Computer Graphics (UCS505)

Project on

SPACE SHOOTER GAME

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INTRODUCTION

The 2 player space shooting game is an exciting and challenging project that utilizes the Open GL graphics library in C++ to create a visually stunning and engaging game environment. The game is designed to be played by two players, who compete against each other in a thrilling space battle using laser weapons to shoot down enemy spacecraft.. This project report provides a detailed overview of the game's design, development, and implementation.

The goal of this project is to create a fun and engaging game that showcases the capabilities of the Open GL library. The game's design is focused on providing players with an immersive and challenging gaming experience that tests their skills and reflexes in a dynamic and fast-paced environment. The use of lasers as the primary weapon adds an extra layer of excitement and strategy to the game, as players must carefully aim and time their shots to avoid being hit by enemy fire.

To achieve the project goals, we utilized the Open GL library, which provides a wide range of powerful tools and functions for creating complex 3D graphics environments. The library was implemented using the C++ programming language, which allowed us to create a robust and scalable code base that can handle the complex interactions and calculations required for the game.

The game's design includes a detailed 3D environment, complete with realistic lighting and particle effects, which creates an immersive atmosphere for players..

Overall, the 2 player space shooting game is an exciting project that demonstrates the power and versatility of the Open GL graphics library. The game's engaging gameplay, stunning visuals, and customizable features make it a fun and challenging experience for players of all skill levels. This project report provides a detailed overview of the game's design, development, and implementation, highlighting the key features of Computer Graphics and Open Gl used.

COMPUTER GRAPHICS CONCEPTS USED:

Here are some fundamental computer graphics and OpenGL concepts used in the code:

- Vertex: A vertex is a point in space, typically represented as a coordinate (x,y,z). In the code, vertices are defined using the `glVertex3f` function.

- Transformations: In computer graphics, transformations are used to move, rotate, or scale objects in a scene. They are used to change the position, orientation, or size of an object. Transformations are applied to vertices or points of an object in a scene to change its position, orientation, or size. Common transformations include translation, rotation, and scaling. transformations are applied using the glTranslatef and glRotatef functions.In the code, transformations are applied using the `glTranslatef` and `glRotatef` functions.

- Projection: Projection is the process of mapping 3D objects onto a 2D plane. In the code, projection is set up using the `glMatrixMode` and `glLoadIdentity` functions.

- Shading: Shading is a technique used to determine the color of a pixel or fragment in a scene. It is used to create the illusion of depth, texture, and lighting in a 3D scene. Shading algorithms calculate the color of each pixel based on the light sources in the scene, the properties of the object being rendered, and the viewing angle of the observer. Common shading techniques include flat shading, Gouraud shading, and Phong shading. In the code, shading is achieved using the `glColor3f` function.

- Texture Mapping: Texture mapping is a technique used to add detail and complexity to objects in a scene by applying images, patterns, or colors to their surfaces. It is used to create the illusion of surface texture, depth, and complexity in 3D models. Texture mapping involves projecting an image onto a surface by mapping the coordinates of the image onto the coordinates of the object's surface.In the code, texture mapping is used in the second code snippet with the `glTexImage2D` and `glBindTexture` functions.

- Lighting: Lighting is a crucial element in computer graphics that is used to create the illusion of depth and realism in a scene. It involves simulating the behavior of light sources in a scene, such as the position, color, and intensity of light sources, as well as the surface properties of objects in the scene, such as their reflectance, roughness, and transparency. Lighting algorithms are used to calculate the color and intensity of light at each point in the scene, which is then used to shade the objects in the scene.

USER DEFINED FUNCTIONS:

In the above codes, there are several user-defined functions, which are created to perform specific tasks or operations. These functions are:

- void myInit(): Initializes the background color and the projection mode.
- void drawFigure(): Draws the shape of the figure with a given set of vertices.
- void display() function: This function is responsible for rendering the scene and updating it based on any changes. It first clears the window using the background color set in the init() function, sets up the camera position, and then draws the objects in the scene using the glBegin() and glEnd() functions.
- main(): The main function that initializes the window, sets the display mode, and calls the display function to start the rendering process.
- void reshape(): This function is called whenever the window is resized and is responsible for adjusting the viewport and projection matrix to maintain the aspect ratio of the objects.
- void keyboard(): This function is called whenever a key is pressed on the keyboard and is used to handle the user input. In the code above, it is used to toggle between wireframe and solid mode.
- void displayRasterText(): It is a user-defined function in the above code that takes a string as input and displays it as a raster text.Overall, the displayRasterText() function provides a simple way to display text on the screen using the GLUT library in OpenGL.
- introScreen(): This function is a user-defined function used in the provided code that is responsible for rendering the introductory screen for the program. This function sets up the graphics pipeline and draws a simple 2D animation using OpenGL primitives.

- startScreenDisplay(): This function is a user-defined function in the given code that displays the start screen of the game. It initializes the background color and clears the screen. It also displays some text and an image on the screen using OpenGL functions.

- DrawAlien(): This function is a user-defined function that is used to draw an alien on the screen using OpenGL primitives such as lines, points, and polygons. This function takes in two parameters, the x and y coordinates of the alien.

