Rhodes University

Department of Computer Science

Graphics 2007 Honours Project

Project Title:

A Trip through our Solar System

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By:

Richard Awusi

Table of Contents

Introduction

My project takes us on a trip through our very own solar system. I've always wanted to create an animation of this sort, and I saw this as an opportunity to do so. The aim of the project was to re-produce our solar system, not in its entirety, but to show the major aspects, namely the planets. The video does not show the solar system in any scale, but just a random way in which the planets have been placed in order to achieve the animation in the amount of time given.

Technical Details

The project animation was done using Blender version 2.41, a free 3D modeling software. Blender allows for the creation of numerous meshes, which can be used to attain different kinds of environments. My project involved modeling our solar system, which required the use of meshes such as spheres, lights, particles and cubes.

The Planets

Each planet was created from a UVsphere which is one of the sphere meshes present in the Blender modeler. Each UVsphere is made up of 32 segments and 32 rings.

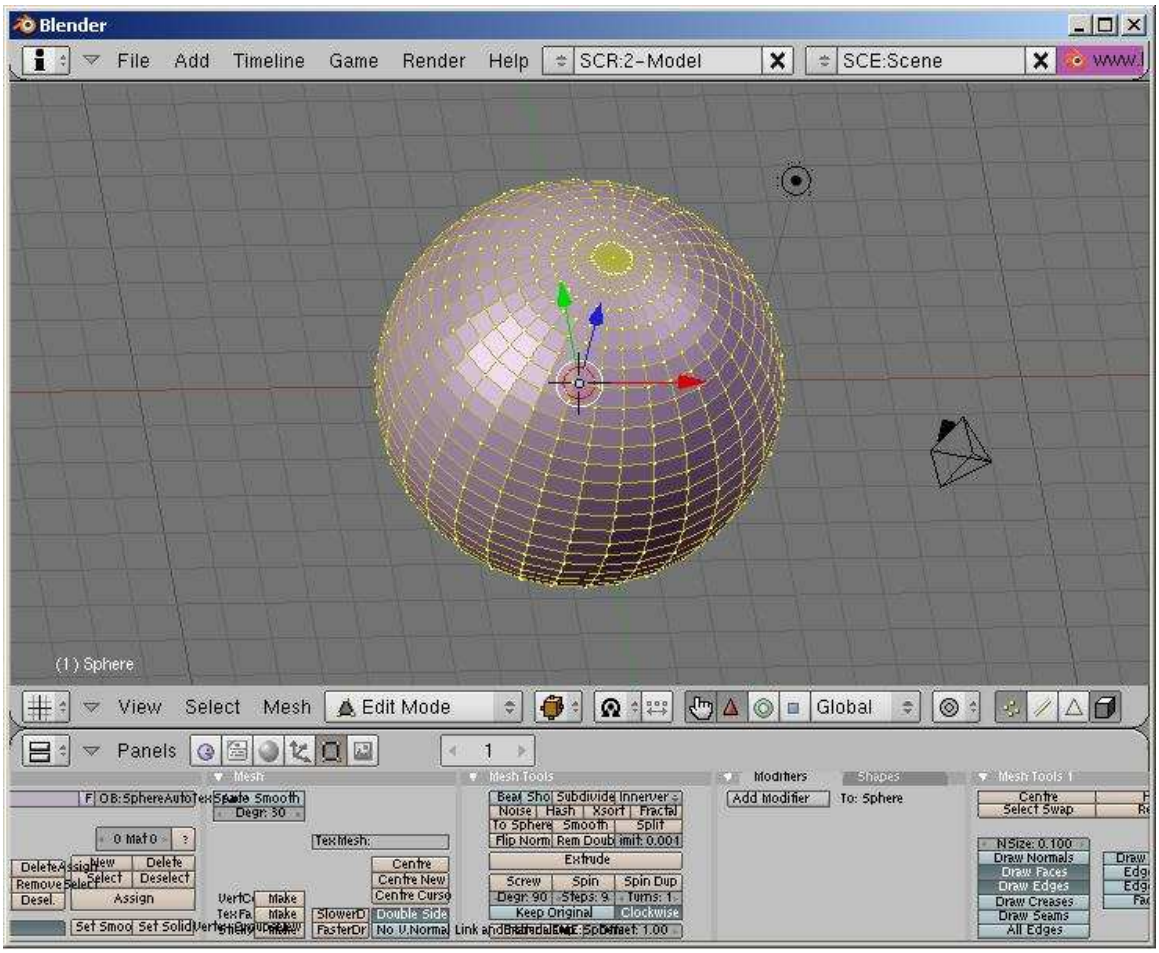

Figure 1: Creating the planets

The spheres were scaled to their appropriate sizes to represent the different planets. Textures representing the different planets of the solar system were then obtained (http://planetpixelemporium.com/planets.html), and mapped onto the different spheres. The same was done for the sun and the moon around the earth. Some planets, such as Earth or Pluto, have a lot of water or ice on their surface. This means there will be a lot of reflection from such surfaces. The reflections from each of the planets that do exhibit this characteristic, was achieved by increasing the specular highlights of each sphere. Those planets that do not have any reflections, such as Mars, had their specular highlights turned down to zero.

Texture Mapping

Textures used in the production were all mapped onto spherical objects. These mappings were done by loading each texture and generating a spherical mapping around the different spheres. Each texture is mapped on as a smooth texture, with no bump mapping. To make the planets look slightly bumpy, I added a bit of randomness to the normal calculations of the vertices of the spheres, which affects the lighting calculations and thus achieving bump mapping.

