Mini Project

Moving Bus on the Road

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Abstract: This project aims to create a 3D animation of a moving bus on a road using OpenGL and Dev C++. The bus and road models are created using basic OpenGL primitives and the motion of the bus is controlled by specifying its position and orientation at each frame. User interaction is incorporated by allowing the user to control the bus's motion and camera viewpoint. The camera viewpoint is set up using the gluLookAt function. The project demonstrates the versatility and potential of OpenGL and Dev C++ for creating interactive 3D environments. The project will be implemented using Dev C++ and the OpenGL library. Overall, the project involves a combination of basic OpenGL graphics programming, animation techniques, and user interaction to create an engaging and interactive 3D environment.

Key Words: OpenGL, Dev C++, GL Functions, 3D Graphics, Moving Bus.

Introduction: OpenGL is a powerful graphics library widely used for creating 2D and 3D graphics applications. It provides a set of functions and tools for rendering high-quality graphics and animation in real-time. One of the most popular applications of OpenGL is in game development, where it is used to create immersive and interactive game environments.

This project aims to demonstrate the capabilities of OpenGL by creating a 3D animation of a moving bus on the road with a traffic light using C++ as the programming language and Dev C++ as the development environment. The project involves designing and implementing a realistic 3D model of a bus, a road, and a traffic light.

The project incorporates user interaction by allowing the user to control the bus's motion, but the traffic light is controlled by a timer. The timer changes the color of the traffic light at specific intervals, adding a realistic element to the animation.

The project showcases the power and versatility of OpenGL graphics programming and C++ as a development language for creating complex and realistic 3D environments. By including a traffic light, this project provides an opportunity to create an immersive and engaging experience that simulates a moving bus on the road with realistic traffic signals. By incorporating both user interaction and dynamic traffic signals, this project aims to demonstrate the potential of OpenGL and C++ for creating immersive and realistic 3D graphics applications that simulate real-world scenarios.

Methodology: OpenGL using Dev C++

Code:

```
#include<windows.h>
#ifdef __APPLE__
#include <GLUT/glut.h>
#else
#include <GL/glut.h>
#endif
#include <stdlib.h>
#include <math.h>

float p=0.0;
void circle(GLfloat rx, GLfloat ry, GLfloat cx, GLfloat cy)
{
  glBegin(GL_TRIANGLE_FAN);
   glVertex2f(cx,cy);
  for(int i=0; i<100; i++)
  {
      float angle = 4.0f * 3.1416f * i/100;
     float x = rx * cosf(angle);
      float y = ry * sinf(angle);
     glVertex2f((x+cx),(y+cy));
   }
   glEnd();
}
void display(void)
{
   glClear (GL_COLOR_BUFFER_BIT);
```

```
glBegin(GL_QUADS);
//making lower side
glColor3f (0.0, 1.0, 0.0);
glVertex3f (0, 0, 0.0);
glVertex3f (60, 0, 0.0);
glVertex3f (60, 5, 0.0);
glVertex3f (0, 5, 0.0);
//Road side
glColor3f (0.0, 0.0, 0.0);
glVertex3f (0, 5, 0.0);
glVertex3f (60,5, 0.0);
glVertex3f (60, 20, 0.0);
glVertex3f (0, 20, 0.0);
//Upper side
glColor3f (0.0, 1.0, 0.0);
glVertex3f (0, 20, 0.0);
glVertex3f (60, 20, 0.0);
glVertex3f (60, 40, 0.0);
glVertex3f (0, 40, 0.0);
//Upper road
glColor3f (0.0, 0.0, 0.0);
glVertex3f (20, 20, 0.0);
glVertex3f (35, 20, 0.0);
glVertex3f (30, 40, 0.0);
glVertex3f (15, 40, 0.0);
  //Move code
  if(p<=100)
  p=p-0.005;
```

```
      else
        p=0;
    glutPostRedisplay();
     //bus body
    glColor3f (1, 0, 0);
    glVertex3f (p+45, 17, 0.0);
    glVertex3f (p+45, 22, 0.0);
    glVertex3f (p+58, 22, 0.0);
    glVertex3f (p+58, 17, 0.0);
    //bus body sider
    glVertex3f (p+42, 17, 0.0);
    glVertex3f (p+42, 20, 0.0);
    glVertex3f (p+45, 20, 0.0);
    glVertex3f (p+45, 17, 0.0);
   //bus windows 1
    glColor3f (0,1,1);
    glVertex3f (p+45.2, 19, 0.0);
    glVertex3f (p+45.2, 21, 0.0);
    glVertex3f (p+47, 21, 0.0);
    glVertex3f (p+47, 19, 0.0);
//door
    glColor3f (1, 1, 1);
    glVertex3f (p+47.2, 17, 0.0);
    glVertex3f (p+47.2, 21, 0.0);
    glVertex3f (p+49, 21, 0.0);
    glVertex3f (p+49, 17, 0.0);
     //windows 1 (side by side windows)
    glColor3f (0,1,1);
```

