**COMPUTER GRAPHICS PROJECT**

" *Traffic Signal* "

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**AIM :** To write a program in OpenGL simulating a traffic signal. The traffic light is to be controlled by the user.

**SOFTWARES USED** :

* Windows 8.1 Professional
* Microsoft Visual Studio 2010 Professional
* OpenGL Libraries

**INTRODUCTION :**

The program is used to simulate a traffic signal with two moving cars. The traffic light is controlled by the user via the *Space Bar* key. The execution ensures smooth animation of the two vehicles with no collision. While one car moves from *Left* to *Right* of the screen, the other moves from *Top* to *Bottom*. The process is repeated indefinitely until the user decides to close the simulation. The code includes various conditions to avoid an *accident* i.e. a collision. The car keeps on moving if it's current position is at the junction and the traffic light is *Red* while the other car waits even though the light is *Green.* This is done to execute a real-time environment. It is understood that while the Traffic Light is either *Red* or *Green* for one car, it is the exact opposite for the other.

**EXPLANATION** :

* **void init()**

This function initializes the display window. The *glClearColor()* command sets White color for the display window with full opacity. *glColor3f()* sets the current drawing color to Black. *glMatrixMode()* selects the projection matrix for manipulation. *glLoadIdentity()* sets the current matrix to the identity matrix. *gluOrtho2D()* defines a 2D orthographic projects matrix with left and right horizontal and vertical clippings.

* **void keyboard (** unsigned char key, int x, int y **)**

This function is used to detect if the user has pressed the assigned key on the keyboard and to change the Traffic Light accordingly. The ASCII for the Space Bar is 32. *glutPostRedisplay()* calls the *display()* function when the application requests refreshing of the display window.