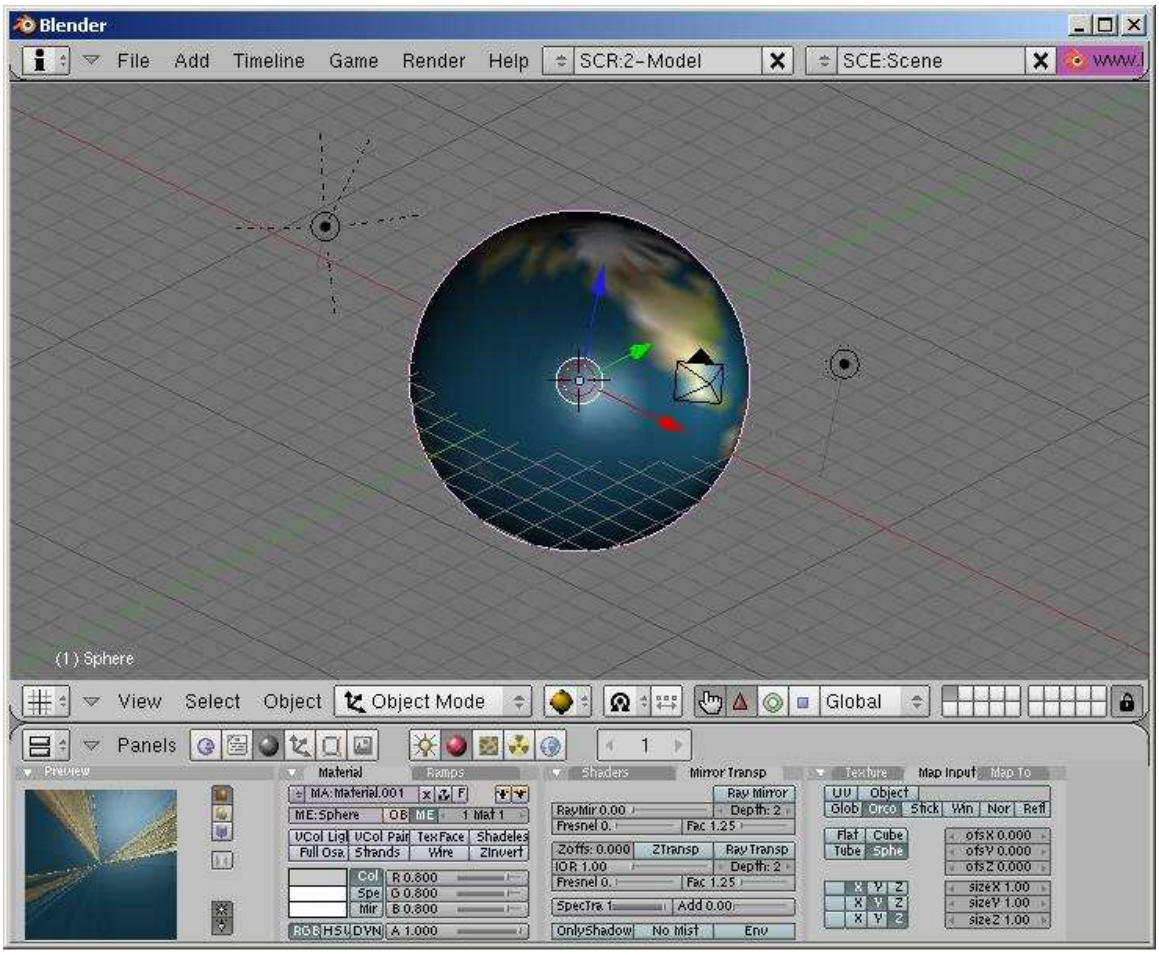

Figure 2: Texture mapping spheres for realistic planet appearance

The Comet

The comet in the animation was done by the use of a particle system that can be generated within the Blender environment. The comet was done by creating a cube and

having that cube emit thousands of particles for a certain amount of time. Blender comes with a built in particle system generator, which formed the basis of my comet creation. The comet emits approximately 69601 particles in about 30 seconds. Each of these particles is affected by gravity in the negative x-axis direction to give the long tail appearance of the comet. These particles were then given a random amount of time to live, and a slight randomness to their starting direction so that they don't all just follow a straight line. Each particle is rendered as a halo material with ring and star-like rendering added to them. This gives the particles a slight glowing colour and a smoky appearance. The comet is active for approximately 600 frames of the animation because it is not visible in all the other frames.