- void mouseClick(): This function is a user-defined function in the above code that handles the mouse clicks on the screen.

All of these functions are defined by the user and called by the OpenGL graphics engine as needed. They work together to create a fully functional graphics application.

CODE :

```
#ifdef _WIN32
#include<windows.h>
#endif
#include<stdio.h>
#include<stdlib.h>
#include<GL/glut.h>
#include<math.h>
#define GL_SILENCE_DEPRECATION

#define XMAX 1200
#define YMAX 700
#define SPACESHIP_SPEED 20
#define TOP 0
#define RIGHT 1
#define BOTTOM 2
#define LEFT 3


GLint m_viewport[4];
bool mButtonPressed = false;
float mouseX, mouseY;
enum view { INTRO, MENU, INSTRUCTIONS, GAME, GAMEOVER };
view viewPage = INTRO; // initial value
bool keyStates[256] = { false };
bool direction[4] = { false };
bool laser1Dir[2] = { false };
bool laser2Dir[2] = { false };

int alienLife1 = 100;
int alienLife2 = 100;
bool gameOver = false;
float xOne = 500, yOne = 0;
float xTwo = 500, yTwo = 0;
```

```
bool laser1 = false, laser2 = false;

GLint CI = 0;

GLfloat a[][2] = { 0,-50, 70,-50, 70,70, -70,70 };

GLfloat LightColor[][3] = { 1,1,0,   0,1,1,   0,1,0 };

GLfloat AlienBody[][2] = { {-4,9}, {-6,0}, {0,0}, {0.5,9}, {0.15,12}, {-14,18}, {-19,10},
{-20,0},{-6,0} };

GLfloat AlienCollar[][2] = { {-9,10.5}, {-6,11}, {-5,12}, {6,18}, {10,20}, {13,23},
{16,30}, {19,39}, {16,38},
                                                    {10,37}, {-13,39}, {-18,41}, {-20,43},
{-20.5,42}, {-21,30}, {-19.5,23}, {-19,20},
                                                    {-14,16}, {-15,17},{-13,13},  {-9,10.5}
};

GLfloat ALienFace[][2] = { {-6,11}, {-4.5,18}, {0.5,20}, {0.,20.5}, {0.1,19.5}, {1.8,19},
{5,20}, {7,23}, {9,29},
                                                    {6,29.5}, {5,28}, {7,30},
{10,38},{11,38}, {11,40}, {11.5,48}, {10,50.5},{8.5,51}, {6,52},
                                                    {1,51}, {-3,50},{-1,51}, {-3,52}, {-
5,52.5}, {-6,52}, {-9,51}, {-10.5,50}, {-12,49}, {-12.5,47},
                                                    {-12,43}, {-13,40}, {-12,38.5}, {-
13.5,33},{-15,38},{-14.5,32},  {-14,28}, {-13.5,33}, {-14,28},
                                                    {-13.8,24}, {-13,20}, {-11,19}, {-
10.5,12}, {-6,11} };
GLfloat ALienBeak[][2] = { {-6,21.5}, {-6.5,22}, {-9,21}, {-11,20.5}, {-20,20}, {-
14,23}, {-9.5,28}, {-7,27}, {-6,26.5},
                                                    {-4.5,23}, {-4,21}, {-6,19.5}, {-8.5,19},
{-10,19.5}, {-11,20.5} };



void displayRasterText(float x, float y, float z, const char* stringToDisplay) {
        glRasterPos3f(x, y, z);
        for (const char* c = stringToDisplay; *c != '\0'; c++) {
                glutBitmapCharacter(GLUT_BITMAP_TIMES_ROMAN_24, *c);
        }
}


void init()
{
        glClearColor(0.0, 0.0, 0.0, 0);
        glColor3f(1.0, 0.0, 0.0);
        glMatrixMode(GL_PROJECTION);
```

```
	glLoadIdentity();

	gluOrtho2D(-1200, 1200, -700, 700);
	//  gluOrtho2D(-200,200,-200,200);
	glMatrixMode(GL_MODELVIEW);
}

void introScreen()
{
	glClear(GL_COLOR_BUFFER_BIT);

	glColor3f(1.0, 0.0, 0.0);
	displayRasterText(-425, 490, 0.0, "THAPAR INSTITUTE OF TECHNOLOGY");
	glColor3f(1.0, 1.0, 1.0);
	displayRasterText(-700, 385, 0.0, "DEPARTMENT OF COMPUTER SCIENCE
AND ENGINEERING");
	glColor3f(0.0, 0.0, 1.0);
	displayRasterText(-225, 300, 0.0, "CG PROJECT: ");
	glColor3f(1.0, 0.0, 1.0);
	displayRasterText(-225, 200, 0.0, "Space Shooter");
	glColor3f(1.0, 0.0, 0.0);
	displayRasterText(-800, -100, 0.0, " STUDENT NAMES");
	glColor3f(1.0, 1.0, 1.0);
	displayRasterText(-800, -200, 0.0, " Rachit Gupta (102003056)");
	displayRasterText(-800, -285, 0.0, " Sumedha Sahni (102003047)");
	displayRasterText(-800, -375, 0.0, " Gohan Kohli (102003063)");
	glColor3f(1.0, 0.0, 0.0);
	displayRasterText(-250, -500, 0.0, "Academic Year 2022-23");
	glColor3f(1.0, 1.0, 1.0);
	displayRasterText(-300, -650, 0.0, "Press ENTER to start the game");
	glFlush();
	glutSwapBuffers();
}

void startScreenDisplay()
{
	glLineWidth(10);
```

```
        //SetDisplayMode(MENU_SCREEN);

        glColor3f(1, 0, 0);
        glBegin(GL_LINE_LOOP);          //Border
        glVertex2f(-750, -500);
        glVertex2f(-750, 550);
        glVertex2f(750, 550);
        glVertex2f(750, -500);
        glEnd();

        glLineWidth(1);

        glColor3f(1, 1, 0);
        glBegin(GL_POLYGON);                    //START GAME
PLOYGON
        glVertex2f(-200, 300);
        glVertex2f(-200, 400);
        glVertex2f(200, 400);
        glVertex2f(200, 300);
        glEnd();

        glBegin(GL_POLYGON);                    //INSTRUCTIONS
POLYGON
