VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI.

CGV Mini Project Report on

"VERTICAL LIFT BRIDGE SIMULATION"

Submitted by

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Certificate

This is to certify that the CGV Mini Project entitled **"VERTICAL LIFT BRIDGE SIMULATION"** carried out by **Ms. SAKSHI SHANKAR SULGEKAR** bearing **USN** 2KL20CS081 **and Ms. SHREYA VIJAYKUMAR SHETTI** bearing **USN** 2KL20CS093 have satisfactorily completed the academic requirements for the partial fulfillment of ***CGV Laboratory with Mini Project (18CSL67)*** of VI Semester Bachelor of Engineering in Computer Science and Engineering of the Visvesvaraya Technological University, Belagavi for the Academic year 2022-2023.

Project Coordinator **HOD**

Internal Examiner

Name:

Signature:

Date:

External Examiner

Name:

Signature:

Date:

ACKNOWLEDGEMENT

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Our hearty gratitude also goes out to all the faculty members of Computer Science and Engineering department, members of KLE Dr. MSSCET, and our parents for their constant encouragement, valuable guidance and for providing necessary help and support in all ways possible.

ABSTRACT

The project "VERTICAL LIFT BRIDGE SIMULATION" is used to demonstrate the use of OpenGL functions that is defined in OpenGL.Our objective is to develop a simple project to show the simulation of vertical lift bridge.

Here the user must enter the necessary parameters in order to perform the simulation of vertical lift bridge. The OpenGL can be used for interaction with the hardware. Then the result will be displayed on the screen.

This project we are working is under Linux/Windows platform and are closed using C programming language with underlying tool-OpenGL which gives rich and highly usable 3D graphics. The same program can be run on different computer and the graphics will be the same on the two machines. We make use of the "GL/glut" to implement the project."GL/glut" is the library that gives robust framework to create good graphical effects.

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CHAPTER 1:

1.1 INTRODUCTION

Graphics provides one of the most natural means of communicating with a computer, since our highly developed 2D and 3D pattern recognition abilities allow us to perceive and process pictorial data rapidly and efficiently. Interactive computer graphics is the most important means of producing pictures since the invention of photography and television. It has the added advantage that, with the computer, we can make pictures not only of concrete real world objects but also of abstract, synthetic objects, such as mathematical surfaces and of data that have no inherent geometry, such as survey results.

1.2 OPENGL

OpenGL (Open Graphics Library) is a standard specification defining a cross language cross platform API for writing applications that produce 2D and 3D computer graphics. The interface consists of over 250 different function calls which can be used to draw complex 3D scenes from simple primitives. OpenGL was developed by Silicon Graphics Inc. (SGI) in 1992 and is widely used in CAD, virtual reality, scientific visualization, information visualization and flight simulation. It is also used in video games, where it competes with direct 3D on Microsoft Windows Platforms. OpenGL is managed by the non profit technology consortium, the Khronos group Inc.

OpenGL serves two main purposes:

- To hide the complexities of interfacing with different 3D accelerators, bypresenting programmer with a single, uniform API
- To hide the differing capabilities of hardware platforms , by requiring that all implementations support the full OpenGL feature set.

OpenGL has historically been influential on the development of 3D accelerator, promotinga base level of functionality that is now common in consumer level hardware:

- Rasterized points, lines and polygons are basic primitives.
- A transform and lighting pipeline.
- Z buffering.
- Rasterized Texture Mapping.
- Alpha Blending.

OpenGL Graphics Architecture:

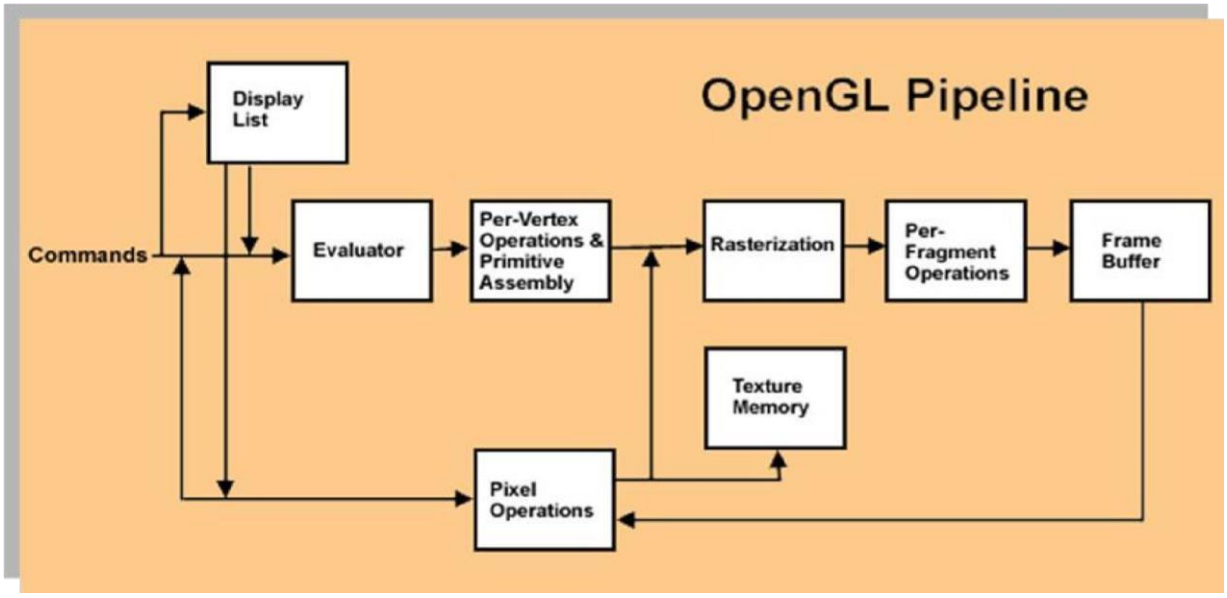

Figure 1.1 OpenGL Graphics Architecture

Display Lists :

All data, whether it describes geometry or pixels, can be saved in a display list for currentfor later use. When a display list is executed, the retained data is sent from the display list just as if it were sent by the application in immediate mode.

Evaluators :

All geometric primitives are eventually described by vertices. Parametric curves and surfaces may be initially described by control points and polynomial functions called basis functions.

Per Vertex Operations :

For vertex data, next is the "per-vertex operations" stage, which converts the vertices into primitives. Some vertex data are transformed by 4 x 4 floating-point matrices. Spatial coordinates are projected from a position in the 3D world to a position on your screen.

Primitive Assembly :

Clipping, a major part of primitive assembly, is the elimination of portions of geometry which fall outside a half space, defined by a plane.

Pixel Operation:

While geometric data takes one path through the OpenGL rendering pipeline, pixel data takes a different route. Pixels from an array in system memory are first unpacked from one of a variety of formats into the proper number of components. Next the data is scaled, biased,and processedby a pixel map. The results are clamped and then either written into texture memory or sent to the rasterization step.

Rasterization:

Rasterization is the conversion of both geometric and pixel data into fragments. Each fragment square corresponds to a pixel in the frame buffer. Color and depth values are assigned for each fragment square.

Fragment Operations :

Before values are actually stored into the frame buffer, a series of operations are performed that may alter or even throw out fragments. All these operations can be **enabled or disabled.**

1.3 PROJECT GOAL

The aim of this project is to show the shadow implementation using OPENGL which include Movement, Light properties also transformation operations like translation, rotation, scaling etc on objects. The package must also have a user friendly interface.

1.4 SCOPE

It is developed in C language. It has been implemented on WINDOWS platform. The 2-D graphics package designed here provides an interface for the users for handlingthe display and manipulation of Aqueduct. The Keyboard is the main input device used.

1.5 DEFINITION

The project **VERTICAL LIFT BRIDGE SIMULATION** is created to demonstrate. OpenGL' concepts. It encompasses some of the skills learnt in our OpenGL classes such as pushMatrix(), translate(), popMatrix(), timer function etc.

