

## Faversham Express

### Brief description of the scene:

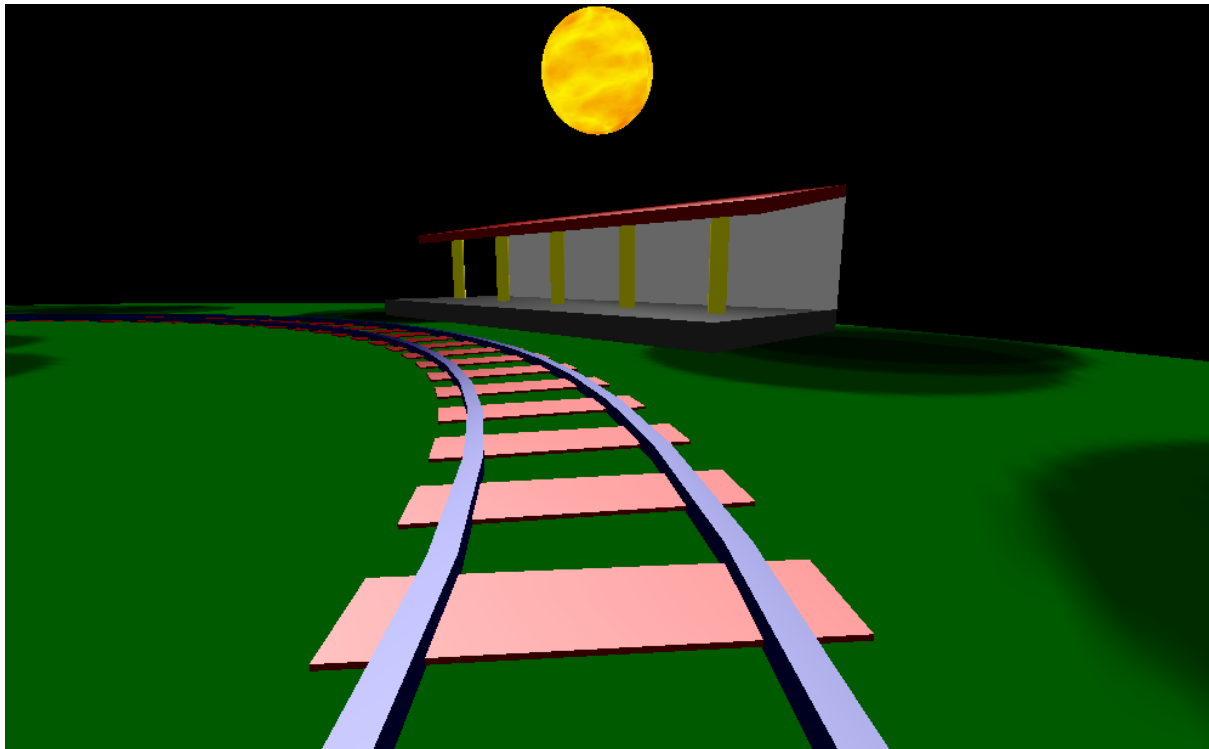
The scene is a park-themed spatial station. It consists of a circular piece of land floating in the middle of outer space with a star such as the Sun orbiting around it. There is also a circular train track close to the edge of the terrain that is going to be used by a toy train. Some other elements of the scene are a train station, a candy bar tunnel, and a control tower that will provide not only light during night to the scene, but also a camera that will be always capturing the train.



*Screenshot of the sunset (a few seconds after the animation starts).*

Extra features implemented:

1 - Track enhancements: Not implemented. Some track enhancements have been implemented such as tiles, but it is still a circular track as per used in Lab-2.