        glVertex2f(-200, 50);
        glVertex2f(-200, 150);
        glVertex2f(200, 150);
        glVertex2f(200, 50);
        glEnd();

        glBegin(GL_POLYGON);                    //QUIT POLYGON
        glVertex2f(-200, -200);
        glVertex2f(-200, -100);
        glVertex2f(200, -100);
        glVertex2f(200, -200);
        glEnd();

        if (mouseX >= -100 && mouseX <= 100 && mouseY >= 150 && mouseY <=
```

```
200) {
		glColor3f(0, 0, 1);
		if (mButtonPressed) {
			alienLife1 = alienLife2 = 100;
			viewPage = GAME;
			mButtonPressed = false;
		}
	}
	else
		glColor3f(0, 0, 0);

	displayRasterText(-100, 340, 0.4, "Start Game");

	if (mouseX >= -100 && mouseX <= 100 && mouseY >= 30 && mouseY <= 80)
{
		glColor3f(0, 0, 1);
		if (mButtonPressed) {
			viewPage = INSTRUCTIONS;
			printf("instruction button pressed \n");
			mButtonPressed = false;
		}
	}
	else
		glColor3f(0, 0, 0);
	displayRasterText(-120, 80, 0.4, "Instructions");

	if (mouseX >= -100 && mouseX <= 100 && mouseY >= -90 && mouseY <= -
40) {
		glColor3f(0, 0, 1);
		if (mButtonPressed) {
			mButtonPressed = false;
			exit(0);
		}
	}
	else
		glColor3f(0, 0, 0);
	displayRasterText(-100, -170, 0.4, "    Quit");
```

```
	glutPostRedisplay();
}

void backButton() {
	if (mouseX <= -450 && mouseX >= -500 && mouseY >= -275 && mouseY <= -
250) {
		glColor3f(0, 0, 1);
		if (mButtonPressed) {
			viewPage = MENU;
			mButtonPressed = false;
			//instructionsGame = false;
			glutPostRedisplay();
		}
	}
	else glColor3f(1, 0, 0);
	displayRasterText(-1000, -550, 0, "Back");
}

void instructionsScreenDisplay()
{
	glClear(GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT);
	//SetDisplayMode(MENU_SCREEN);
	//colorBackground();
	glColor3f(1, 0, 0);
	displayRasterText(-900, 550, 0.4, "INSTRUCTIONS");
	glColor3f(1, 0, 0);
	displayRasterText(-1000, 400, 0.4, "PLAYER 1");
	displayRasterText(200, 400, 0.4, "PLAYER 2");
	glColor3f(1, 1, 1);
	displayRasterText(-1100, 300, 0.4, "Key 'w' to move up.");
	displayRasterText(-1100, 200, 0.4, "Key 's' to move down.");
	displayRasterText(-1100, 100, 0.4, "Key 'd' to move right.");
	displayRasterText(-1100, 0, 0.4, "Key 'a' to move left.");
	displayRasterText(100, 300, 0.4, "Key 'i' to move up.");
	displayRasterText(100, 200, 0.4, "Key 'k' to move down.");
	displayRasterText(100, 100, 0.4, "Key 'j' to move right.");
	displayRasterText(100, 0, 0.4, "Key 'l' to move left.");
```

```
	displayRasterText(-1100, -100, 0.4, "Key 'c' to shoot, Use 'w' and 's' to change direction.");
	displayRasterText(100, -100, 0.4, "Key 'm' to shoot, Use 'i' and 'k' to change direction.");
	//displayRasterText(-1100 ,-100 ,0.4 ,"The packet can be placed only when 's' is pressed before.");
	displayRasterText(-1100, -300, 0.4, "The Objective is to kill your opponent.");
	displayRasterText(-1100, -370, 0.4, "Each time a player gets shot, LIFE decreases by 5 points.");
	backButton();
	//if(previousScreen)
	//	nextScreen = false ,previousScreen = false; //as set by backButton()
}

void DrawAlienBody(bool isPlayer1)
{
	if (isPlayer1)
		glColor3f(0, 1, 0);
	else
		glColor3f(1, 1, 0);			//BODY color
	glBegin(GL_POLYGON);
	for (int i = 0; i <= 8; i++)
		glVertex2fv(AlienBody[i]);
	glEnd();

	glColor3f(0, 0, 0);				//BODY Outline
	glLineWidth(1);
	glBegin(GL_LINE_STRIP);
	for (int i = 0; i <= 8; i++)
		glVertex2fv(AlienBody[i]);
	glEnd();

	glBegin(GL_LINES);		//BODY effect
	glVertex2f(-13, 11);
	glVertex2f(-15, 9);
	glEnd();
}
void DrawAlienCollar()
```

```
{
	glColor3f(1, 0, 0);				//COLLAR
	glBegin(GL_POLYGON);
	for (int i = 0; i <= 20; i++)
		glVertex2fv(AlienCollar[i]);
	glEnd();

	glColor3f(0, 0, 0);				//COLLAR outline
	glBegin(GL_LINE_STRIP);
	for (int i = 0; i <= 20; i++)
		glVertex2fv(AlienCollar[i]);
	glEnd();
}
void DrawAlienFace(bool isPlayer1)
{
	//glColor3f(0.6,0.0,0.286);				//FACE
	//glColor3f(0.8,0.2,0.1);
	//glColor3f(0,0.5,1);
	//if(isPlayer1)
	glColor3f(0, 0, 1);
	// else
	//	glColor3f(0,1,0);

	glBegin(GL_POLYGON);
	for (int i = 0; i <= 42; i++)
		glVertex2fv(ALienFace[i]);
	glEnd();

	glColor3f(0, 0, 0);				//FACE outline
	glBegin(GL_LINE_STRIP);
	for (int i = 0; i <= 42; i++)
		glVertex2fv(ALienFace[i]);
	glEnd();

	glBegin(GL_LINE_STRIP);	//EAR effect
	glVertex2f(3.3, 22);
```

```
	glVertex2f(4.4, 23.5);
	glVertex2f(6.3, 26);
	glEnd();
}
void DrawAlienBeak()
{
	glColor3f(1, 1, 0);				//BEAK color
	glBegin(GL_POLYGON);
	for (int i = 0; i <= 14; i++)
		glVertex2fv(ALienBeak[i]);
	glEnd();

	glColor3f(0, 0, 0);				//BEAK outline
	glBegin(GL_LINE_STRIP);
	for (int i = 0; i <= 14; i++)
		glVertex2fv(ALienBeak[i]);
	glEnd();
}
void DrawAlienEyes(bool isPlayer1)
{
	// if(isPlayer1)
	glColor3f(0, 1, 1);