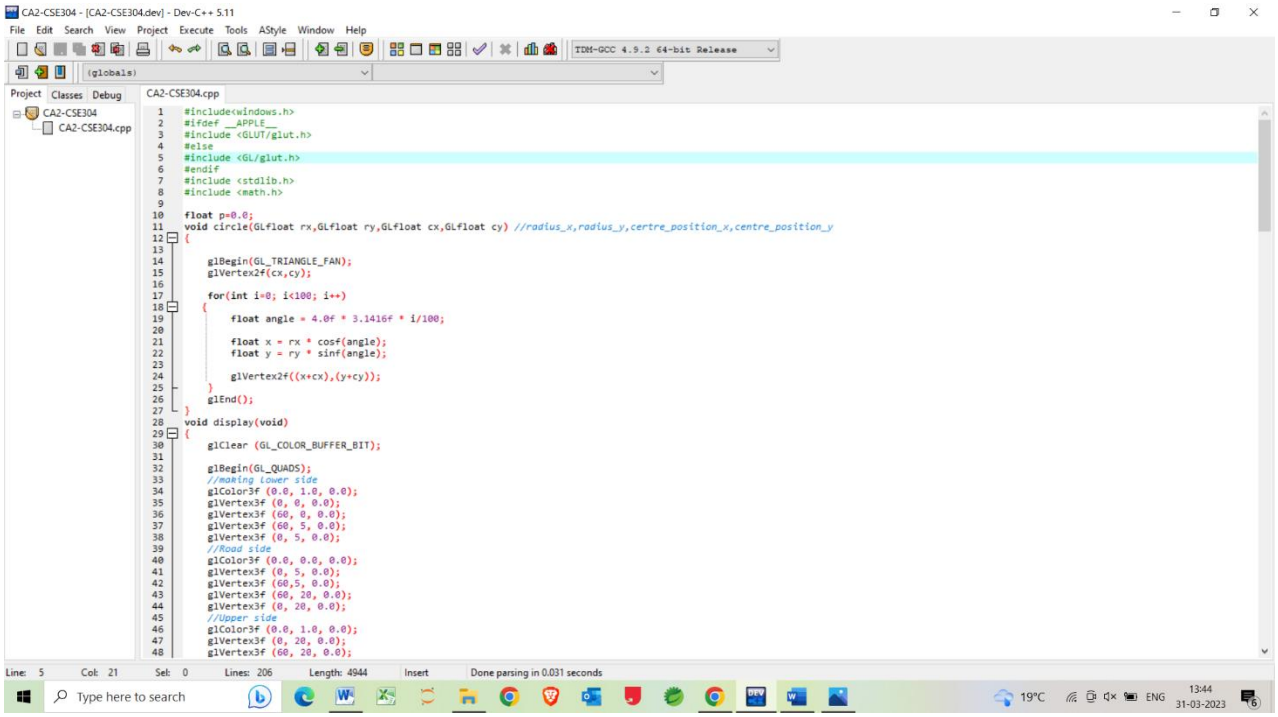
```
    glVertex3f (p+50, 19, 0.0);
    glVertex3f (p+50, 21, 0.0);
    glVertex3f (p+52.5, 21, 0.0);
    glVertex3f (p+52.5, 19, 0.0);
    //windows 2
    glVertex3f (p+53, 19, 0.0);
    glVertex3f (p+53, 21, 0.0);
    glVertex3f (p+55.5, 21, 0.0);
    glVertex3f (p+55.5, 19, 0.0);
    //windows 3
    glVertex3f (p+56, 19, 0.0);
    glVertex3f (p+56, 21, 0.0);
    glVertex3f (p+58, 21, 0.0);
    glVertex3f (p+58, 19, 0.0);
    glEnd();
    //bus fornt windows
    glBegin(GL_TRIANGLES);
    glColor3f (0,1,1);
    glVertex3f (p+42, 20, 0.0);
    glVertex3f (p+45, 20, 0.0);
    glVertex3f (p+45, 22, 0.0);
    glEnd();
    glColor3f (0.224, 0.255, 0.255);
    circle(1,1,p+45,17);
    circle(1,1,p+55,17);
    glBegin(GL_QUADS);

//Taffic Light part start
```

```
//Traffic light bottom 1
glColor3f (0.224, 0.255, 0.255);
glVertex3f (35, 12, 0.0);
glVertex3f (35, 14, 0.0);
glVertex3f (40, 14, 0.0);
glVertex3f (40, 12, 0.0);
//Traffic light bottom 2
glVertex3f (36, 14, 0.0);
glVertex3f (36, 17, 0.0);
glVertex3f (39, 17, 0.0);
glVertex3f (39, 14, 0.0);
