CPT205-Computer Graphics

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Information and Computing Science

1. Introduction

The 3-dimensional scene I design is about the Spring Festival in China. Multiple graphics techniques in OpenGL are utilised, for example, hierarchical modelling for the indoor scenario, viewing and projection for daily objects, lighting and material for the outside environment and texture mapping for wall decoration and floor. This report will show the design idea of the 3D modelling, features of each main object with corresponding photos and list the interaction instruction.

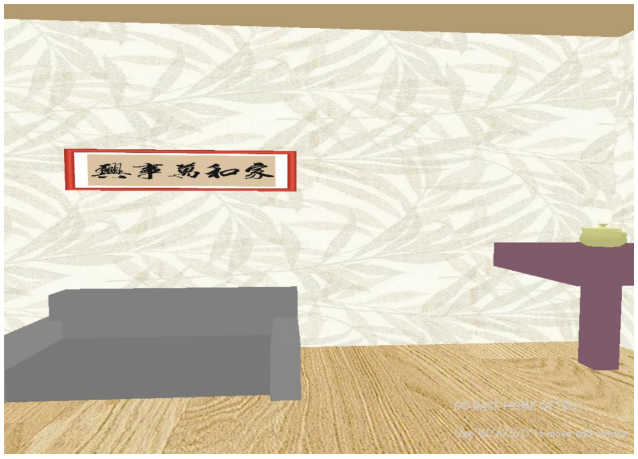
2. Design idea

This 3D scene consists of three parts, a simulation of a dynamic view on the bus, an outdoor street scene and an indoor scene connected by keyboard and mouse interactions.

The design theme is the Spring Festival, the most important traditional festival in China to celebrate the coming new year in the lunar calendar and pray for happiness and fortune. It is always at the end of January or early February. In this period, no matter how far people live or work, they will go back home to accompany with their parents and visit relatives. Therefore, in the first scene, it is a view simulating people on the way home by bus and watching outside.

In the spring festival, hanging spring couplets outside the home and letting off fireworks are other popular customs of blessing. Hence, they are drawn as symbolized elements in the street scene after getting off the bus.

The house is on the opposite side of the street with a sofa, dining table, scrolls, TV and a human. That person in red represents a relative waiting for having dinner with you together. Also, the scrolls above the sofa with five characters written by writing brush mean peace and warmth. Moreover, people will watch the Chinese New Year Gala after dinner on New Year eve. Hence, the TV implemented by texture mapping hangs opposite the sofa to show real daily life.



3. Features

3.1 Outdoor objects

3.1.1 Bus window

The projection mode is set to Ortho projection to draw four 2-dimensional rectangles surrounding the display window to simulate the bus view.

3.1.2 Trees, lamps and two buildings

The moving trees, lamps and buildings are all implemented using geometry creation, hierarchical modelling and transformations. They can move forward by setting global

variables and constantly changing the value by timer functions. Furthermore, the building in grey uses texture mapping with a brick image and advertisements images as decoration.

3.1.3 Firework in the distance

It achieves by setting global variables and time callback function to control each line in each direction moving simultaneously.

3.1.4 Lighting and material model

Relevant lighting and material parameters should be set first and apply them to the scene in need. For the lighting model, two lights are changed corresponding to different sub-scenes and mouse control. Following are two outdoor scene screenshots with different lightings.

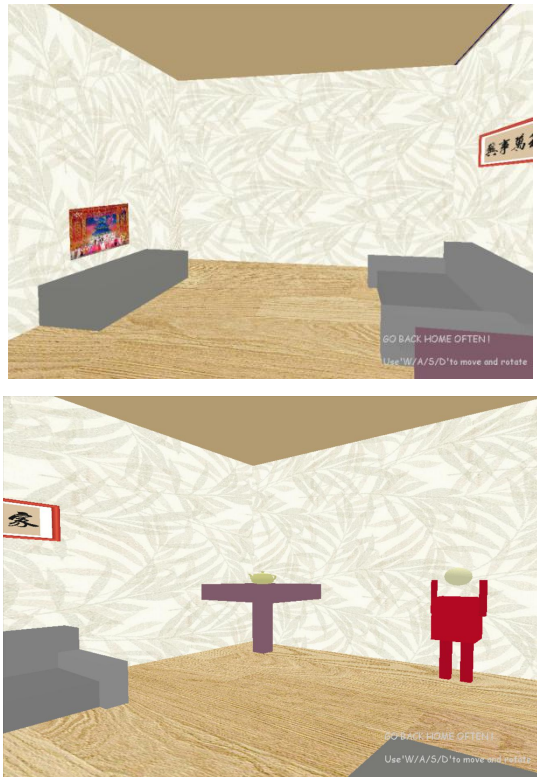
3.2 Indoor objects

3.2.1 TV, wallpaper and floor

They are all achieved by texture mapping. For the TV effect, two images for texture mapping are displayed alternatively by the setting timer functions, which is similar to the implementation of the advertisement effect.

3.2.2 furnitures and human

Indoor furniture, for example, the sofa, dining table, TV cabinet. They use geometry creation to form basic structure, use hierarchical modelling and transformation to set an exact position of each part.



4. Interaction

4.1 Interaction implementation

The moving and rotating functions achieve walking around freely by changing the position of the eyes and the look-up point. Furthermore, Using the polar coordinate to calculate how much a position coordinate should be changed when rotating one degree can help implement a rotating scene with the eye position as the centre. It can provide a better operation experience than rotating the whole ground or rotating with the coordinate origin.

After getting off the bus and entering the static scene, keyboard interaction can control freely on the map. However, it is not recommended to keep going to the border of the ground because the ground size is too large, no hidden objects are drawing that far. Besides, because the house is at the east south of the original viewpoint, one suggestion routine is pressing a/A continuously until you face the firework. Then, press w/W to move forward until the green footpath. Finally, turn left and move forward to enter the home directly.

4.2 Interaction instruction

All keyboard and mouse interaction with their corresponding functions are filled in the following tables:

Keyboard button	**function**
W / w	Move forward
S / s	Move backward
A / a	Turn left
D / d	Turn right
U / u	Move up
J / j	Move down

Mouse operation	**function**
Press left button on the text “Click here to get off the bus”	Stop animated scene and permit keyboard interacion
Press right button	Change lighting effect
Press left button on the text ”go back home soon”	Restore lighting effect