	// else
	//	glColor3f(0,0,0);

	glPushMatrix();
	glRotated(-10, 0, 0, 1);
	glTranslated(-6, 32.5, 0);	//Left eye
	glScalef(2.5, 4, 0);
	glutSolidSphere(1, 20, 30);
	glPopMatrix();

	glPushMatrix();
	glRotated(-1, 0, 0, 1);
	glTranslated(-8, 36, 0);					//Right
eye
	glScalef(2.5, 4, 0);
```

```
	glutSolidSphere(1, 100, 100);
	glPopMatrix();
}
void DrawAlien(bool isPlayer1)
{
	DrawAlienBody(isPlayer1);
	DrawAlienCollar();
	DrawAlienFace(isPlayer1);
	DrawAlienBeak();
	DrawAlienEyes(isPlayer1);
}
void DrawSpaceshipBody(bool isPlayer1)
{
	if (isPlayer1)
		glColor3f(1, 0, 0);			//BASE
	else
		glColor3f(0.5, 0, 0.5);

	glPushMatrix();
	glScalef(70, 20, 1);
	glutSolidSphere(1, 50, 50);
	glPopMatrix();

	glPushMatrix();						//LIGHTS
	glScalef(3, 3, 1);
	glTranslated(-20, 0, 0);		//1
	glColor3fv(LightColor[(CI + 0) % 3]);
	glutSolidSphere(1, 1000, 1000);
	glTranslated(5, 0, 0);				//2
	glColor3fv(LightColor[(CI + 1) % 3]);
	glutSolidSphere(1, 1000, 1000);
	glTranslated(5, 0, 0);				//3
	glColor3fv(LightColor[(CI + 2) % 3]);
	glutSolidSphere(1, 1000, 1000);
	glTranslated(5, 0, 0);				//4
	glColor3fv(LightColor[(CI + 0) % 3]);
```

```
	glutSolidSphere(1, 1000, 1000);
	glTranslated(5, 0, 0);                          //5
	glColor3fv(LightColor[(CI + 1) % 3]);
	glutSolidSphere(1, 1000, 1000);
	glTranslated(5, 0, 0);                          //6
	glColor3fv(LightColor[(CI + 2) % 3]);
	glutSolidSphere(1, 1000, 1000);
	glTranslated(5, 0, 0);                          //7
	glColor3fv(LightColor[(CI + 0) % 3]);
	glutSolidSphere(1, 1000, 1000);
	glTranslated(5, 0, 0);                          //8
	glColor3fv(LightColor[(CI + 1) % 3]);
	glutSolidSphere(1, 1000, 1000);
	glTranslated(5, 0, 0);                          //9
	glColor3fv(LightColor[(CI + 2) % 3]);
	glutSolidSphere(1, 1000, 1000);

	glPopMatrix();
}
void DrawSteeringWheel()
{
	glPushMatrix();
	glLineWidth(3);
	glColor3f(0.20, 0., 0.20);
	glScalef(7, 4, 1);
	glTranslated(-1.9, 5.5, 0);
	glutWireSphere(1, 8, 8);
	glPopMatrix();

}
void DrawSpaceshipDoom()
{
	glColor4f(0.7, 1, 1, 0.0011);
	glPushMatrix();
	glTranslated(0, 30, 0);
	glScalef(35, 50, 1);
```

```
	glutSolidSphere(1, 50, 50);
	glPopMatrix();
}

void DrawLaser(int x, int y, bool dir[]) {
	//glPushMatrix();
	int xend = -XMAX, yend = y;
	if (dir[0])
		yend = YMAX;
	else if (dir[1])
		yend = -YMAX;
	glLineWidth(5);
	glColor3f(1, 0, 0);
	glBegin(GL_LINES);
	glVertex2f(x, y);
	glVertex2f(xend, yend);
	glEnd();
	//glPopMatrix();
}

void SpaceshipCreate(int x, int y, bool isPlayer1) {
	glPushMatrix();
	glTranslated(x, y, 0);
	DrawSpaceshipDoom();
	glPushMatrix();
	glTranslated(4, 19, 0);
	DrawAlien(isPlayer1);
	glPopMatrix();
	DrawSteeringWheel();
	DrawSpaceshipBody(isPlayer1);
	glEnd();
	glPopMatrix();
}

void DisplayHealthBar1() {
	char temp1[40];
```

```
	glColor3f(1, 1, 1);
	sprintf_s(temp1, "  LIFE = %d", alienLife1);
	displayRasterText(-1100, 600, 0.4, temp1);
	glColor3f(1, 0, 0);
}

void DisplayHealthBar2() {
	char temp2[40];
	glColor3f(1, 1, 1);
	sprintf_s(temp2, "  LIFE = %d", alienLife2);
	displayRasterText(800, 600, 0.4, temp2);
	glColor3f(1, 0, 0);
}

void checkLaserContact(int x, int y, bool dir[], int xp, int yp, bool player1) {
	int xend = -XMAX, yend = y;
	xp += 8; yp += 8; // moving circle slightly up to fix laser issue
	if (dir[0])
		yend = YMAX;
	else if (dir[1])
		yend = -YMAX;

	// Here we find out if the laser(line) intersects with spaceship(circle)
	// by solving the equations for the same and finding the discriminant of the
	// quadratic equation obtained
	float m = (float)(yend - y) / (float)(xend - x);
	float k = y - m * x;
	int r = 50; // approx radius of the spaceship

	//calculating value of b, a, and c needed to find discriminant
	float b = 2 * xp - 2 * m * (k - yp);
	float a = 1 + m * m;
	float c = xp * xp + (k - yp) * (k - yp) - r * r;

	float d = (b * b - 4 * a * c); // discriminant for the equation
	printf("\nDisc: %f x: %d, y: %d, xp: %d, yp: %d", d, x, y, xp, yp);
```

```
	if (d >= 0) {
		if (player1)
			alienLife1 -= 5;
		else
			alienLife2 -= 5;

		printf("%d %d\n", alienLife1, alienLife2);
	}
}

void gameScreenDisplay()
{
	DisplayHealthBar1();
	DisplayHealthBar2();
	glScalef(2, 2, 0);

	if (alienLife1 > 0) {
		SpaceshipCreate(xOne, yOne, true);
		if (laser1) {
			DrawLaser(xOne, yOne, laser1Dir);
			checkLaserContact(xOne, yOne, laser1Dir, -xTwo, yTwo, true);
		}
	}
	else {
		viewPage = GAMEOVER;
	}

	if (alienLife2 > 0) {
		glPushMatrix();
		glScalef(-1, 1, 1);
		SpaceshipCreate(xTwo, yTwo, false);
		if (laser2) {
			DrawLaser(xTwo, yTwo, laser2Dir);
			checkLaserContact(xTwo, yTwo, laser2Dir, -xOne, yOne, false);
		}
		glPopMatrix();
```