*Track during the sunset. Train arriving to the station.*

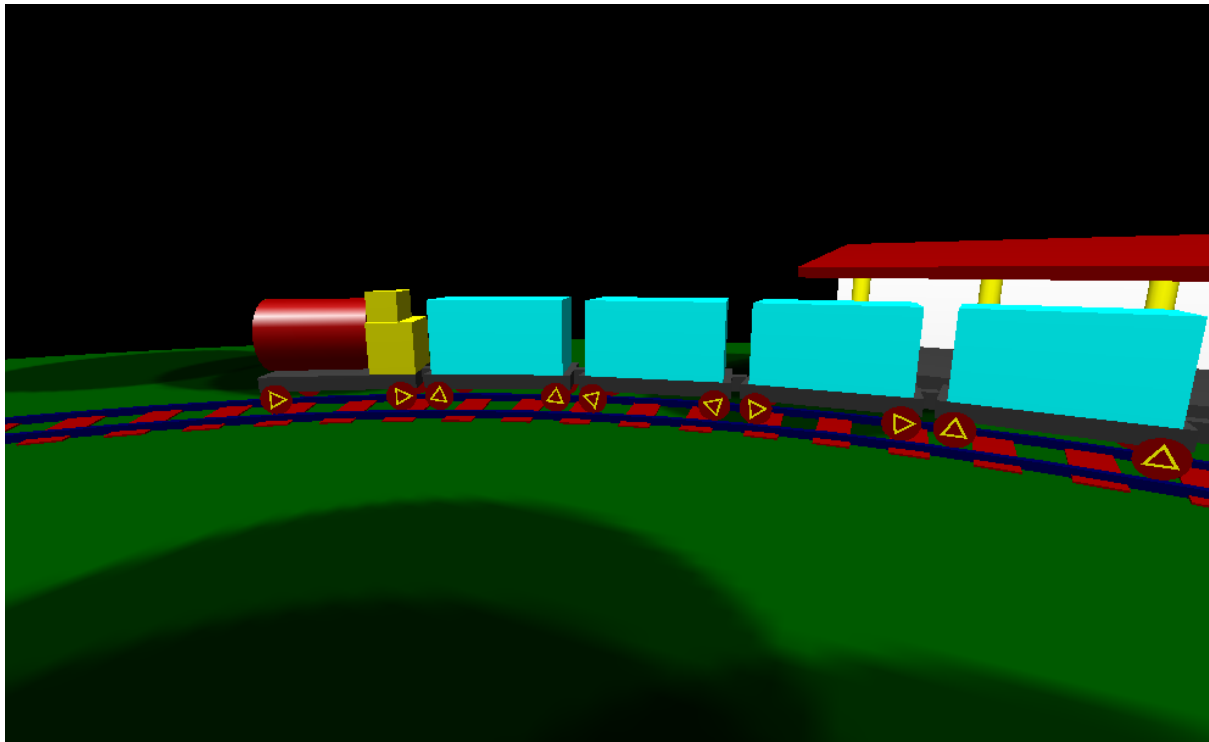
2 - Model enhancements:

- Track misalignment corrections. The solution was implemented by considering each wagon as an independent unit with a small offset of -10.5 degrees between each unit of these units, and multiplying its position by this offset. See function calls below:

```
engine(0, 1, -120, 0 * alpha + theta);  
wagon(0, 1, -120, 1 * alpha + theta);  
wagon(0, 1, -120, 2 * alpha + theta);  
wagon(0, 1, -120, 3 * alpha + theta);  
wagon(0, 1, -120, 4 * alpha + theta);
```

Where *alpha* is the offset, *theta* is the position of the train (in function of the timer) and every unit is translated by 120 units along the z axis.

- Rotating wheels, (see photo below)



*Rotating wheels of the train as it leaves the station.*

- Spot light (switches on during night and off during day).

### 3 - Scene enhancements:

- A texture-mapped sun was added to the scene (see previous photos). It orbits around the platform and provides white Sun light during the day. It moves slower than the train, but not so slow that it will look static. Its light turns off during night to avoid unwanted light in the scene.

- A control tower, located at the center of the map (origin). Its function is to provide a spot camera, and a warm light that turns on during night to illuminate the scene.
- Floor has been changed to Disk (GLU) and texture-mapped. A well-balanced number of slices and loops was chosen to decrease the number of calculations but also to still show the spotlight used by the train and to improve the number of calculations.

### 4 - View mode enhancements:

In addition to the camera view mode specified in Section 3, two other cameras have been added. A driver's view and a control tower's view. Both move along with the train, providing different perspectives of the scene. To toggle between cameras, press the "c" or "C" key during the animation.

### Full list of control functions:

All the control functions are implemented as specified in the scope.

#### Keyboard:

- Up arrow: Move camera forward in the current direction;
- Down arrow: Move camera backward in the current direction;
- Left arrow: Change the current camera direction towards left;
- Right arrow: Change the current camera direction towards right;
- Page Up: Increase camera height;
- Page Down: Decrease camera height;
- C or c: Toggle between cameras.

#### Mouse:

No mouse implementations have been added however it can be used to resize the window. The camera's aspect ratio will be maintained.

### Build commands and instructions for compiling the program:

In terminal, inside the 'Project' folder, use the following commands

To build:

```
g++ -Wall RailwayWorld.cpp RailModels.cpp -IGL -IGLU -lglut
```

To execute:

```
./a.out
```

### References to sources:

No external sources have been used for this assignment, only material provided in this course.

Note: The file "grass.bmp" used for texture mapping the ground of the scene was created by me, originally to be used as tiles but chosen to be used as a single sampling for aesthetic reasons.