//Traffic light upper position
glVertex3f (35.5, 17, 0.0);
glVertex3f (35.5, 26, 0.0);
glVertex3f (39.5, 26, 0.0);
glVertex3f (39.5, 17, 0.0);
//light 1
glColor3f (0, 1, 0);
glVertex3f (36, 20, 0.0);
glVertex3f (36, 21, 0.0);
glVertex3f (39, 21, 0.0);
glVertex3f (39, 20, 0.0);
//light 2
glColor3f (1, 1, 0);
glVertex3f (36, 22, 0.0);
glVertex3f (36, 23, 0.0);
glVertex3f (39, 23, 0.0);
```

```
    glVertex3f (39, 22, 0.0);
    //light 3
    glColor3f (1, 0, 0);
    glVertex3f (36, 24, 0.0);
    glVertex3f (36, 25, 0.0);
    glVertex3f (39, 25, 0.0);
    glVertex3f (39, 24, 0.0);
    //Traffic light part stop
glEnd();
// Name and Registration Number
    glColor3f(1.0, 1.0, 1.0);
    glRasterPos2i(36, 6);
    char number[] = "11915065";
    char name[] = "Yerukola Vikas - ";
    for(int i=0;i<16;i++)
          {
          glutBitmapCharacter(GLUT_BITMAP_TIMES_ROMAN_24, name[i]);
          }
    for (int i = 0; i < 8; i++)
          {
        glutBitmapCharacter(GLUT_BITMAP_TIMES_ROMAN_24, number[i]);
    }
   glFlush ();
}
void init (void)
{
    glClearColor (0.0, 0.0, 0.0, 0.0);
    glLoadIdentity();
```