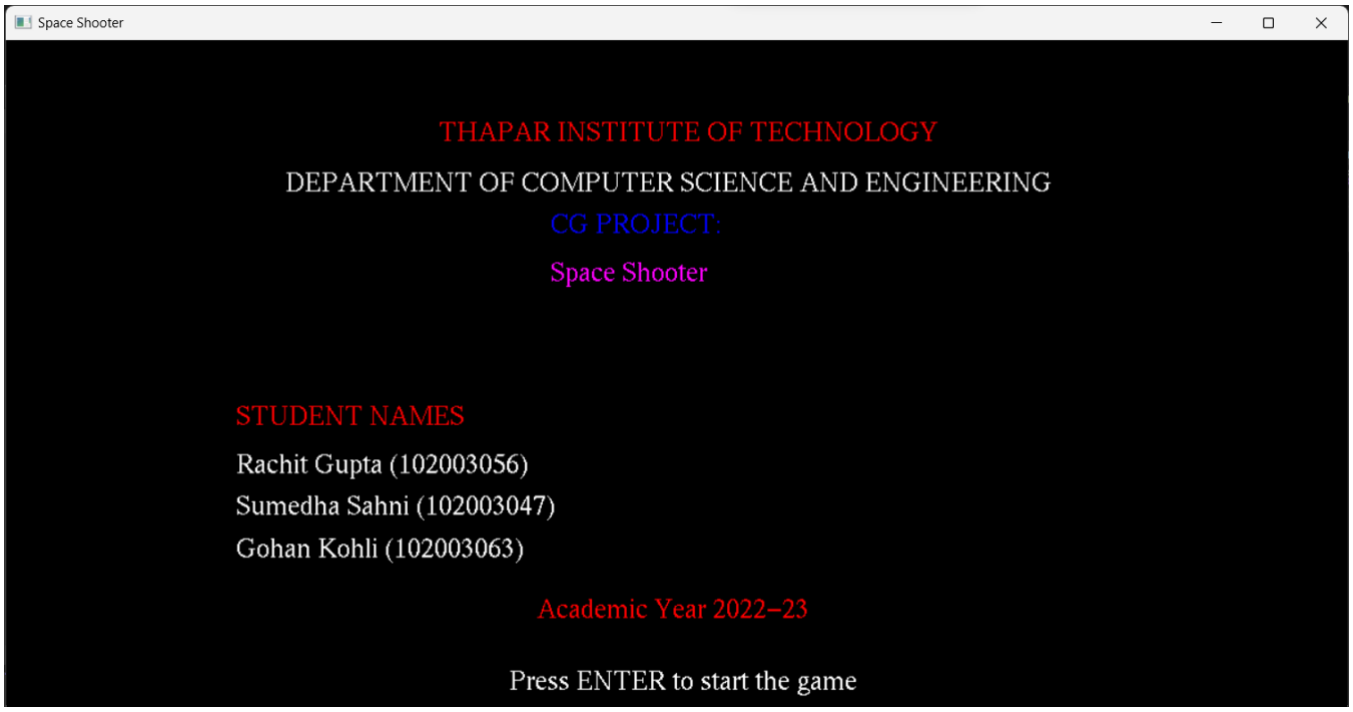
```
	}
	else {
		viewPage = GAMEOVER;
	}

	if (viewPage == GAMEOVER) {
		xOne = xTwo = 500;
		yOne = yTwo = 0;
	}
}

void displayGameOverMessage() {
	glColor3f(1, 1, 0);
	const char* message;
	if (alienLife1 > 0)
		message = "Game Over! Player 1 won the game";
	else
		message = "Game Over! Player 2 won the game";

	displayRasterText(-350, 600, 0.4, message);
}

void keyOperations() {
	if (keyStates[13] == true && viewPage == INTRO) {
		viewPage = MENU;
		printf("view value changed to %d", viewPage);
		printf("enter key pressed\n");
	}
	if (viewPage == GAME) {
		laser1Dir[0] = laser1Dir[1] = false;
		laser2Dir[0] = laser2Dir[1] = false;
		if (keyStates['c'] == true) {
			laser2 = true;
			if (keyStates['w'] == true)		laser2Dir[0] = true;
			if (keyStates['s'] == true)		laser2Dir[1] = true;
		}
```

