams and blueprints [4]. As well as providing graphical references for the model, these sources also provided knowledge on the functions of each part of the craft, aiding in the design of their shapes and materials.

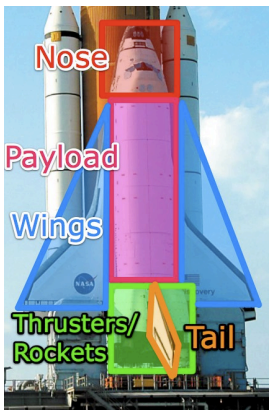
Visually, my proposed scene consists of the space craft overlooking Earth, a combination of the below images:

[Proposed Image [1]] + [Proposed Image [2]] + [Proposed Image [3]]

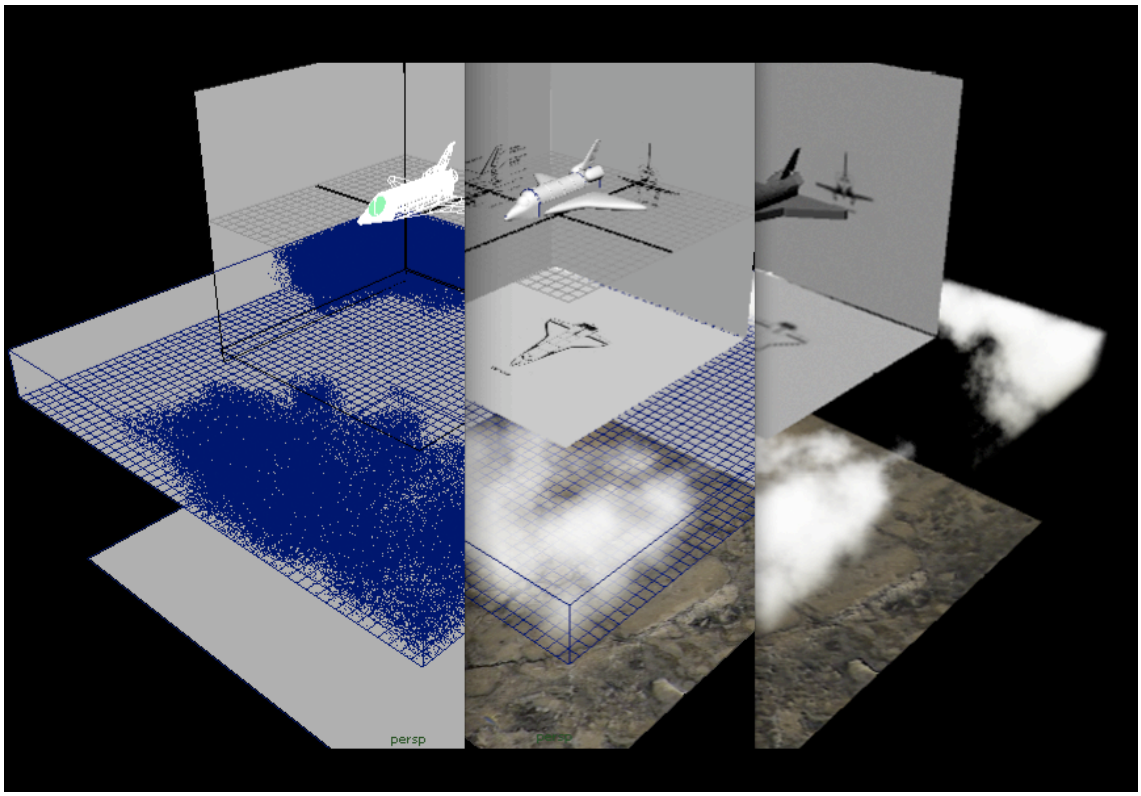
My proposed scene can be divided into the following components (of which I shall refer too throughout my observations and strategies for constructing said scene):

- Earth
  - Terrain
  - Clouds
  - Atmosphere

- Space Craft [Labeled on the right]
  - Nose
  - Payload
  - Thrusters/Rockets
  - Tail
  - Wings



An early draft of some of these components within my scene are depicted below:



Modeling Observation:
The Earth's terrain is bumpy, in patterns defined by mountain ranges, flat planes, canyons, rivers, oceans, water beds etc. Clouds, as viewed from above Earth, consist of small defined translucent clumps of white smog that can sometimes congregate together to form large soft masses. The Earth's shape, and hence it's atmosphere, appears spherical in nature when viewed from a great distance.

The space craft is symmetrical in shape. Its nose has three embossed windows on each side, with a few holes in the lower deck. The crafts' payload has a semi-circle top and a rectangular bottom, there are slight dividing extrusions between the 8 Bay Doors, with one dividing extrusion along the pay load's axis of symmetry. Thrusters (propellant tanks) appear to be smooth extruded trapeziums with sharper edges towards the rockets and its bottom consists of an extruded protective edge. Two rockets are attached to these tanks, three larger rockets are attached to the end of the shuttle and they are cone-like in shape with rings around them. The tail appears as a stretched out rhombus, consisting of two flaps which act as the rudder. The wing looks like a triangle pitched inwards at the middle, consisting of two body flaps per side.

