VISVESVARAYA TECHNOLOGICAL UNIVERSITY
BELAGAVI

Mini Project Report on

"SPACE SHOOTER"

Submitted in the partial fulfillment for the requirements of Computer Graphics & Visualization Laboratory of 6th semester CSE requirement in the form of the Mini Project work.

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CERTIFICATE

This is to certify that the Project work entitled **"SPACE SHOOTER"** is a bonafide work carried out by **Mudireddy Hithyshi (1BY20CS117), N Mythili (1BY20CS119), and Nithya H S (1BY20CS130)** in partial fulfillment for *Mini Project* during the year 2019-2020. It is hereby certified that this project covers the concepts of *Computer Graphics & Visualization*. It is also certified that all corrections/suggestions indicated for Internal Assessment have beenincorporated in this report.

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EXTERNAL VIVA – VOCE

Name of the Examiners	Signature with Date
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ACKNOWLEDGEMENT

We are happy to present this project after completing it successfully. This project would not have been possible without the guidance, assistance and suggestions of many individuals. Wewould like to express our deep sense of gratitude and indebtedness to each and every one who has helped us make this project a success.

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Lastly, we thank our parents and friends for the support and encouragement given throughoutin completing this precious work successfully.

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ABSTRACT

The main aim of the Story Simulation Computer Graphics Mini Project is to illustrate the concepts and usage of pre-built functions in OpenGL. Simulation of -SPACE SHOOTER CODE" is being done using computer graphics. The development of the game has large scope to learn computer graphics and visualization from scratch. We will be using OpenGL. utility toolkit to implement the algorithm, written in C language.

Space shooters have been around for quite some time. The game has existed for well over half a century. History has it that space shooters became a thing in the days of classic arcade games where it gradually replaced Pinball machines in the 60%. Space war debuted in 1962, thereby marking the beginning of a period. Space shooters are some of the earliest video games ever developed, Steve Russell designed the code, which enabled the game to run on DEC PDP-I minicomputers. The game failed to rank up in terms of reputation with other subsequent titles due to the limited availability of these compatible machines that facilitates its running.

In the 70s, Space Invaders took over the global market, raking in over 5600 million in Japan alone in its early days. It was available an arcade machines, which directly translates to it being open to a larger pool of players. Space shooting games let a mark on the young people of the 70s era, and to this day, Space Invaders is regarded as one of the best games ever developed.

The 80s was a significant era for space shooting games because this period saw many innovations brought to the genre. The popular game. Contra, from 1987, widened the array of weapons available to the player and the enemies encountered during gameplay. In that decade, space shooters invariably ranked among the top deliveries in the industry market.

The 2D perspective is a popular aspect of the space shooter design element. The layout of the space shooting game is almost always simple. Peculiar in this subgenre of the arcade game is the movement of the player across a sci-fi map. A significant part of the game is playable in an outer space setting.

We have tried to implement the project making it as user-friendly and error free as possible. We regret any errors that may have inadvertently crept in.

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CHAPTER 1

INTRODUCTION

1.1 COMPUTER GRAPHICS

Computer graphics are graphics created using computers and, more generally, the representation and manipulation of image data by a computer hardware and software. The development of computer graphics, or simply referred to as CG, has made computers easier to interact with, and better for understanding and interpreting many types of data. Developments in computer graphics have had a profound impact on many types of media and have revolutionized the animation and video game industry. 2D computer graphics are digital images—mostly from two-dimensional models, such as 2D geometric models, text (vector array), and 2D data. 3D computer graphics in contrast to 2D computer graphics are graphics that use a three-dimensional representation of geometric data that is stored in the computer for the purposes of performing calculations and rendering images.

The user controls the contents, structure, and appearance of the objects and of their displayed images by using input devices, such as keyboard, mouse, or touch- screen. Due to close relationships between the input devices and the display, the handling of such devices is included in the study of computer graphics. The advantagesof the interactive graphics are many in number. Graphics provides one of the most natural means of communicating with a computer, since our highly developed 2D and 3D patter-recognition abilities allow us to perceive and process data rapidly and efficiently. In many design, implementation, and construction processes today, the information pictures can give is virtually indispensable. Scientific visualization became an important field in the 1980s when the scientists and engineers realized that they could not interpret the prodigious quantities of data produced in supercomputer runs without summarizing the data and highlighting trends and phenomena in various kinds of graphical representations.