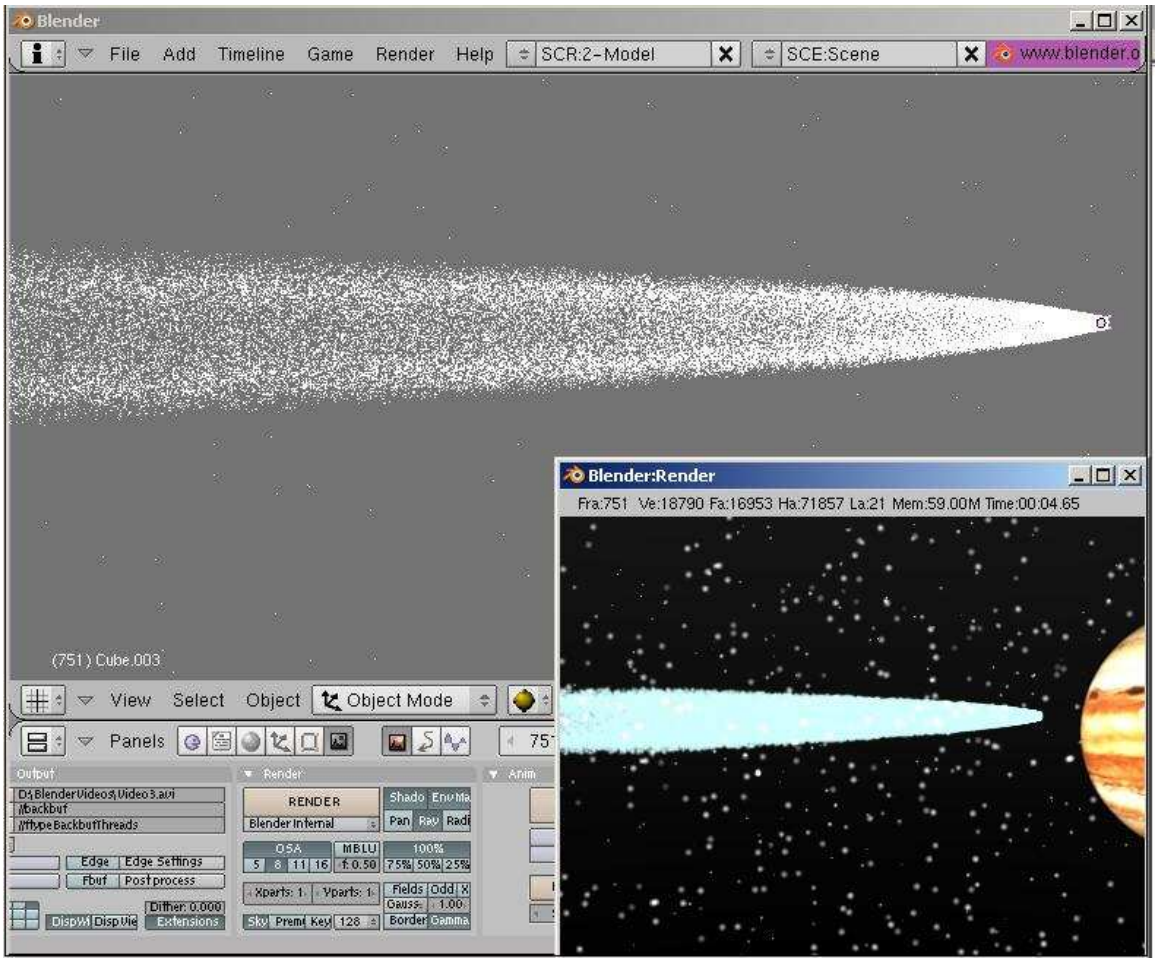

Figure 3: Particle system used for the comet

Lighting

The lighting was done in a way that would approximate that of the sun. Eighteen lambs were placed around the sun mesh, with each lamb having a light intensity of about one out of ten. I chose to use lots of lambs as opposed to Hemi lights because hemi lights brighten up the entire scene, taking away the realism. The lambs created a nice bright area around the sun; it lit up the area of the planets facing the sun, making areas away from the sun dark, and made planets far from the sun less bright.