Modeling Strategy:
The varying height of Earth's terrain shall be simulated via bump maps, while clouds will be constructed with a 3D container of mass size and resolution, they will be varied such that they exist mainly as small defined clumps and soft massive waves. The atmosphere will be based constructed from a nurbs torus with inner radius roughly equal to its simulated height above Earth.

The ‘Space Shuttle Orbiter’ will be modeled based off an image [5] from it’s Nasa website. Its nose will be created out of a smoothed out polygon, with windows and holes created by its Union, Intersection and Difference to smoothed prisms and cylinders. The payload is constructed via a nurbs loft between a semi-circle and rectangular curves, 5 equidistant hull sections and a central hull along its length are selected to be extruded outwards. Thrusters are generated from a smoothed polygon cube with extra divisions enforcing its sharper edges, a bottom face that is extruded inwards, and a scaled down top. Rockets are cones with close equidistant sides extruded outwards. The tail is created via a polygon cube with relevant extrusions for flaps and an applied lattice deformer as a slant. Wings are created by modeling one via a smooth extruded rectangle and mirroring it.

Lighting Observation:
The main source of light is the sun, which are reflected by the Earth. The sun produces shadows in both terrain and cloud. It is also slightly reflected in the atmosphere, which diffuses most of it in a blueish glow. Reflected light from the Earth's surface also becomes evident in the base of the clouds, which are a darker color than their tops.

The space craft is composed of aerothermal material which protects areas which encounter the greatest atmospheric strain. It covers the bottom the craft, the sides of its wings, the tip of its node, front of its tail and its rockets. It is represented by the black portions of the diagram [5]. This substance appears similar to a dark grey form of hard rubber. The rest of the ship is metallic in nature and white in color.

Lighting Strategy:
The shadows cast by the sun on the Terrain shall be simulated via bump mapping. Shadows cast by clouds and their varying opacities will be generated via Maya's fluid dynamics in the clouds characteristics. Clouds will also have a white to brown shaded color along their y-axis to simulate the reflected light from Earth's terrain. The atmosphere will be constructed via a translucent, blue, material, with slight reflectivity of direct sunlight.

The materials of the space craft will be based off of dark grey lamber for aerothermal material and a soft metallic, white blinn material for metal surfaces.

Texturing Observation:
The texture of the Earth's terrain and clouds have been covered by bump maps and fluid dynamics respectively. The atmosphere has an airey, noise-like texture to it, but this is nullified with its distance from the camera.

The aerothermal surfaces on the spacecraft are very smooth. The wings and tail have the same metal-plated texture, quite smoothed out, uniform, metal white plates. The propellant tanks, payload and the top of the nose, on the other hand, are covered by tiled metal plates, drilled together, visually consisting of a more distinctive edge.

Texturing Strategy:
The texture of the Earth has already been handled in above categories whilst defining their shape and lighting. The spacecraft's wings and tail will be constructed from a soft grayed grid texture applied to its material. Similarly, the other metallic portions of the craft will have a grid-like, more distinctive texture with small holes, applied to their materia.

Camera Observation:
A large portion of the space craft, the foreground, will be overlooking a segment of Earth. Earth will be framed much like Proposed Image [2] and [3]. The spacecraft will be positioned tangential to Earth which occupies the background.

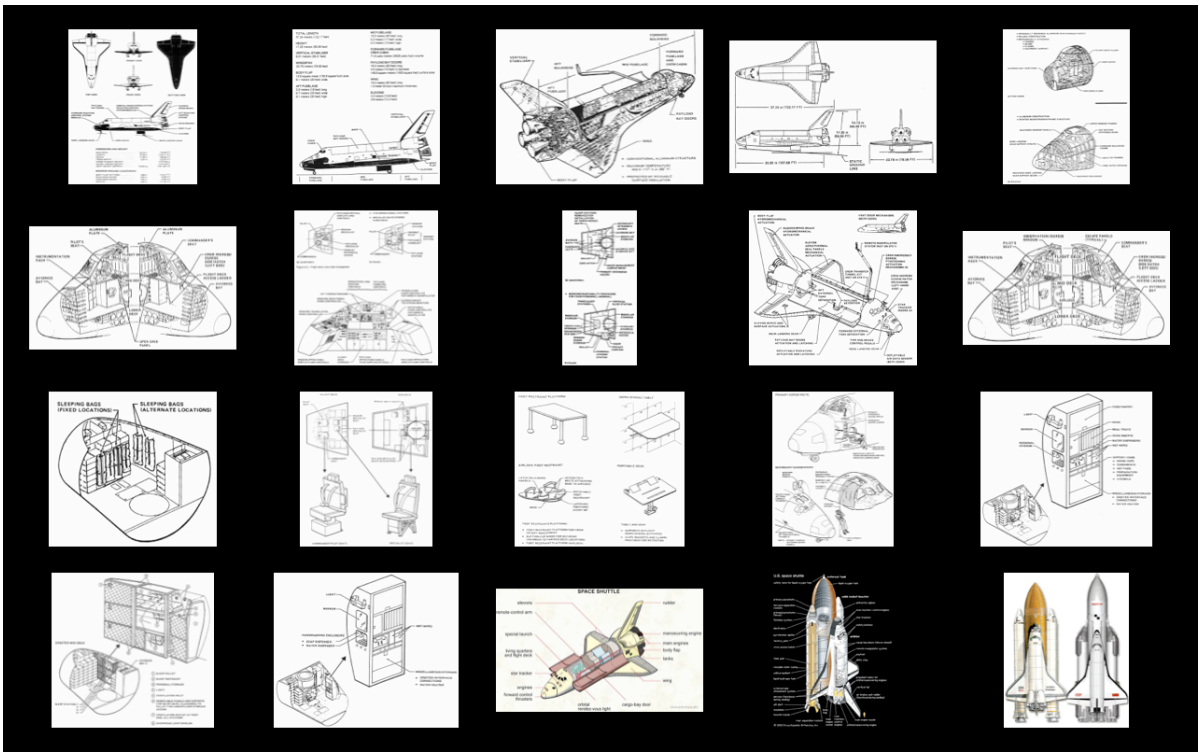
Camera Strategy:
In order to frame the above scenario, the camera will target a point a kilometer (in real-world measurements) in front of the space craft's nose. The camera's position will also be situated a hundred or so kilometers above the spacecraft, forty-five degrees above its tangent.

