COSC363: Computer Graphics
Assignment 1

Alien Invasion!

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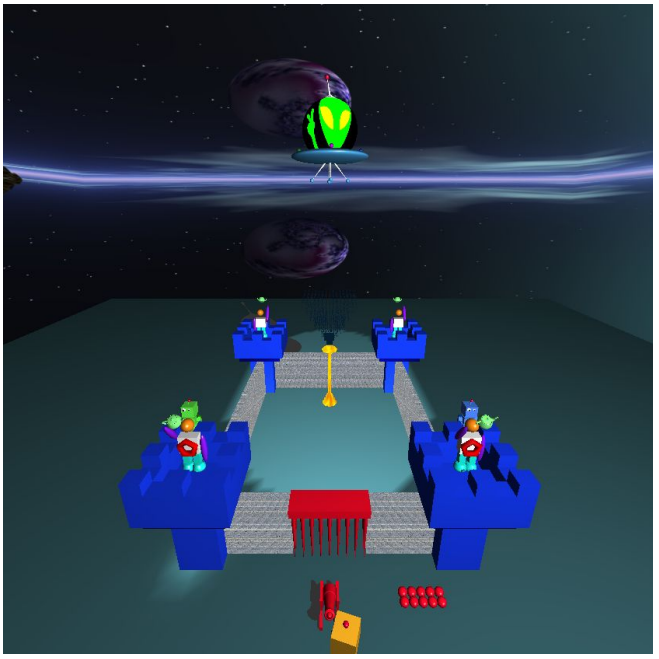
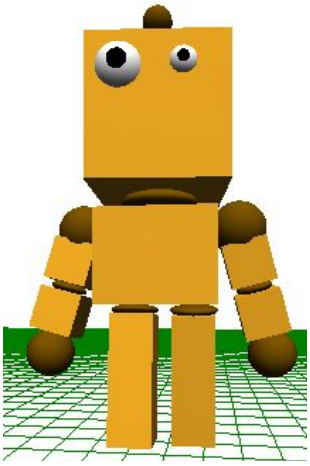
I/ Description

The aliens have invaded our planet and stealing our water. They use water tower to transfer water from our ocean to the space. Then they made a fortress to defence themself from human in space. Four robot stay on the fortress to identify where the spaceship should land. One yellow robot is looking around the fortress to prevent sudden attack from human and two side robots are preparing two new Cannons. The Spaceship from aliens is taking off. The Cannons can be fire at anytime. When yellow robot finds any unordinary event from human.



II/ Complex Features

Robot, Spaceship:



III/ Control Functions

Up Arrow:	Move camera forward in the current direction
Down Arrow:	Move camera backward in the current direction
Left Arrow:	Rotate camera left
Right Arrow:	Rotate camera right
'q':	Rotate camera up
'w':	Rotate camera down
'c':	Fire the Cannon
's':	Lift-off the spaceship
Home key:	Toggle between two camera modes

IV/ Extra Features

1. Planar shadows:

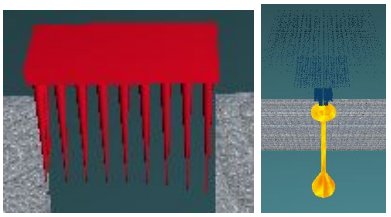
   There are two shadows implemented in the assignment, which are shadows of Cannon and Spaceship. The Shadows reflect the movement of the Cannon (when it fires) and the Spaceship (when it lifts off).

2. Spot Light:

   When the yellow robot moves around the fortress, it casts a spotlight. The spotlight moves around with the robot and rotates with the rotation of the robot's head.
   When the spaceship takes off, a spot light spreads out on the floor until the spaceship disappears in the sky.

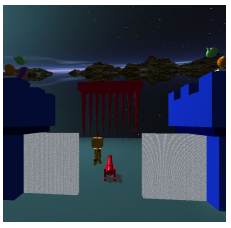
3. Animated system inside the fortress:

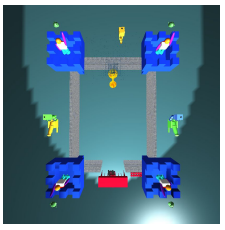
The gate automatically moves up and down in front of the fortress.
Inside the fortress, there is a water tower.