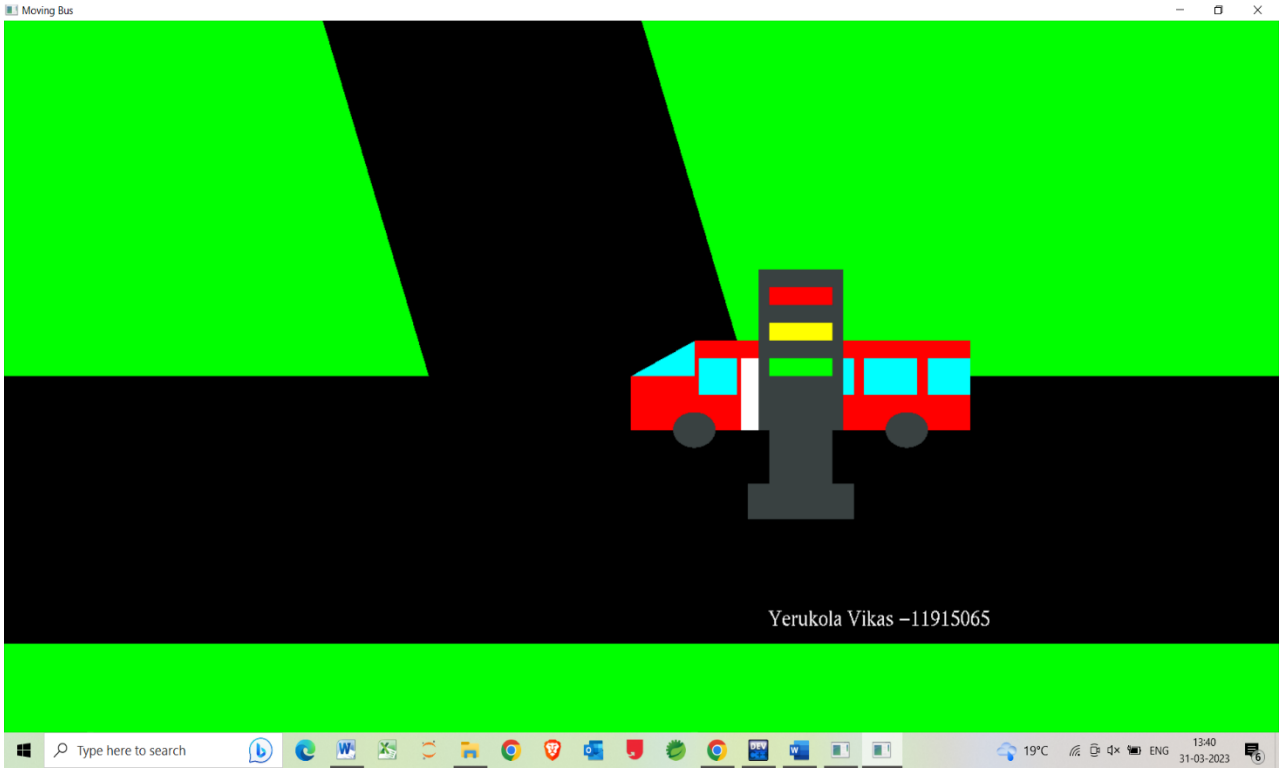
```
    glOrtho(0.0,60, 0.0, 40, -1.0, 1.0);
}
int main(int argc, char** argv)
{
    glutInit(&argc, argv);
    glutInitDisplayMode (GLUT_SINGLE | GLUT_RGB);
    glutInitWindowSize (720, 720);
    glutInitWindowPosition (100, 100);
    glutCreateWindow ("Moving Bus");
    init ();
    glutDisplayFunc(display);
    glutMainLoop();
    return 0;
}
```