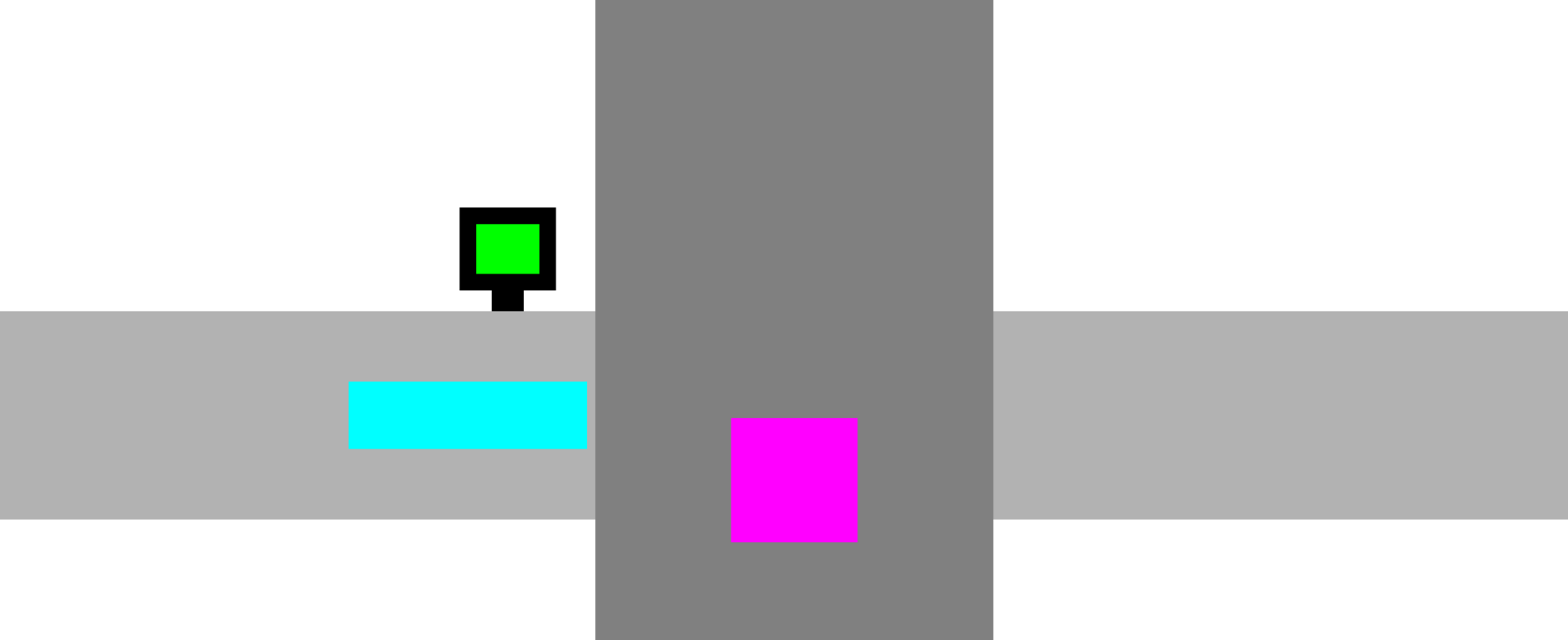
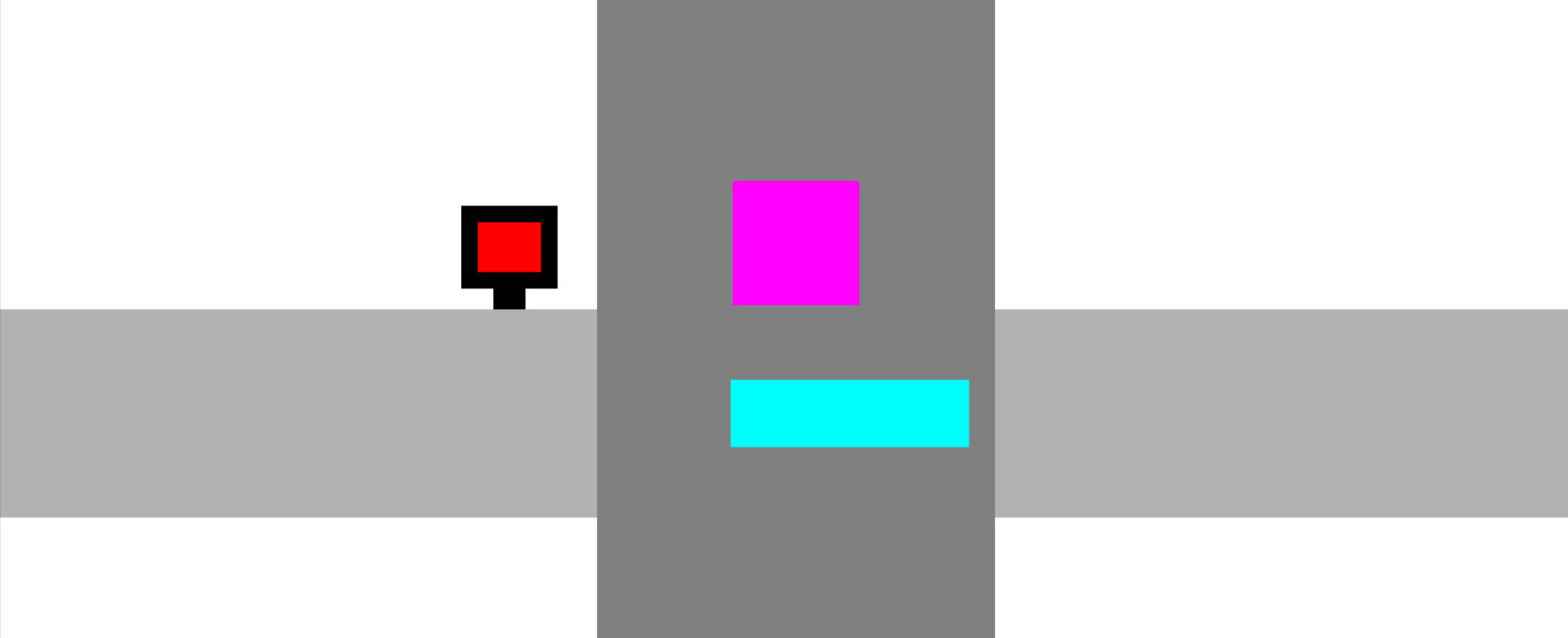
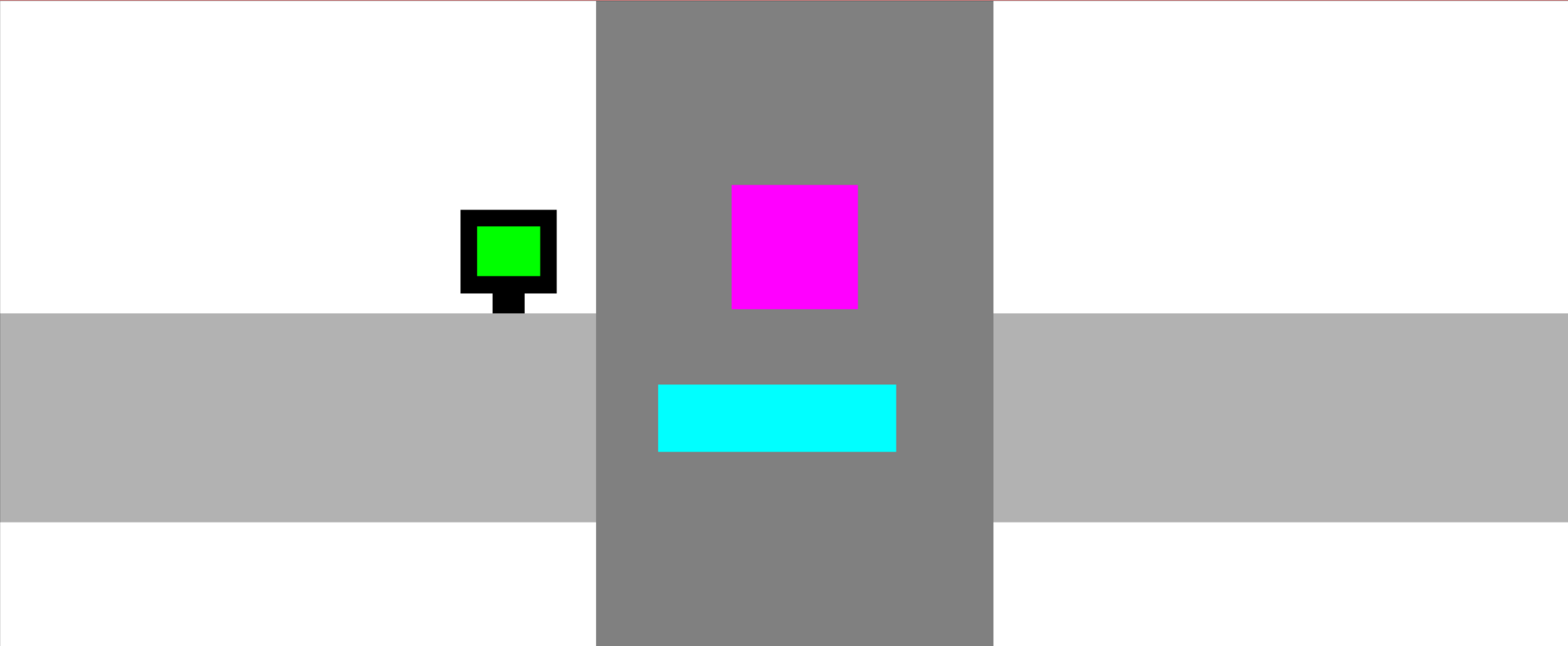