1.2 OPEN GL

OpenGL is the most extensively documented 3D graphics API (Application Program Interface) to date. Information regarding OpenGL is all over the Web and in print. It is impossible to exhaustively list all sources of OpenGL information. OpenGL programs are typically written in C and C++. One can also program OpenGL from Delphi (a Pascal-like language), Basic, Fortran, Ada, and other languages. To compile and link OpenGL programs, one will need OpenGL header files. To run OpenGL programs one may need shared or dynamically loaded OpenGL libraries, or a vendor-specific OpenGL Installable Client Driver (ICD).

OpenGL is a low-level graphics library specification. It makes available to the programmer a small set of geometric primitives - points, lines, polygons, images, and bitmaps. OpenGL provides a set of commands that allow the specification of geometric objects in two or three dimensions, using the provided primitives, together with commands that control how these objects are rendered (drawn).

1.3 GLUT

The OpenGL Utility Toolkit (GLUT) is a library of utilities for OpenGL programs, which primarily perform system-level I/O with the host operating system. Functions performed include window definition, window control, and monitoring of keyboard and mouse input. Routines for drawing a number of geometric primitives (both in solid and wireframe mode) are also provided, including cubes, spheres, and cylinders. GLUT even has some limited support for creating pop-up menus. The two aims of GLUT are to allow the creation of rather portable code between operating systems (GLUT is cross- platform) and to make learning OpenGL easier. All GLUT functions start with the glut prefix (for example, glutPostRedisplay marks the current window as needing to be redrawn).

CHAPTER 2

LITERATURE SURVEY

CG (Computer graphics) started with the display of data on hardcopy plotters and cathode ray tube screens soon after the introduction of computer themselves. It includes the creation, storage, and manipulation of models and images of objects. These models include physical, mathematical, engineering, architectural, and even conceptual or abstract structures, natural phenomena, and so on. Computer Graphics today islargely interactive-the user controls the contents, structure, and appearance of objects and their displayed images by using input devices, such as keyboard, mouse or touch sensitive panel on the screen. Bitmap graphics is used for user-computer interaction. A Bitmap is an ones and zeros representation of points (pixels, short for _picture elements‘) on the screen. Bitmap graphics provide easy-to-use and inexpensive graphics based applications.

The concept of desktop is a popular metaphor for organizing screen space. By means of a window manager, the user can create, position, and resize rectangularscreen areas, called windows, that acted as virtual graphics terminals, each running an application. This allowed users to switch among multiple activities just by pointing at the desired window, typically with the mouse. Graphics provides one of the most natural means of communicating with the computer, since our highly developed 2D and 3D pattern – recognition abilities allow us to perceive and process pictorial data rapidly and efficiently. In many design, implementation, and construction processes, the informationpictures can give is virtually indispensable.

Computer graphics is the creation and manipulation of pictures with the aid ofcomputers. It is divided into two broad classes:

- Non-Interactive Graphics.
- Interactive Graphics.

2.1 NON – INTERACTIVE GRAPHICS

This is a type of graphics where observer has no control over the picturesproduced on the screen. It is also called as Passive graphics.

2.2 INTERACTIVE GRAPHICS

This is the type of computer graphics in which the user can control the pictures produced. It involves two-way communication between user and computer. The computer upon receiving signal from the input device can modify the displayed picture appropriately. To the user it appears that the picture changes instantaneously in response to his commands. The following fig. shows the basic graphics system:

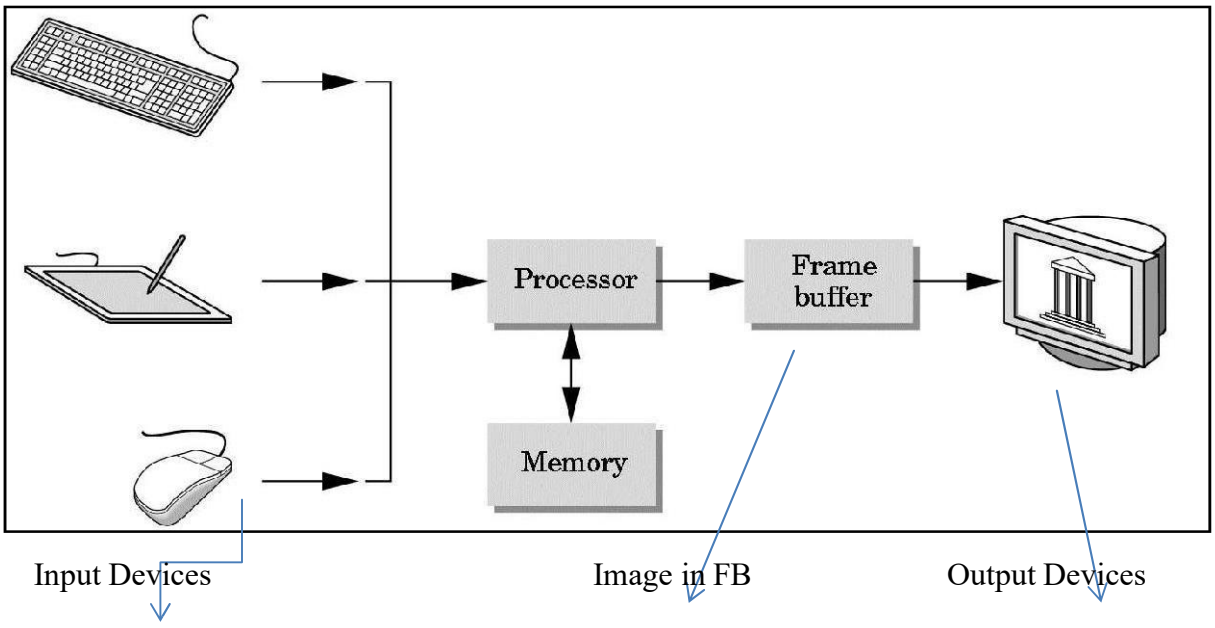

FIGURE 2.2 BASIC GRAPHICS SYSTEM

CHAPTER 3

PROJECT IN DETAIL

3.1 PROBLEM STATEMENT

Computer graphics is no longer a rarity. It is an integral part of all computer user interfaces, and is indispensable for visualizing 2D; 3D and higher dimensional objects .Creating 3D objects, rotations and any other manipulations are laborious process with graphics implementation using text editor. OpenGL provides more features fordeveloping 3D objects with few lines by built in functions. The geometric objects are the building blocks of any individual .Thereby developing, manipulating, applying any transformation, rotation, scaling on them is the major task of any image development.

So in this project the main problem statement is to narrate a story with help of computer graphics that is using Open GL. We will be having two alien space ships on the sci-fi map who will be fighting against each other. This is the multiplayer game.

3.2 BRIEF INTRODUCTION

In this Project, we are two graphically designed alien spaceships fight against each other in a sci-fi map. We make use of C++ in OpenCL in computer graphics.

The 2D perspective is the popular aspect of the space shooter design element. The layout of the space shooting game is almost always simple. Peculiar to this subgenre of the arcade game is the movement of the player across a sci – fi map. A significant part of the game is playable in an outer space setting.

This is a two player game. Here both the spaceships have 100 lives and a damage of 5 is given to the player who gets hit by the other player.

3.3 SCOPE AND MOTIVATION

The existence of a continually moving market orchestrates the need for different game genres to change with time. No single game genre stays the same forever. Space shooters don't work differently from the vast majority of games in the industry. As time passes, space shooters evolve with the market in different ways. Development of subdivisions within the arcade game genre, taking various appearances, and merging styles of play peculiar to other games are some of the aspects where these changes are evident.

Space shooters have been different over the years. The earliest model had static players where the movement was highly limited. Rail shooters are ones where the player stays on a static path. Others put the player in a fictitious canal. Some make use of the 3D engine to allow for movement in multiple directions.

In this project we are trying to develop an easy, efficient and cost free method of space shooter game.

3.4 PROPOSED SYSTEM

We need something which is as interesting as a TV serial and at the same timefilled with good stuffs.

Space shooters are somewhat different from a typical action game. Its conventional setting is often one in a sci-fi environment. The player usually appears like a spacecraft or something close to it. Players need no skill set or strategy to advance in the game. The levels surpassed or points amassed are the basis for judgment of players' progress.

With the use of different functionality like of making polygons, using various functions of mouse and creation of menu, the whole sci-fi map with the two player as alien spaceships. This project gives a user-friendly interface for the end user to interact with the frames. This project contains several different frames that are used in a particular sequence to help the aver understand the story.

3.5 USER INTERFACE

The legend for user interaction is as follows:

For Player 1:

- **"W"** To move up.
- **"S"** To move down
- **"D"** To move right
- **"A"** To move left
- **"C"** To shoot and **"w"** and **"s"** to change direction.

For Player 2:

- **"I"** To move up.
- **"K"** To move down
- **"J"** To move right
- **"L"** To move left
- **"M"** To shoot and **"i"** and **"k"** to change direction.