CHAPTER 2:

2.1 LITERATURE SURVEY

The basic functions like glColor3f(…), glVertex3f(…), glRotatef(…), glTranslate(…)glBegin(…), glEnd() etc. that are most commonly used in the code are taken from the prescribedVTU Text book "INTERACTIVECOMPUTER GRAPHICS" 5th edition by Edward Angel.[1].

The lab programs in the syllabus also serve as a basic template for creating a project. The usage of colors and specifications are taken from the various programs that were taught in the lab.[1].

The VTU prescribed text book serves as a huge database of functions and they are used in the project. The C and C++ concepts which are used are being taken from "object oriented programming" by Sourav Sahay.[2].

Some concepts like constructing train, ship, sun, river, bridge, pillars and base are taken from the search results incodecolony.com…

- The bridge allows the vehicles to move on it.
- When a ship approaches the bridge, a signal will be given to stop the movement of vehicles over the bridge.
- As soon as the vehicles stop, the cables start to lift up with the support of two towers.
- Now the ship travels under the bridge without any disturbance and as soon as the ship passes the bridge area, the cables will lease down the lift to make the way for road traffic.

CHAPTER 3:

3.1 HARDWARE REQUIREMENTS

- Intel®Pentium or AMD
- 1GB RAM
- 80GB HDD
- Mouse
- QWERTY Keyboard
- Standard VGA Monitor

3.2 SOFTWARE REQUIREMENTS

- Development Platform: WINDOWS/LINUX
- Language : C
- Library : OpenGL

3.3 IMPLEMENTATION

glColor3f (float, float, float):
This function will set the current drawing color.

gluOrtho(GLdouble left, GLdouble right, GLdouble bottom, GLdoubletop,GLdouble zNear,Gldouble zfar):
The ortho function multiplies the current matrix by an orthography matrix.

glClear( ):
Takes a single argument that is the bitwise OR of several values indicating which buffer isto be cleared.

glClearColor ():
Specifies the red, green, blue, and alpha values used by glClear to clear the color buffers.

glLoadIdentity( ):
The current matrix with the identity matrix.

glMatrixMode(mode):
Sets the current matrix mode, mode can be GL_MODELVIEW, GL_PROJECTION or GL_TEXTURE.

void glutInit (int *argc, charargv):**
Initializes GLUT, the arguments from main are passed in and can be used by theapplication.

void glutInitDisplayMode (unsigned int mode):
Requests a display with the properties in mode. The value of mode is determined by thelogical ORof options including the color model and buffering.

void glutInitWindowSize (int width, int height):
Specifies the initial position of the top-left corner of the window in pixels.

void glutDisplayFunc (void (*func) (void)):
Register the display function func that is executed when the window needs to be redrawn.

glutPostReDisplay ( ) :
Which requests that the display callback be executed after the current callback returns.

void glutMainLoop ():
Cause the program to enter an event-processing loop. It should be the last statement inmainfunction.

glFlush():
Forces and buffers any openGL commands to execute.

glPushMatrix():
Make a copy of current matrix and push it onto the stack.

glPopMatrix():
Pop the top of the current matrix.

glutBitmapCharacter(void* font,int character):
Write a character to output.

glRasterpos3f(x,y,z):
To set the coordinates of raster text.

CHAPTER 4:

4.1 SNAPSHOTS

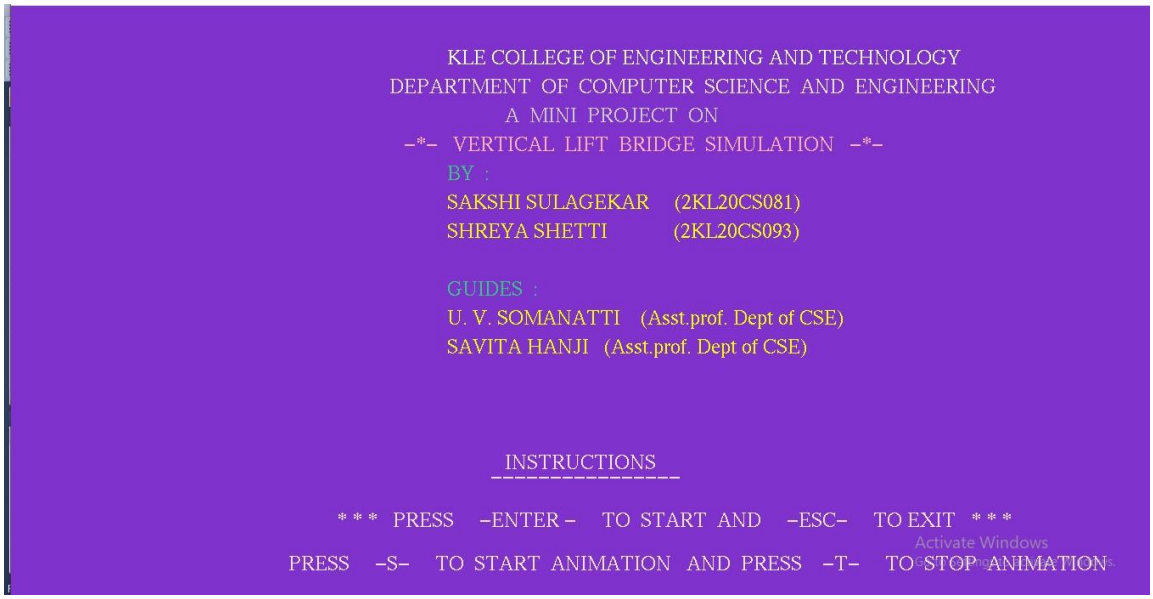

fig 4.1 welcome screen

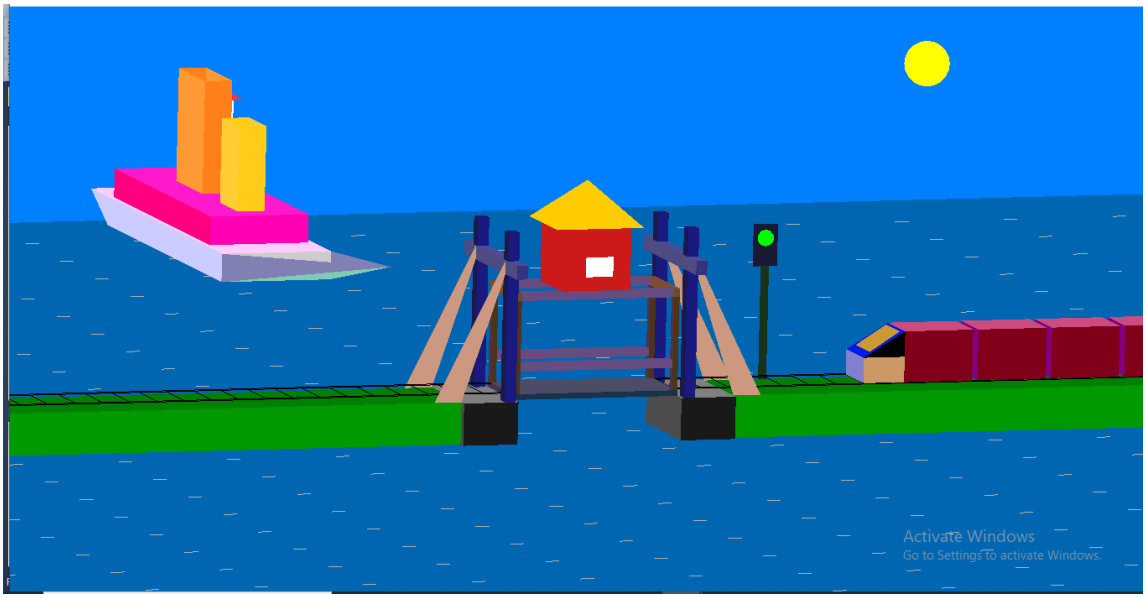

fig 4.2 Ship and Train approaching bridge

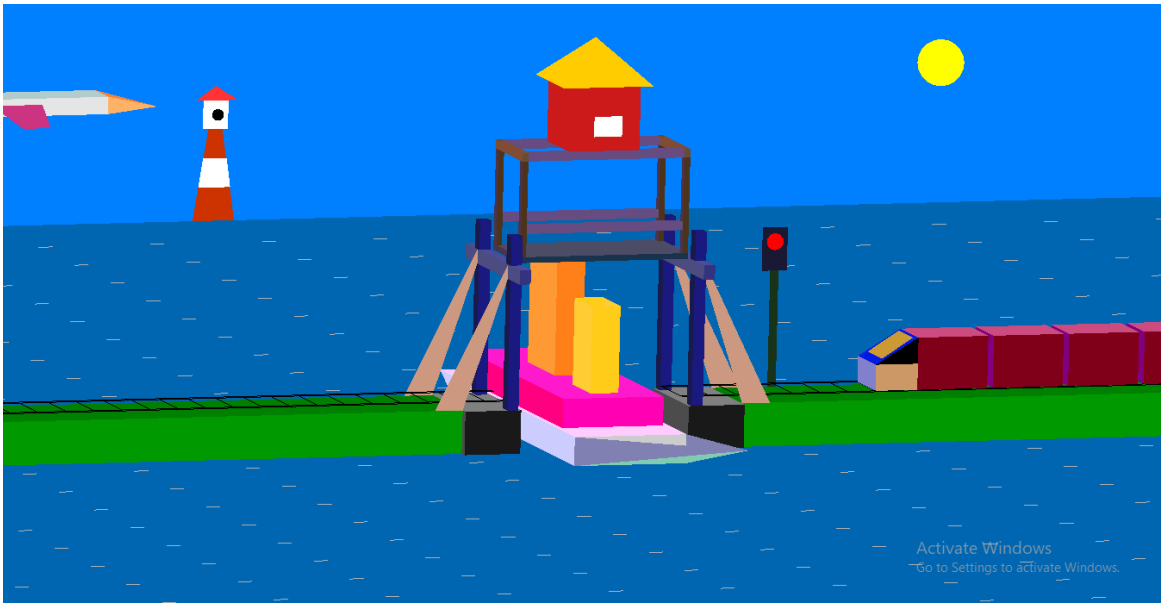

fig 4.3 Ship passing the bridge

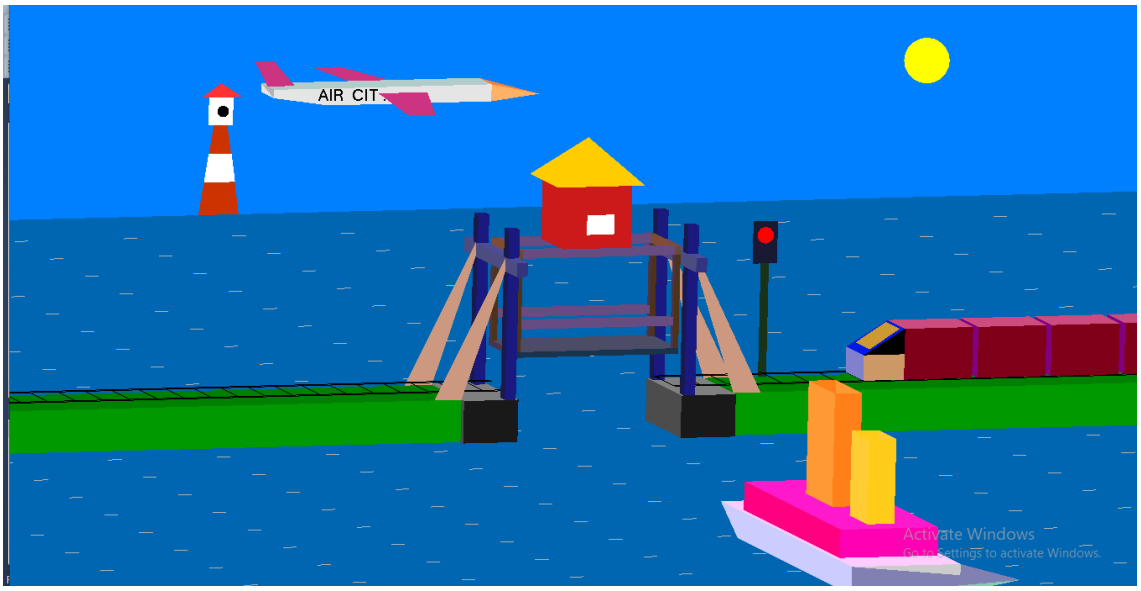

fig 4.4 Lowering of the lift

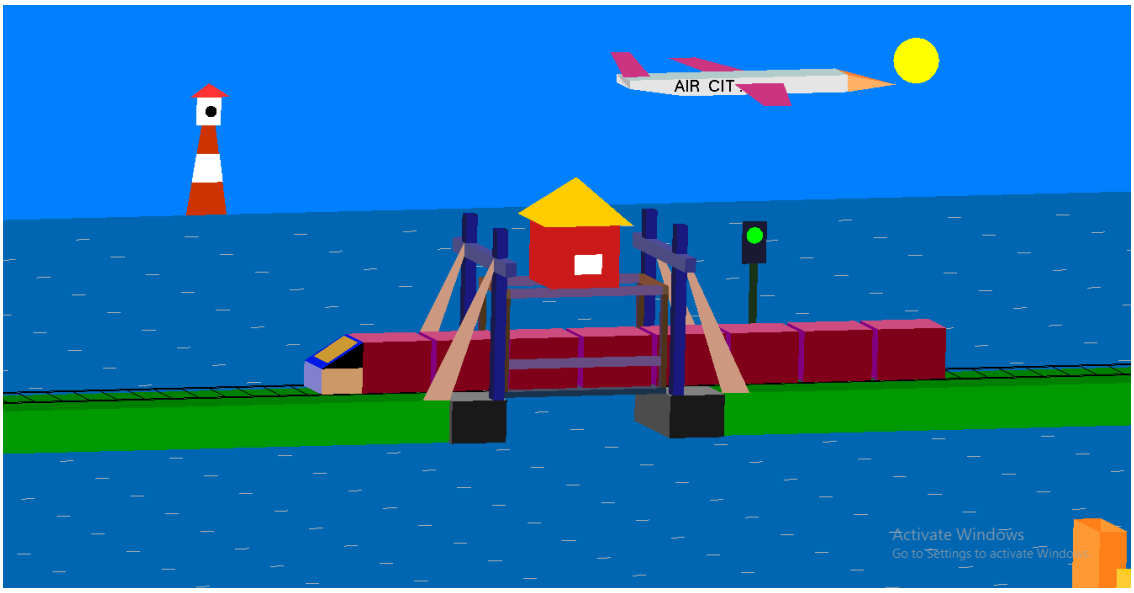

fig 4.5 Train passing the bridge

fig 4.6 Exit Screen

CHAPTER 5

5.1 CONCLUSION:

- Designing and implementing project in graphics is a great experience.We understood and analyzed about the concepts of OpenGL which is very useful for our future.
- "VERTICAL LIFT BRIDGE SIMULATION" is developed to provide a GUI. An attempt has been made to develop an OpenGL package which meets necessary requirements of the user.
- The development of the mini project has given us a good exposure to openGL by which we havelearnt some of the techniques which help in the development of interactive application.
- As the program needs to be run even on low-end machines the code should be efficient andoptimalwith the minimal redundancies.
- It is built assuming that the standard output device (monitor) supports colors.

5.2 FUTURE SCOPE:

- This application is like open source where anyone can design and add his own codes to modify.
- Sounds of sea, boat, bus and bridge movement can be incorporated.
- Support for different types of vehicles all moving simultaneously on bridge.
- Support for advanced 3D representation of the entire scenario.
- Support for transparency of layers and originality.

5.3 REFERENCES:

TEXT BOOK:

- Edward Angel, Interactive Computer Graphics A Top-Down Approach Using OpenGL,Pearson Education Asia,Fifth Edition,2008.

WEBSITES:

- www.OpenGL.org
- www.Github.com
- www.stackoverflow.com..
- www.youtube.com
- www.openglprojects.in