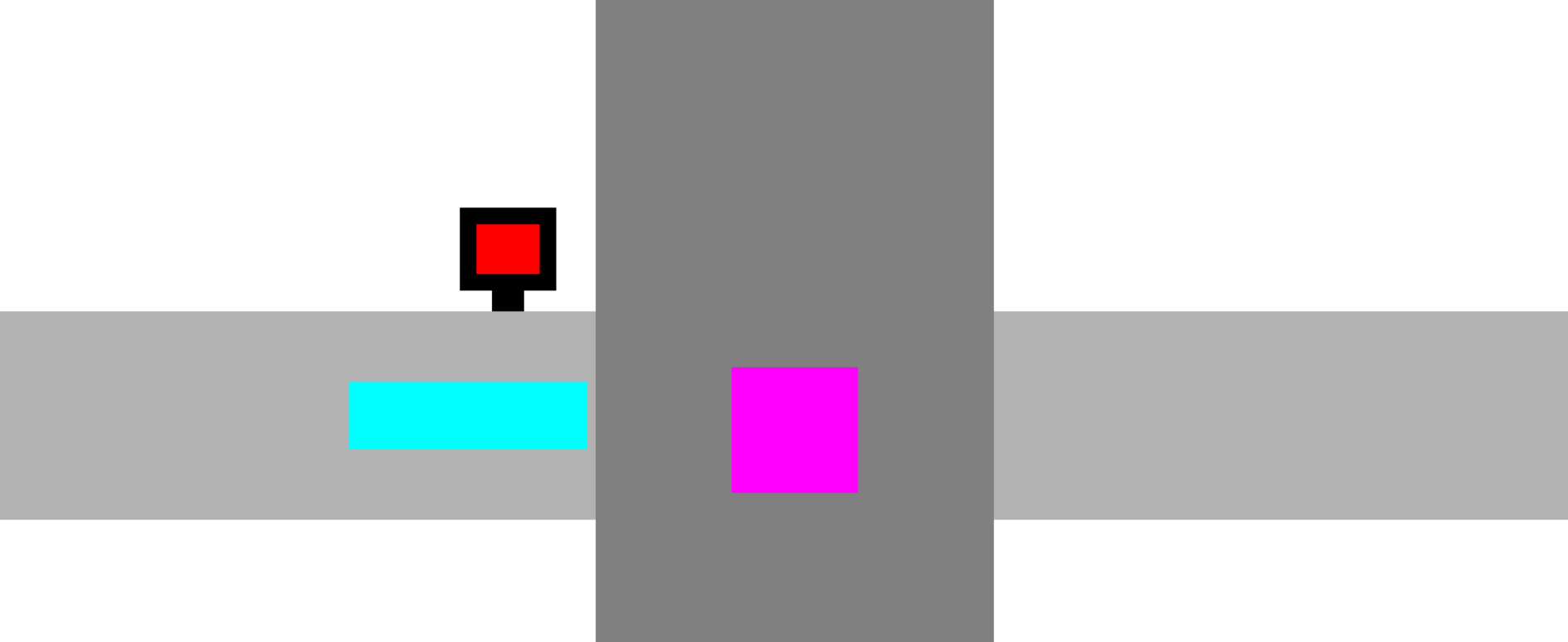
* **int main (** int argc, char \*\*argv **)**