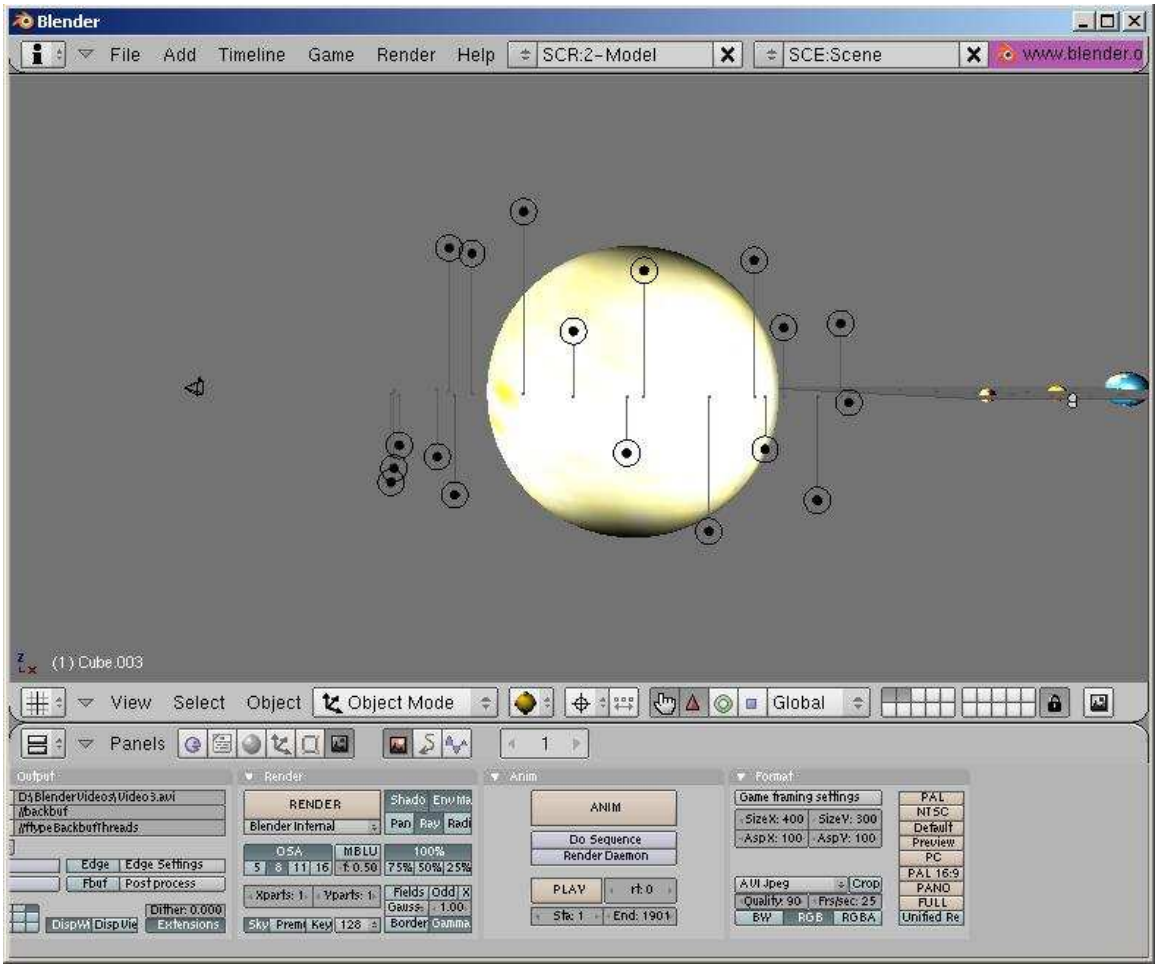

Figure 4: Lamps around the sun representing lighting technique

The Space Environment

The background of the animation was generated by using a built in feature in Blender. When an image is rendered in Blender, the user can choose a background for the application. I elected to use a space background.

The Animation

The moon follows a circular path around Earth, a path that is completed every 150 frames. This motion was then extrapolated for the rest of the animation. The camera however has approximately 30 key frames that were defined by me. On average, the frames defined by me were done at 100 frame intervals. However, certain motions were to complex to be left to Blender to auto-generate, such as a rotation around a planet. For example, the rotation around Earth had me defining four key frames, whereas I only had to define one key frame for Venus. By defining key frames, Blender generated all other frames in between. The animation runs over a total of 1901 frames.

Text

The text was added using Microsoft Movie Maker. The product allows one to import videos (my animation from Blender), and manipulate with the videos as they see fit. I added the introduction title, planet names and the credits at the end to the animation.

Audio

The audio played during the animation is a song taken from the album Timeless 3 by Gregorian: Masters of Chant. Like the video, the audio was imported into movie maker and was overlay with the animation video.

Conclusion

The overall project produced an animation that is approximately 1min 26sec long. Blender allowed me to model the various objects of my animation, although some took a while getting used to.

References

James Hasting, 2007. ***planet texture maps.*** Available:

http://planetpixelemporium.com/planets.html

Wikipedia, 2007. ***Blender 3D: Noob to Pro/Making Fire.*** Available:

http://en.wikibooks.org/wiki/Blender_3D:_Noob_to_Pro/Making_Fire