

Xi'an JIAOTONG-LIVERPOOL UNIVERSITY

# 西 交 利 物 浦 大 学

## Course Work Submission

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Programme	Information and Computing Science
Module Title	Computer Graphics
Module Code	CPT205
Assignment Title	2D Modelling Project
Submission Deadline	2021.11.7
Lecturer Resonsible	Yong Yue

I certify that:

- I have read and understood the University's definitions of COLLUSION and PLAGIARISM (available in the Student Handbook of Xi'an Jiaotong-Liverpool University).

With reference to these definitions, I certify that:

- I have not colluded with any other student in the preparation and production of this work;
- this document has been written solely by me and in my own words except where I have clearly indicated and acknowledged that I have quoted or used figures from published or unpublished sources (including the web);
- where appropriate, I have provided an honest statement of the contributions made to my work by other people including technical and other support staff.

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Signature .....Xuening Wang.....

Date .....2021.11.7.....

# Assignment 1: 2D Modelling Project

## Introduction

In this project, computer graphics techniques and OpenGL functions are applied to produce a 2-dimensional greeting card for XJTLU's 15<sup>th</sup> anniversary. The source code is well-configured under MS VC++ and OpenGL environments (freeglut library).

## Design & Features

This greeting card is specially designed for the university 15<sup>th</sup> anniversary, therefore contains a number of important features of XJTLU.

- Background Color

The background color is using XJTLU Navy Purple, which is the representative color of the university.

- 15<sup>th</sup> Anniversary Logo (adapted from XJTLU official website)

The logo is well-designed in the shape of Central Building and the number 15, conveying information about the anniversary.

- Central Building Icon

This icon is initially hand-drawn. Then a series of techniques are applied to obtain the coordinate and color information (such as OpenCV). In the program, the irregular figure is divided into several small triangles or polygons. It is realized by GL\_POLYGON and GL\_TRIANGLES.



Figure 1: Anniversary Logo and CB Icon

- Science Building Icon

The techniques are similar to the previous ones. In addition, functions/loops are used to save code space.

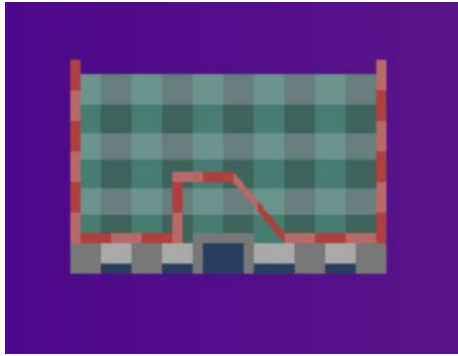


Figure 2: Science Building Icon

- UoL Redbrick Building

The Victoria Building is the landmark of UoL. A series of additional techniques are applied. The clock is designed to be dynamic, which could display current time and work properly. Functions/loops are applied to save code space.



Figure 3: UoL Redbrick Building

- Clock

The clock is designed with the functions of a real clock. In particular, glut time function is applied.

The setup function *SetupRC* gets the system time and the *drawClock* calculates the pointers and angles using relevant formulas.

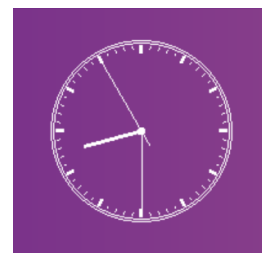


Figure 4: Clock

## 2D OpenGL Techniques

A series of OpenGL Techniques are used in this assignment:

- Creation of Geometry

A great number of geometry primitives are created in this assignment, including lines, points and polygons.

- Transformations

Different types of geometric transformation are applied, including scaling, translation, reflection and so on. For example, small figures need to be moved/adjusted to fit in the overall effects, and in this assignment, these are mostly realized by translation and scaling.

- Special Case:

When drawing the icons, the coordinates are generated from OpenCV, whose default coordinate original is on the top-left, instead of the left-bottom one. Under this circumstance, reflection is required, which is special scaling of y-axis.

- Animation and Interactions

A number of animation and interactions by mouse and keyboard are used in this assignment. Here are the following instructions:

- 1. Click the mouse to show balloons**

When clicking the mouse, some balloons will ascend and appear in the window, then quickly fade away.

- 2. Keyboard interactions with rolling texts**

The program will display several rolling texts. After the balloon fading away, some instructions will appear at the same place like before. Press the following keys and get various kinds of interactions:

- 2.1 Press "F" or "f" to change direction

- 2.2 Press "S" or "s" to stop

- 2.3 Press "R" or "r" to restart

- 2.4 Press "A" or "a" to decrement (decreasing the step/speed)

- 2.5 Press "D" or "d" to increment (increasing the step/speed)

- 2.6 Press "Q" or "q" to exit

## Sample Screenshots