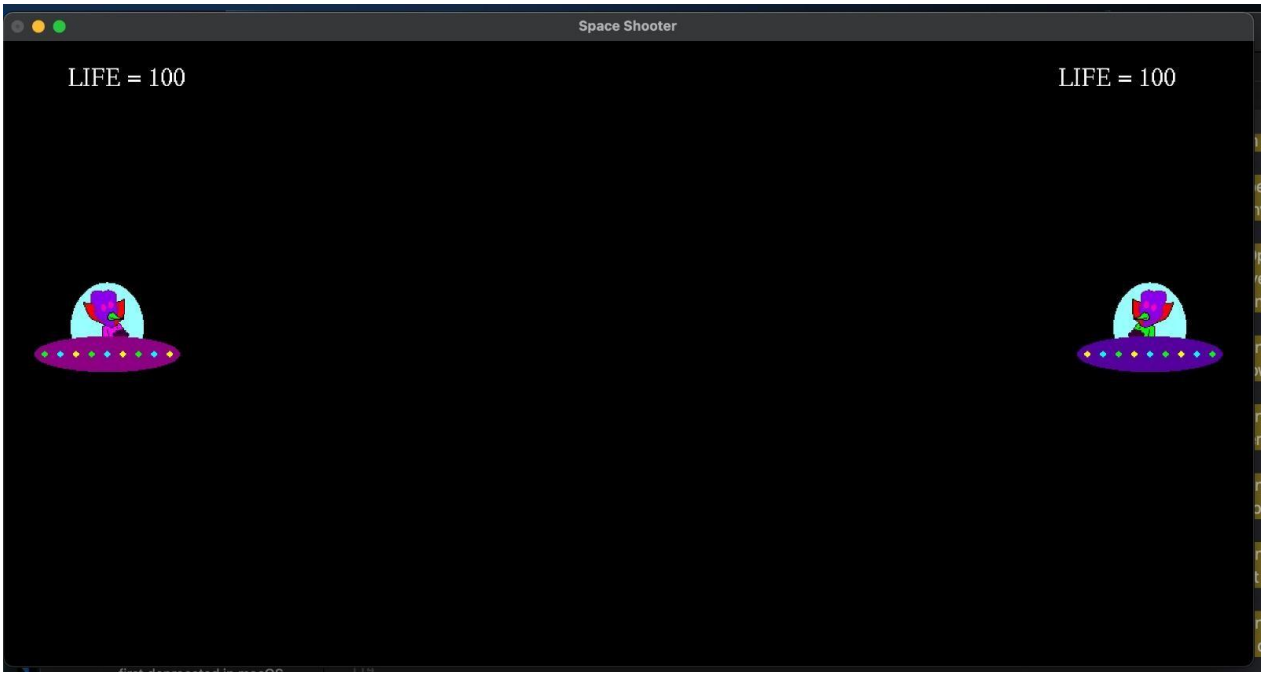

FIGURE 3.5.1: Space Shooter (A scenario)

CHAPTER 4

REQUIREMENT SPECIFICATION

4.1 HARDWARE REQUIREMENTS

- Processor: INTEL / AMD
- Main memory: 2 GB RAM (Min.)
- Hard Disk: Built-in is sufficient
- Keyboard: QWERTY Keyboard
- Mouse: 2 or 3 Button mouse
- Monitor: 1024 x 768 display resolution

4.2 SOFTWARE REQUIREMENTS

- Programming language – C/C++ using OpenGL
- Operating system – Windows/Linux
- Compiler – C/C++ Compiler (GCC compier)
- IDE – Code blocks
- Functional Requirement – <GL/glut.h>

FIGURE 4.2.1: OpenGL API

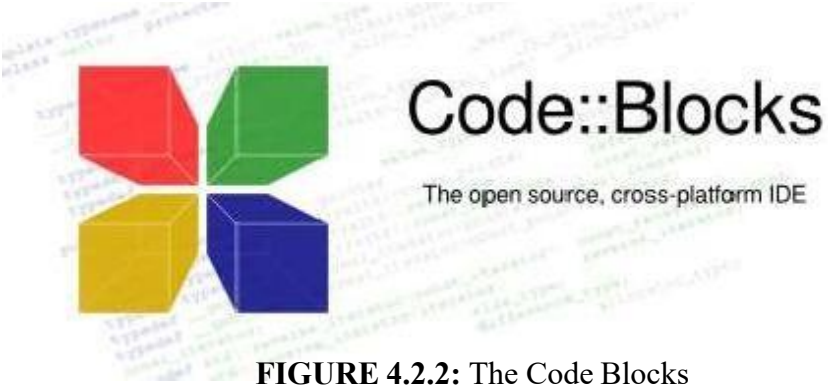

FIGURE 4.2.2: The Code Blocks IDE

CHAPTER 5

DESIGN AND IMPLEMENTATION

5.1 DESIGN

The "Hare and Tortoise Story Simulation" is designed using some of the OpenGL inbuilt functions along with some user defined functions. So, this section comprises of the complete explanation of the design of the project using various opengl functions and user defined methods along with its explanation. This chapter is divided into two sections –

- **OPENGL Functions** – This section throws light on the various openGL functionsused and its uses.
- **USER – DEFINED Functions** – This section demonstrates the various user definedfunctions and its purpose.