4. Camera modes:

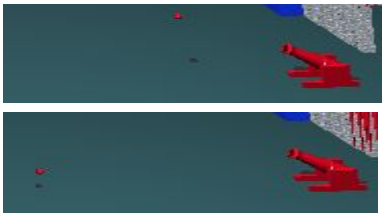
The first camera mode defaults outside the fortress. It gives an overall scene. Press HOME to toggle to the second camera. It shows the view from the point of the spaceship. The second camera also rotates because it follows the animated spaceship. When the spaceship lifts off, the second camera changes the viewpoint to the bottom of the ship.



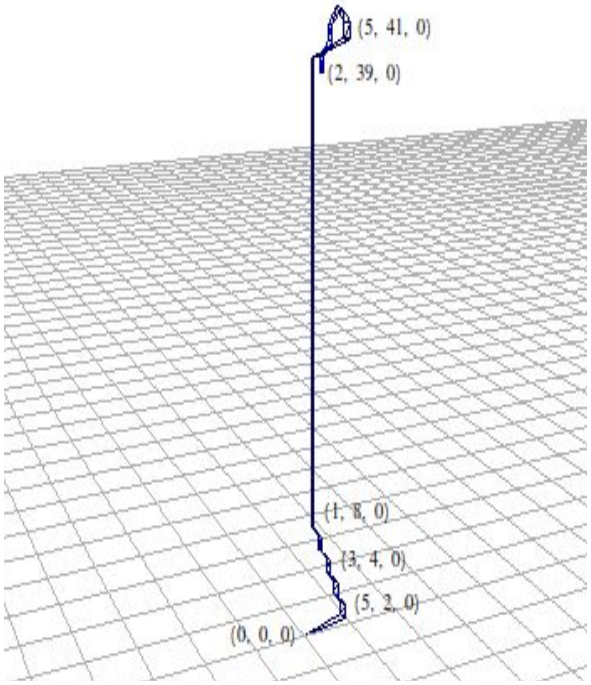


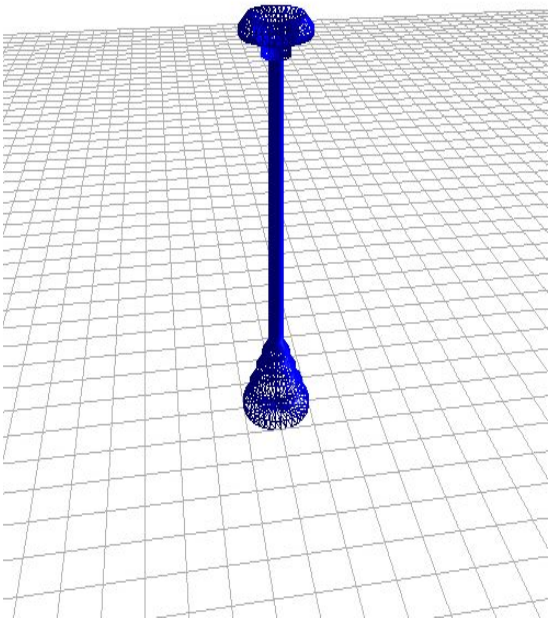
5. Physics models:

The orbit of projectile is a curve. It was generated by a equation: Y = 0.01 * X^2 + 2 * X. The program detects collision between the projectile and the floor then reduces the equation by half. It makes the projectile bouncing in the floor.



6. Sweep surface:





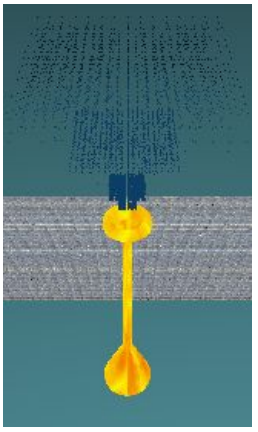
The Vast tower was constructed by sweep surface from design above.

7. Collision detection:
   The first camera can not get out of the skybox.
   The program detects collision when the projectile hits the floor.

8. Skybox:
   Space skybox used.

9. Particle system:

   10000 small particles make up a particle system on the top of the vast. It makes a water effect such as the water comes out from inside the vast.



V/ Challenges

1. Spot light for the robot is quite challenging. The spot light needs to rotate with the movement of the robot and the rotation of the head.
2. Texture the Solid Cube - the programme solid Cube is really big compared with the texture and the texture images have to be less than 10MB. So the programme fortress's wall is quite blur.

VI/ References

Lab1, lab2, lab3, lab4, lab5

http://www.custommapmakers.org/skyboxes.php

http://www.opengl-tutorial.org/intermediate-tutorials/billboards-particles/particles-instancing/

https://www.textures.com/