The *glutInit()* command initializes the GLUT library. *glutCreateWindow()* creates an OpenGL window for rendering and interaction, with name displayed in its title bar. *glutKeyboardFunc()* registers the application function to call when OpenGL detects a key press generating an ASCII character. *glutInitWindowSize()* sets the value of GLUT's initial window size to the size specified by width and height, measured in pixels. *glutInitWindowPosition()* sets the value of GLUT's initial window position giving the position of the top left corner of the window measured in pixels from the top left corner of the X display. *glutInitDisplayMode()* sets the current display mode to double-buffered window with RGB display ( to ensure smoother animation ). *glutMainLoop()* starts the GLUT " event processing loop " which carries on as long as the program is running.

* **void display ()**

The *glClear()* command clears the window. *glRectf()* is used to draw rectangles with bottom left and top right co-ordinates passed as arguments. The function was used to create roads, cars and the traffic light. *glColor3f()* was used to defined the color of the rectangle fills. *glutSwapBuffers()* was used to swap the back buffer with the front buffer. The various " if " conditions ensured successful simulation of the traffic signal to avoid any accident/collision. *glutPostRedisplay()* called the display function whenever the display window needed to be refreshed.

**SNAPSHOTS** :



**CONCLUSION**

The traffic signal simulation was carried out via OpenGL successfully. The two cars moved without any collision and the simulation was smooth. The traffic light was controlled by the user wherein changing the light at any point did not give rise to an *accident*. The project enabled us to have a better understanding of animations, graphics and OpenGL as a whole. We would like to thank Dr. Anju Yadav who helped us throughout the making of the project.