5.1.1 OPEN GL FUNCTIONS:

The different OpenGL functions that are used in the project is described below:

- **glClearColor(0.1,0.8,0.1,1.0)** :- glClearColor() specifies the red, green, blue, and alpha values used by glClear() to clear the color buffers. Values specifiedby glClearColor() are clamped to the range 0, 1

- **glMatrixMode(GL_MODELVIEW)** :- specify which matrix is the current matrix. Specifies which matrix stack is the target for subsequent matrix operations. Three values are accepted: GL_MODELVIEW, GL_PROJECTION, and GL_TEXTURE. The initial value is GL_MODELVIEW.

- **gluOrtho2D(0,1000,0,500)** :- define a 2D orthographic projection matrix.*left*, *right*- Specify the coordinates for the left and right vertical clipping planes.

- **glRasterPos2f(x, y)** :- The glRasterPos2 function uses the argument values for **x** and **y** while implicitly setting z and w to zero and one. The object coordinates presented by glRasterPos are treated just like those of a glVertex command. They are transformed by the current modelview and projection matrices and passed to the clipping stage.

- **glutBitmapCharacter(GLUT_BITMAP_TIMES_ROMAN_24,string[i])** :- glutBitmapCharacter renders a bitmap character using OpenGL. Without using any display lists, glutBitmapCharacter renders the character in the named bitmap font.

- **glutFullScreen()** :- glutFullScreen requests that the *current window* be made full screen. The exact semantics of what full screen means may vary by window system. The intent is to make the window as large as possible and disable any window decorations or borders added the window system.

- **glFlush()** :- Force execution of GL commands in finite time. glFlush empties all of these buffers, causing all issued commands to be executed as quickly as they are accepted by the actual rendering engine. Though this execution may not be completed in any particular time period, it does complete in finite time.

- **glPopMatrix()** :- Push and pop the current matrix stack. glPopMatrix pops the current matrix stack, replacing the current matrix with the one below it on the stack.

- **glBegin(GL_POINTS)** :- delimit the vertices of a primitive or a group of like primitives. glBegin and glEnd delimit the vertices that define a primitive or a group of like primitives. glBegin accepts a single argument that specifies in which of ten ways the vertices are interpreted.

- **glVErex2i(278,280)** :- Specify a vertex . glVertex commands are used within glBegin/glEnd pairs to specify point,line and polygon vertices. The current color , normal , texture coordinates , and fog coordinate are associated with the vertex when glVertex is called.

- **glEnd()** :- delimit the vertices of a primitive or a group of like primitives. glBegin and glEnd delimit the vertices that define a primitive or a group of like primitives.

- **glutSwapBuffers()** :- glutSwapBuffers swaps the buffers of the *current window* if double buffered. Performs a buffer swap on the *layer in use* for the *current window*. Specifically, glutSwapBuffers promotes the contents of the back buffer of the *layer in use* of the *current window* to become the contents of the front buffer. An implicit glFlush is done by glutSwapBuffers before it returns. Ifthe *layer in use* is not double buffered, glutSwapBuffers has no effect.

- **glPushMatrix()** push and pop the current matrix stack. There is a stack of matrices for each of the matrix modes. The current matrix in any mode is the matrix on the top of the stack for that mode.glPushMatrix pushes the current matrix stack down by one, duplicating the current matrix. That is, aftera glPushMatrix call, the matrix on top of the stack is identical to the one below it.

- **glTranslate(a2,0,0)** :- multiply the current matrix by a translation matrix. glTranslate produces a translation by x y z . The current matrix is multiplied by this translation matrix, with the product replacing the current matrix.

- **glutInit(&argc,argv)** :- glutInit is used to initialize the GLUT library. glutInit will initialize the GLUT library and negotiate a session with the window system. During this process, glutInit may cause the termination of the GLUT program withan error message to the user if GLUT cannot be properly initialized. glutInit also processes command line options, but the specific options parse are windowsystem dependent.