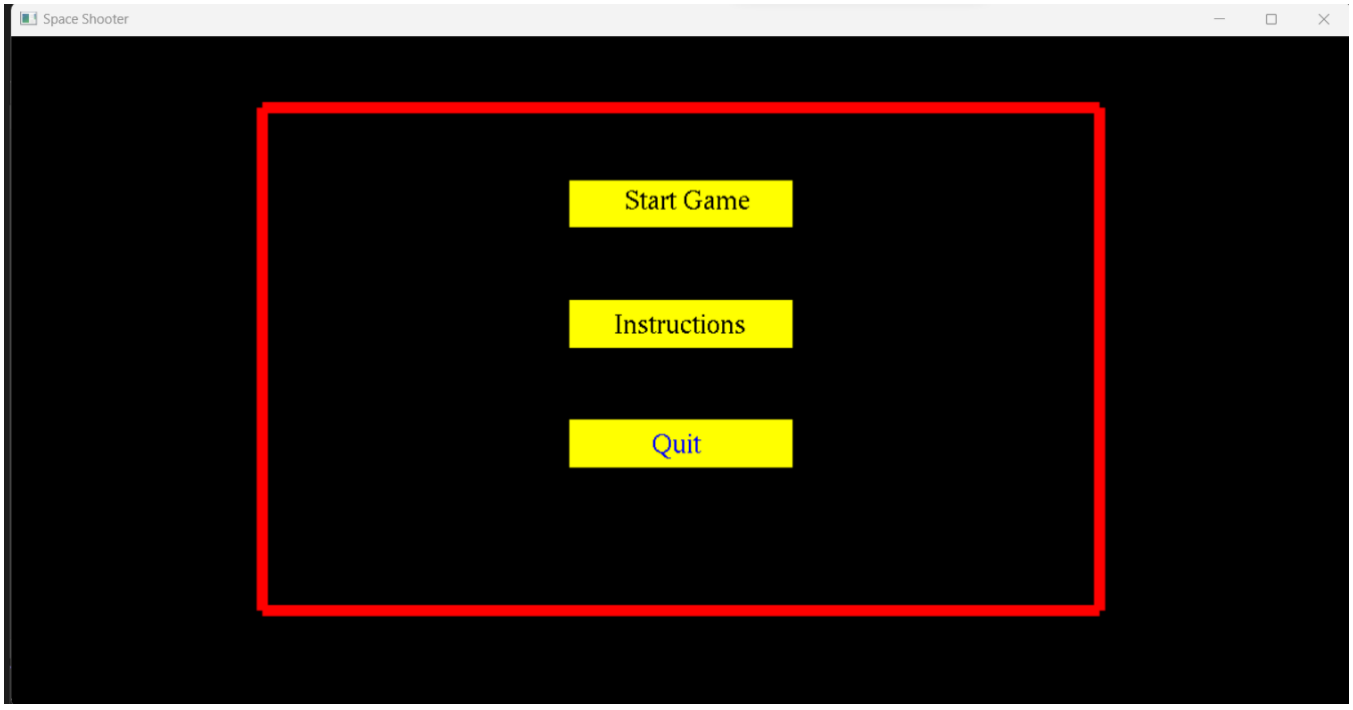
```
                else {
                        laser2 = false;
                        if (keyStates['d'] == true) xTwo -= SPACESHIP_SPEED;
                        if (keyStates['a'] == true) xTwo += SPACESHIP_SPEED;
                        if (keyStates['w'] == true) yTwo += SPACESHIP_SPEED;
                        if (keyStates['s'] == true) yTwo -= SPACESHIP_SPEED;
                }

                if (keyStates['m'] == true) {
                        laser1 = true;
                        if (keyStates['i'] == true) laser1Dir[0] = true;
                        if (keyStates['k'] == true) laser1Dir[1] = true;
                }
                else {
                        laser1 = false;
                        if (keyStates['l'] == true) xOne += SPACESHIP_SPEED;
                        if (keyStates['j'] == true) xOne -= SPACESHIP_SPEED;
                        if (keyStates['i'] == true) yOne += SPACESHIP_SPEED;
                        if (keyStates['k'] == true) yOne -= SPACESHIP_SPEED;
                }
        }
}

void display()
{
        keyOperations();
        glClear(GL_COLOR_BUFFER_BIT);

        switch (viewPage)
        {
        case INTRO:
                introScreen();
                break;
        case MENU:
                startScreenDisplay();
                break;
```