References:
[+] acknowledges a specific source that contributed a large amount of information.

[1] A collection of photos used as reference materia from:
- spaceflight.nasa.gov
- topnews.us
- allKennedySpaceTours.com
- chamorrobible.org
- nasaImages.org
- worldpress.com
- archives.gov
- violet.vn
- scrapetv.com

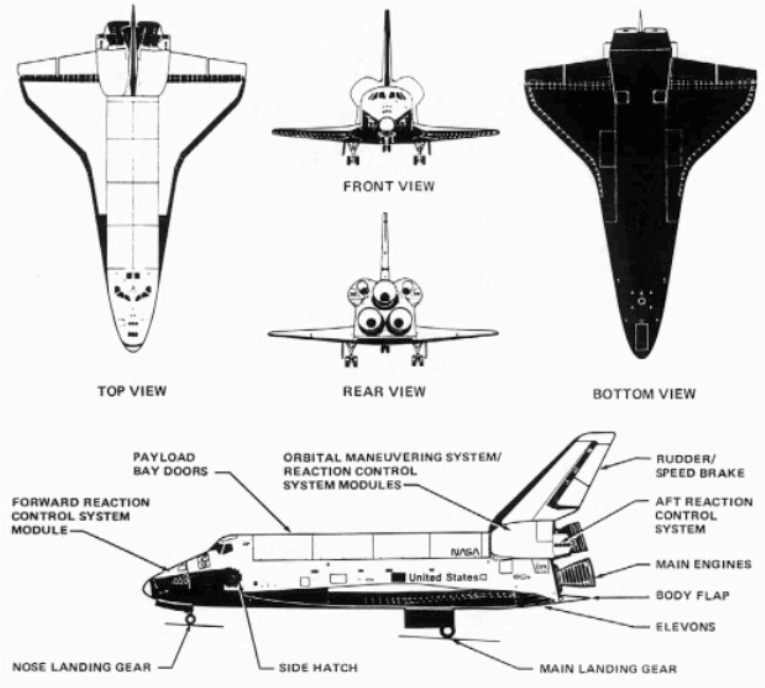
[2] Documentaries:
- Apollo 11 - First Steps On The Moon
- Apollo 17 Final Footprints on the Moon
- Apollo 8 Christmas At The Moon
- BBC: Man on the Moon
- NASA: 50 Years of Space Exploration - Volumes 1-5
- The History Channel - Live from ’69: Moon Landing
- CNN Space Shuttle Discovery

[3] Informational Text Documents:
- **+** science.ksc.nasa.gov/shuttle/technology/sts-newsref/stsref-toc.html
- **+** ocw.mit.edu/OcwWeb/Aeronautics-and-Astronautics/16-885JFall-2005/LectureNotes/index.htm
- nasa.gov/mission_pages/shuttle/vehicle/index.html
- science.howstuffworks.com/space-shuttle.htm
- science.ksc.nasa.gov/shuttle/resources/orbiters/orbiters.html



[4] A collection diagrams used throughout the assignment, from:

- + spaceflight.nasa.gov/history/shuttle-mir/multimedia/diagrams/shuttle/diagram-shuttle.htm
- infovisual.info - The Visual Dictionary ©2005-2009
- Encyclopedia Britanica ©2002
- highTechScience.org



[5] The main image upon which the space craft model is based, from:

- + spaceflight.nasa.gov/history/shuttle-mir/multimedia/diagrams/shuttle/diagram-shuttle.html