- **glutInitDisplayMode(GLUT_SINGLE|GLUT_RGB)** :- sets the *initial display mode*. The *initial display mode* is used when creating top-level windows, subwindows, and overlays to determine the OpenGL display mode for the to-be-created window or overlay.

- **glutInitWindowSize(1000,500)** :- set the *initial window size* . Windows created by glutCreateWindow will be requested to be created with the current *initialwindow position* and *size*.The intent of the *initial window position* and *size* values is to provide a suggestion to the window system for a window's initial size and position. The window system isnot obligated to use this information. A GLUT program should use the window's reshape callback to determine the true size of the window.

- **glutCreateWindow("HARE AND TORTOISE")** :- creates a top-level window. The name will be provided to the window system as the window's name. The intent is that the window system will label the window with the name.Implicitly, the *current window* is set to the newly created window.

- **glutPositionWindow(50,50)** :- requests a change to the position of the *current window*. . For top-level windows, the x and y parameters are pixel offsets from the screen origin. For subwindows, the x and y parameters are pixel offsets from the window's parent window origin.

- **glutDisplayFunc(display1)** :- registers the callback function (or event handler) for handling window-paint event. The OpenGL graphic system calls back this handler when it receives a window re-paint request. In the example, we register the function display() as the handler.

- **glutKeyboardFunc(NormalKey)** :- glutKeyboardFunc sets the keyboard callback for the *current window*. When a user types into the window, each key press generating an ASCII character will generate a keyboard callback.

- **glutMainLoop()** :- glutMainLoop enters the GLUT event processing loop. This routine should be called at most once in a GLUT program. Once called, this routine will never return. It will call as necessary any callbacks that have been registered.

5.2 IMPLEMENTATION

This section speaks about the implementation of the project via the snapshots. It gives the detailed description of the way in which various scenes and frames are implemented.

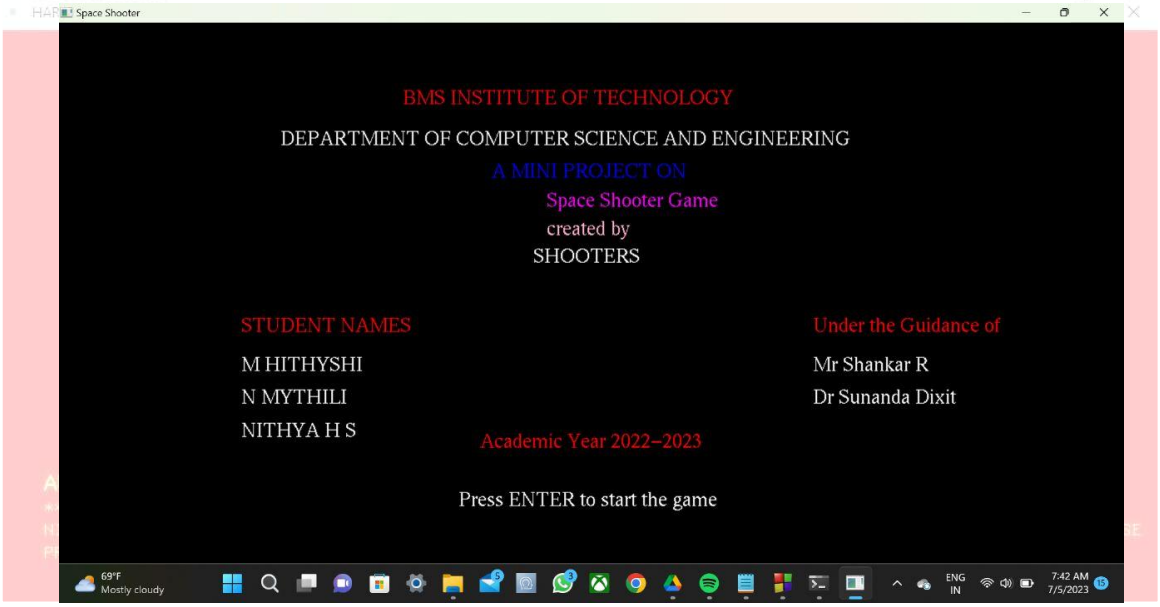

FIGURE 5.2.1

First Screen – This is the first scene when the project runs. It displays the welcome page and basic key-action instructions of this project.