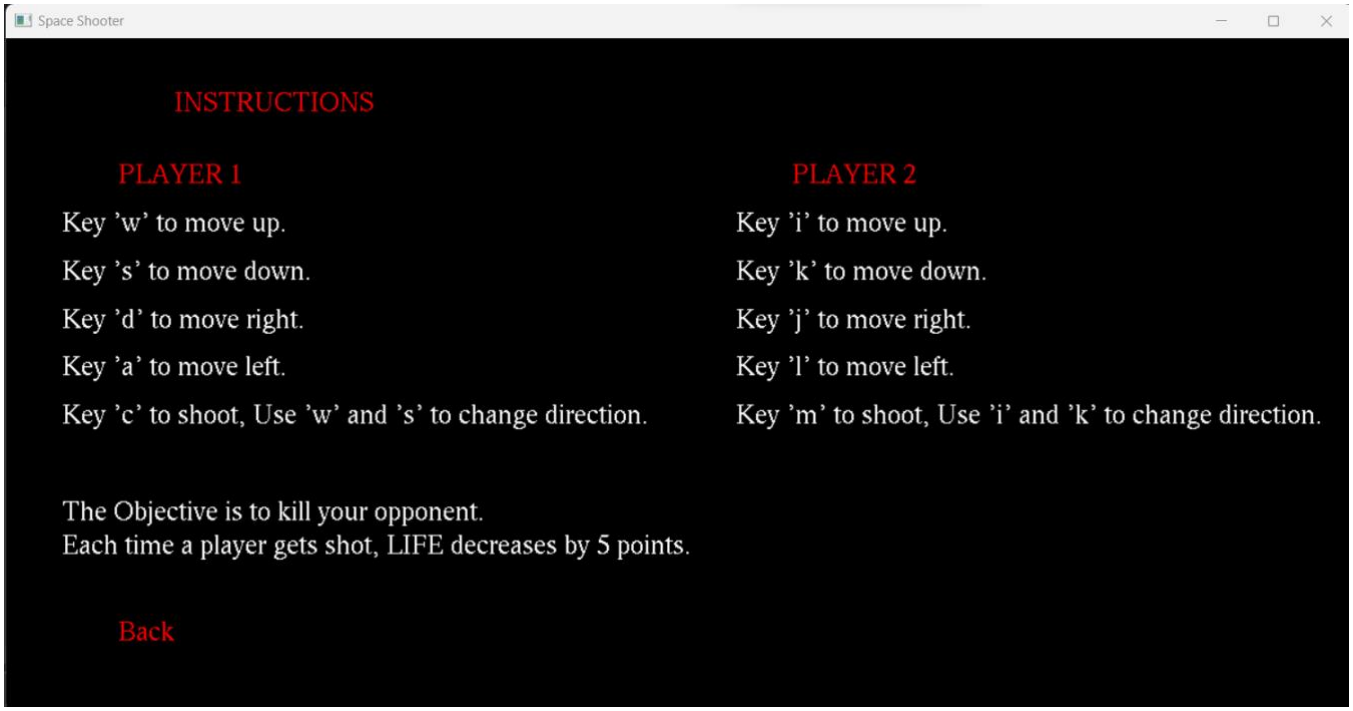
```
	case INSTRUCTIONS:
		instructionsScreenDisplay();
		break;
	case GAME:
		gameScreenDisplay();
		//reset scaling values
		glScalef(1 / 2, 1 / 2, 0);
		break;
	case GAMEOVER:
		displayGameOverMessage();
		startScreenDisplay();
		break;
	}

	glFlush();
	glLoadIdentity();
	glutSwapBuffers();
}



void passiveMotionFunc(int x, int y) {

	//when mouse not clicked
	mouseX = float(x) / (m_viewport[2] / 1200.0) - 600.0;  //converting screen
resolution to ortho 2d spec
	mouseY = -(float(y) / (m_viewport[3] / 700.0) - 350.0);

	//Do calculations to find value of LaserAngle
	//somethingMovedRecalculateLaserAngle();
	glutPostRedisplay();
}

void mouseClick(int buttonPressed, int state, int x, int y) {

	if (buttonPressed == GLUT_LEFT_BUTTON && state == GLUT_DOWN)
		mButtonPressed = true;
	else
```

```
                mButtonPressed = false;
        glutPostRedisplay();
}

void keyPressed(unsigned char key, int x, int y)
{
        keyStates[key] = true;
        glutPostRedisplay();
}

void refresh() {
        glutPostRedisplay();
}

void keyReleased(unsigned char key, int x, int y) {
        keyStates[key] = false;
}

int main(int argc, char** argv)
{
        glutInit(&argc, argv);
        glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB);
        glutInitWindowPosition(0, 0);
        glutInitWindowSize(1200, 600);
        glutCreateWindow("Space Shooter");
        init();
        glutIdleFunc(refresh);
        glutKeyboardFunc(keyPressed);
        glutKeyboardUpFunc(keyReleased);
        glutMouseFunc(mouseClick);
        glutPassiveMotionFunc(passiveMotionFunc);
        glGetIntegerv(GL_VIEWPORT, m_viewport);
        glutDisplayFunc(display);
        glutMainLoop();
}
```