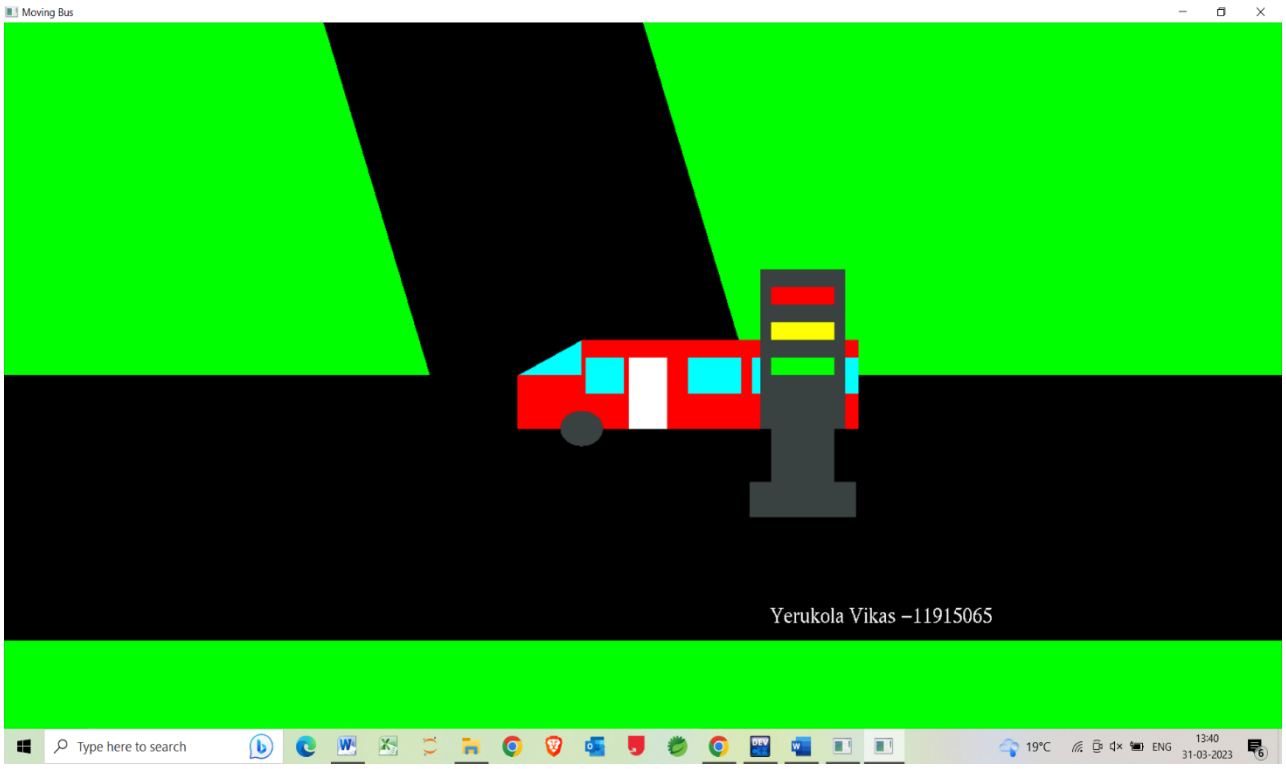
Snapshot of Project:

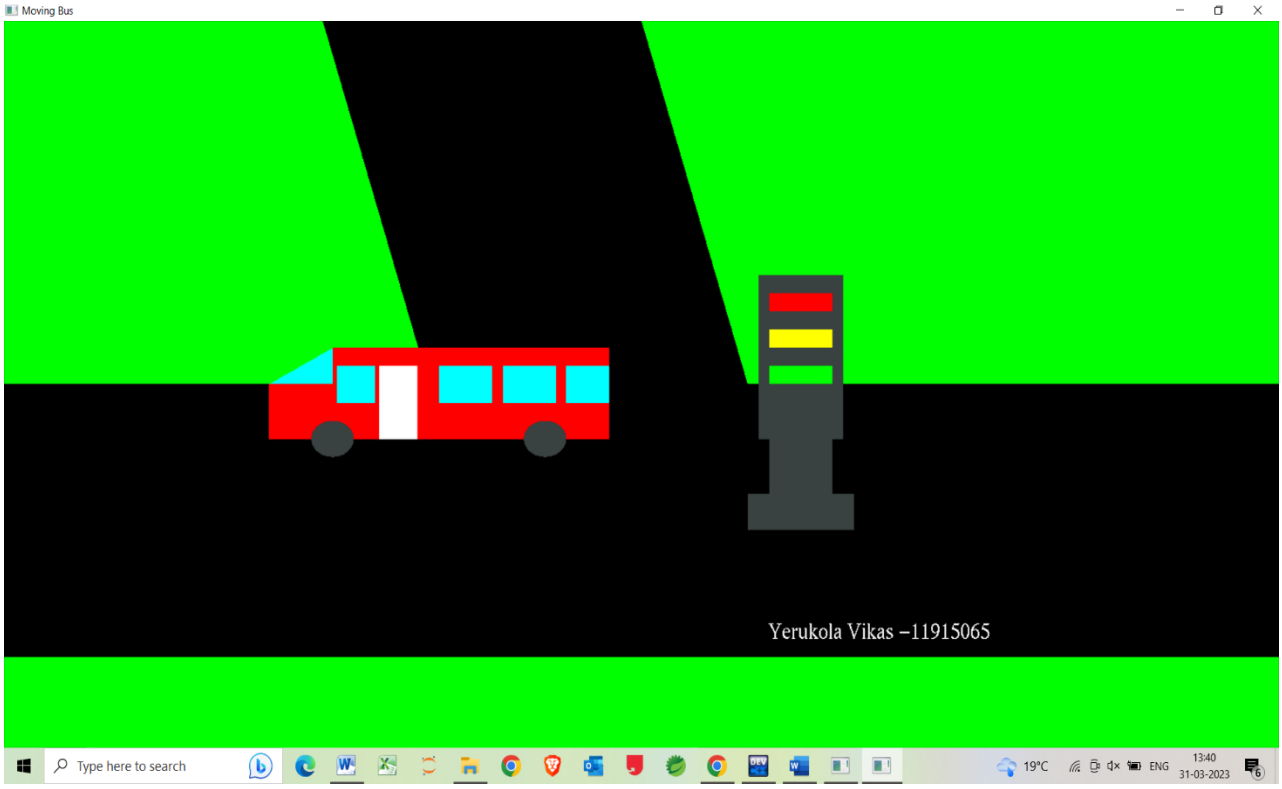


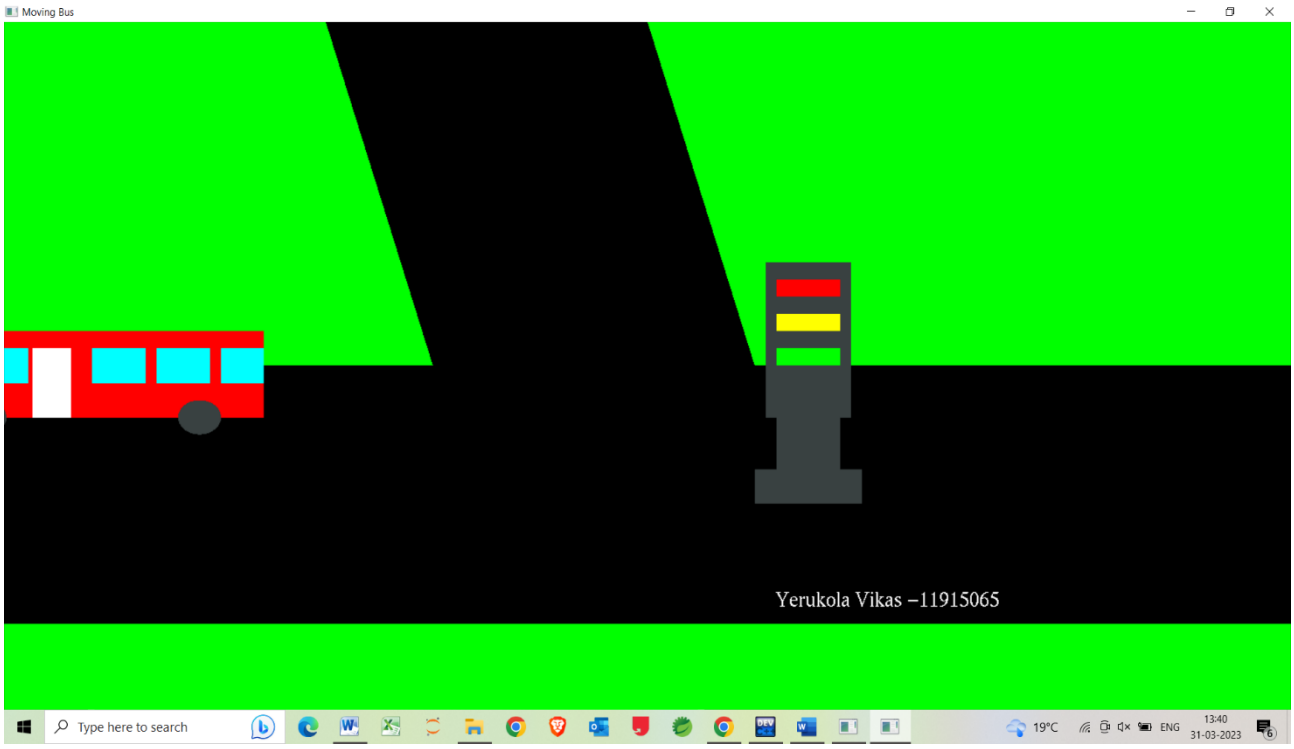
```
    glColor3f (1, 0, 0);
    glVertex3f (36, 24, 0.0);
    glVertex3f (36, 25, 0.0);
    glVertex3f (39, 25, 0.0);
    glVertex3f (39, 24, 0.0);

    //Traffic light part stop

    glEnd();
    glColor3f(1.0, 1.0, 1.0);
    glRasterPos2i(36, 6);
    char number[] = "11915065";
    char name[] = "Yerukola Vikas - ";
    for(int i=0;i<16;i++)
    {
        glutBitmapCharacter(GLUT_BITMAP_TIMES_ROMAN_24, name[i]);
    }
    for (int i = 0; i < 8; i++)
    {
        glutBitmapCharacter(GLUT_BITMAP_TIMES_ROMAN_24, number[i]);
    }


    glFlush ();

}

void init (void)
{
    glClearColor (0.0, 0.0, 0.0, 0.0);
    glLoadIdentity();


    glOrtho(0.0,60, 0.0, 40, -1.0, 1.0);
}

int main(int argc, char** argv)
{
    glutInit(&argc, argv);
    glutInitDisplayMode (GLUT_SINGLE | GLUT_RGB);
    glutInitWindowSize (720, 720);
    glutInitWindowPosition (100, 100);
    glutCreateWindow ("Moving Bus");
    init ();
    glutDisplayFunc(display);
    glutMainLoop();
    return 0;
}
```

Output:




Moving Bus
Yerukola Vikas –11915065
Type here to search
19°C
ENG
13:40
31-03-2023


Moving Bus
Yerukola Vikas –11915065
Type here to search
19°C
ENG
13:40
31-03-2023



Future Enhancement: Optimization for performance: The project could be enhanced by optimizing the code and graphics for performance, to ensure smooth animation and responsiveness even on lower-end hardware. This could involve improving the efficiency of the rendering code, minimizing the use of system resources, and testing the application on a range of hardware configurations to ensure compatibility.

The project could be enhanced by adding more interactive elements, such as pedestrians or obstacles on the road, to make the environment more dynamic and engaging. This could involve designing and implementing additional 3D models and animations for these elements, as well as adding more user controls to interact with them.

Conclusion: In conclusion, this project has successfully demonstrated the capabilities of OpenGL graphics programming and C++ as a development language for creating complex and realistic 3D environments that simulate real-world scenarios. By creating a 3D animation of a moving bus on the road with a traffic light using Dev C++, we have designed and implemented a realistic 3D model of a bus, a road, and a traffic light. The incorporation of user interaction and dynamic traffic signals has made this animation more engaging and realistic. The project includes a traffic light that changes color at specific intervals, adding an extra layer of realism to the animation.

References:

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- Computer Graphics Through OpenGL: From Theory to Experiments by Sumanta Guha