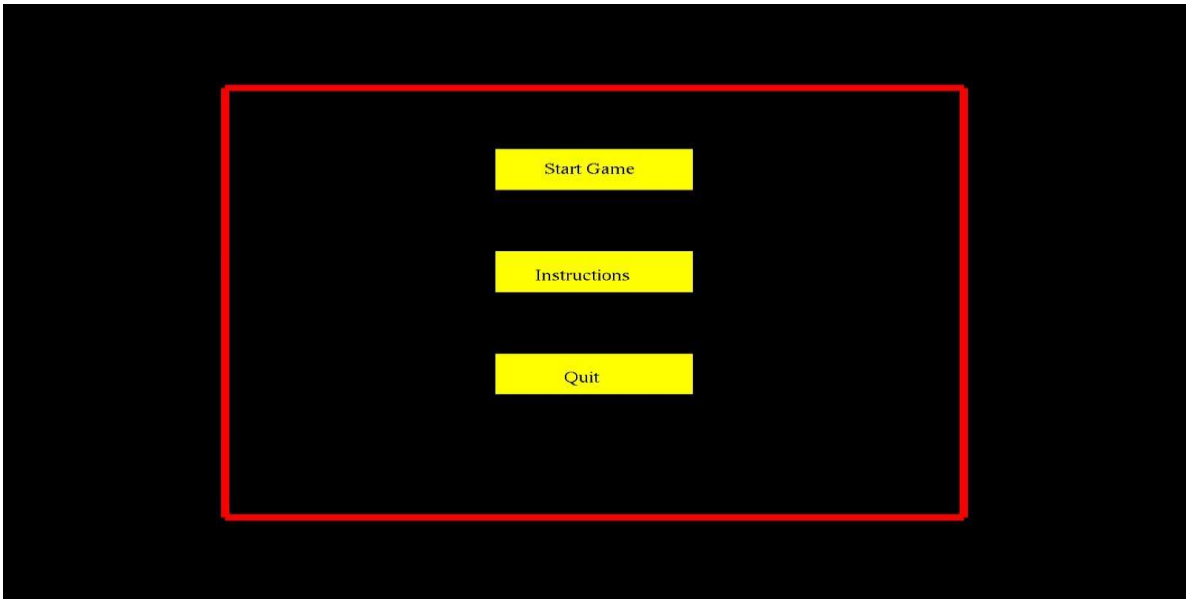

FIGURE 5.2.2

Second Screen – This is the menu, where we can either start the game or see the instruction to play the game or exit the game/program.

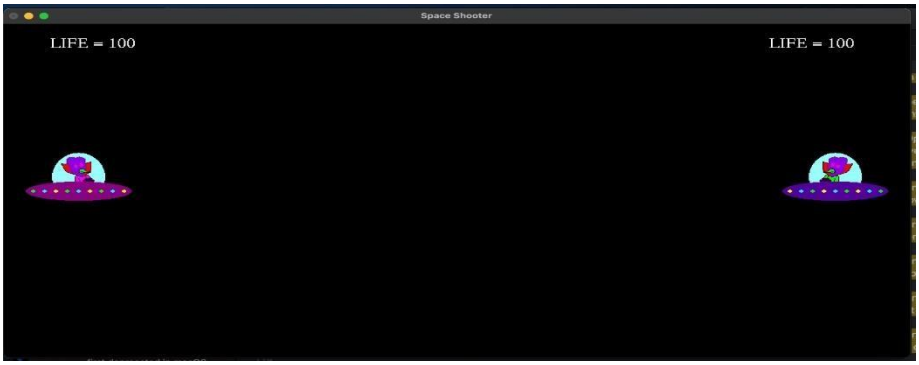

FIGURE 5.2.3

Third Screen – This is the third scene of the project. In this scene, both the player start the game at initial position**.**

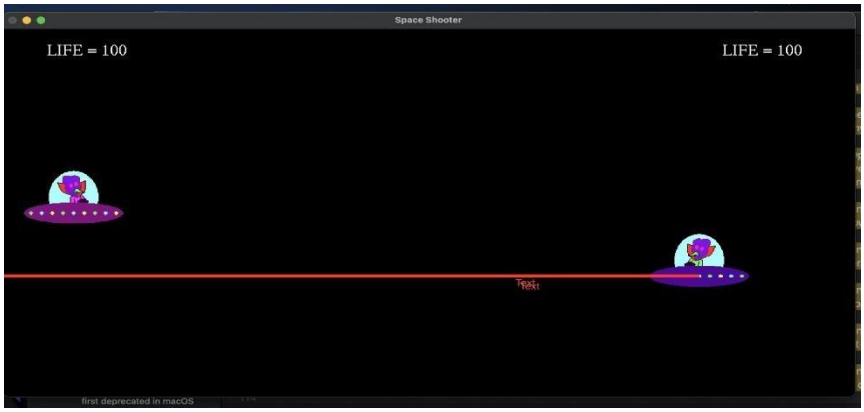

FIGURE 5.2.4

Fourth screen: This is the fourth scene of the project. In this scene players can move throughout the window and adjust their positions.