SCREEN SHOTS :






Space Shooter
INSTRUCTIONS
PLAYER 1
Key 'w' to move up.
Key 's' to move down.
Key 'd' to move right.
Key 'a' to move left.
Key 'c' to shoot, Use 'w' and 's' to change direction.
PLAYER 2
Key 'i' to move up.
Key 'k' to move down.
Key 'j' to move right.
Key 'l' to move left.
Key 'm' to shoot, Use 'i' and 'k' to change direction.
The Objective is to kill your opponent.
Each time a player gets shot, LIFE decreases by 5 points.
Back


Space Shooter
LIFE = 100
LIFE = 60


```
view value changed to 1enter key pressed
instruction button pressed

Disc: 9744.000000 x: 500, y: 0, xp: -492, yp: 8100 95

Disc: 9744.000000 x: 500, y: 0, xp: -492, yp: 8100 90

Disc: 9744.000000 x: 500, y: 0, xp: -492, yp: 8100 85

Disc: 9744.000000 x: 500, y: 0, xp: -492, yp: 8100 80

Disc: 9744.000000 x: 500, y: 0, xp: -492, yp: 8100 75

Disc: 9744.000000 x: 500, y: 0, xp: -492, yp: 8100 70

Disc: 9744.000000 x: 500, y: 0, xp: -492, yp: 8100 65

Disc: 9744.000000 x: 500, y: 0, xp: -492, yp: 8100 60

Disc: 9744.000000 x: 500, y: 0, xp: -492, yp: 8100 55

Disc: 9744.000000 x: 500, y: 0, xp: -492, yp: 8100 50

Disc: 9744.000000 x: 500, y: 0, xp: -492, yp: 8100 45

Disc: 9744.000000 x: 500, y: 0, xp: -492, yp: 8100 40

Disc: 9744.000000 x: 500, y: 0, xp: -492, yp: 8100 35

Disc: 9744.000000 x: 500, y: 0, xp: -492, yp: 8100 30
```