FIGURE 5.2.5

Fifth Screen: This is the fifth scene of the project. In this scene players can shoot each other. By hitting the other player with laser beam that player can decrease other player's life. When any of the player's life comes down to 0, other player gains victory.

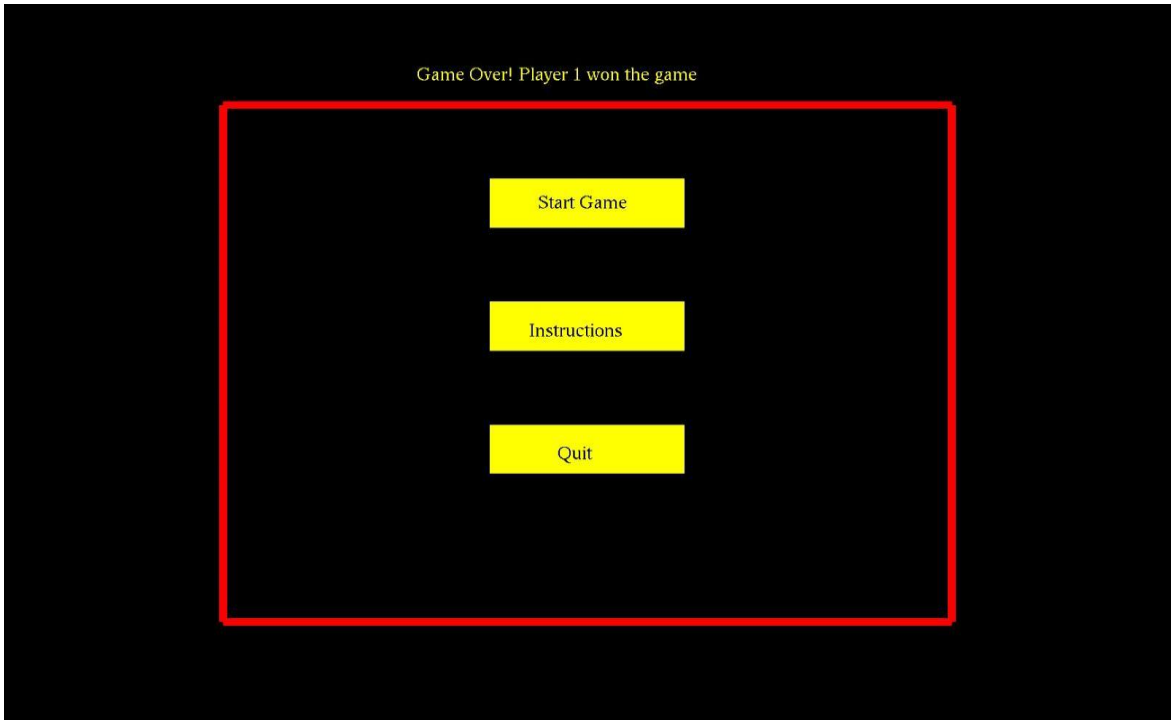

FIGURE 5.2.6

Sixth Screen: This is the sixth scene of the project. This scene shows when gaining victory, it displays “GAME OVER” and declare the winner.

CONCLUSION AND FUTURE ENHANCEMENT

CONCLUSION

The very purpose of developing this project is to exploit the strength of OpenGL. graphics capabilities for an interesting cause. The SPACE SHOOTER has been tested under Windows 10, and has been found to provide ease of use and manipulation to the user. The SPACE SHOOTER created for the Windows operating system can be used to play multiplayer game. It has a very simple and effective user interface.

We found designing and developing this story as a very interesting and learning experience. It helped us to learn about computer graphics, design of Graphical User Interfaces, interface to the user, user interaction handling and screen management. The graphics editor provides all and more than the features that have been detailed in the university syllabus.

FUTURE ENHANCEMENTS

Some of the future enhancements would be:

- Support for advanced 3D representation of the entire scenario.
- Support for transparency of layers and originality that is, simulating the story in a more realistic way.
- Making the user interface of this project more user friendly which will certainly be more effectively and efficiently narrated.

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