VISVESVARAYA TECHNOLOGICAL UNIVERSITY

BELGAVI, KARNATAKA -590 018

A Mini-Project Report on

Maze Game

Submitted in partial fulfillment for the Computer Graphics Laboratory with Mini-Project (18CSL67) course of Sixth Semester of Bachelor of Engineering in Computer Science & Engineering during the academic year 2022-23.

By

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~~ CERTIFICATE ~~

Certified that the mini-project work entitled ***Maze Game*** *is a bonafide work carried out by* ***Dhyan Medappa B****(4MH20CS027) &* ***Mohammad Huzaifa Baig*** *(4MH20CS062) for the Computer Graphics Laboratory with Mini-Project (18CSL67) of Sixth Semester in Computer Science & Engineering under Visvesvaraya Technological University, Belgavi during academic year 2022- 23.*

It is certified that all corrections/suggestions indicated for Internal Assignment have been incorporated in the report. The report has been approved as it satisfies the course requirements.

_____	_____
Signature of Guide	Signature of the HOD
Prof. Ambika K B	**Dr. Shivamurthy R C**
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Name of the Examiners **Signature with date**

1)……

2) ……

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Dhyan Medappa B

Mohammad Huzaifa Baig

~~~ ABSTRACT ~~~

This abstract presents a project centered around the development of a maze game. The primary focus is to create an interactive and engaging gaming experience for players. The maze game is designed using computer graphics techniques and implemented in the C++ programming language with the assistance of OpenGL libraries.

The objective of the project is to challenge players to navigate through intricate and dynamically generated mazes. Players can control a character within the maze using keyboard inputs. By utilizing arrow keys, players can guide the character through the maze, seeking a path to the exit while avoiding obstacles and dead ends.

The game leverages OpenGL's graphics capabilities to render the maze environment in a visually captivating manner. The maze itself is procedurally generated, ensuring a unique and unpredictable experience for each playthrough. The game's immersive atmosphere is enhanced by lighting effects, sound effects, and appropriate visuals, contributing to an enjoyable and engaging gameplay experience.

Furthermore, the project focuses on user interaction and responsiveness. Real-time feedback is provided to the players as they navigate the maze, with instant responses to their keyboard inputs. This ensures a seamless and interactive gameplay flow, enhancing the overall gaming experience.

Overall, the maze game project aims to create an entertaining and visually appealing experience, where players can test their problem-solving and navigation skills within a challenging and dynamic maze environment.

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CHAPTER – 1

INTRODUCTION

1.1 Aim

The aim of this project is to create an immersive and interactive maze game using computer graphics and the OpenGL library. The primary goal is to provide players with an engaging gaming experience where they can navigate challenging mazes, employing problem-solving and spatial reasoning skills. The project aims to showcase procedural maze generation, smooth user controls, and visually appealing graphics, creating a well-rounded and immersive maze game.

1.2 Overview

The maze game project involves the creation of an interactive gaming experience using computer graphics and the OpenGL library. The game will challenge players to navigate through complex mazes while employing problem-solving skills. Procedural maze generation algorithms will be utilized to ensure each gameplay session offers a unique maze layout.

The project aims to provide smooth user controls, allowing players to navigate the maze using keyboard inputs effectively. Real-time feedback and visual cues will be integrated to enhance the player's understanding of their progress and position within the maze. The game's visuals will be enhanced using OpenGL's capabilities, creating a visually appealing and immersive environment. The primary objective is to create an engaging maze game that showcases procedural maze generation, smooth user controls, and visually appealing graphics, offering an enjoyable and challenging gaming experience.

1.3 Outcome

3D designed maze game with interactive gameplay. The player navigates through a complex maze using arrow keys to move the character. The maze is displayed with stunning graphics and visual effects using OpenGL.

When the player presses the left arrow key, the character turns left, accompanied by a smooth rotation animation and sound effects. Similarly, pressing the right arrow key makes the character turn right with corresponding visual and audio cues. When the player presses the up or down arrow key, the character moves forward or backward, respectively, revealing detailed textures and lighting effects on the front and back walls of the maze. The game utilizes keyboard input to provide an immersive experience and responds to user actions in real-time. This project demonstrates the implementation of various OpenGL functions, enhancing our understanding of computer graphics principles and interactive game development.

CHAPTER – 2

DESIGN AND IMPLEMENTATION

2.1 Algorithm

1. Initialize the GLUT library and set the initial display mode.
2. Specify the window size, position, and set the window title as “Maze Game”.
3. Set up the display function using glutDisplayFunc(display).
4. Within the display function, render the maze and the game elements.
5. Set up the keyboard function using glutSpecialFunc(SpecialKeys).
6. Handle user input within the keyboard function to allow interaction with the game using arrow keys.
    - If the up arrow key is pressed, move the character forward in the maze.
    - If the down arrow key is pressed, move the character backward in the maze.
    - If the left arrow key is pressed, rotate the character left.
    - If the right arrow key is pressed, rotate the character right.
7. Determine the number of pixels the character should rotate for each arrow key press.
8. Enable the light source and apply lighting effects within the game to enhance the visuals.
9. Use glutMainLoop() to enter the main GLUT processing loop, which handles events and updates the display.

2.2 Flow Chart

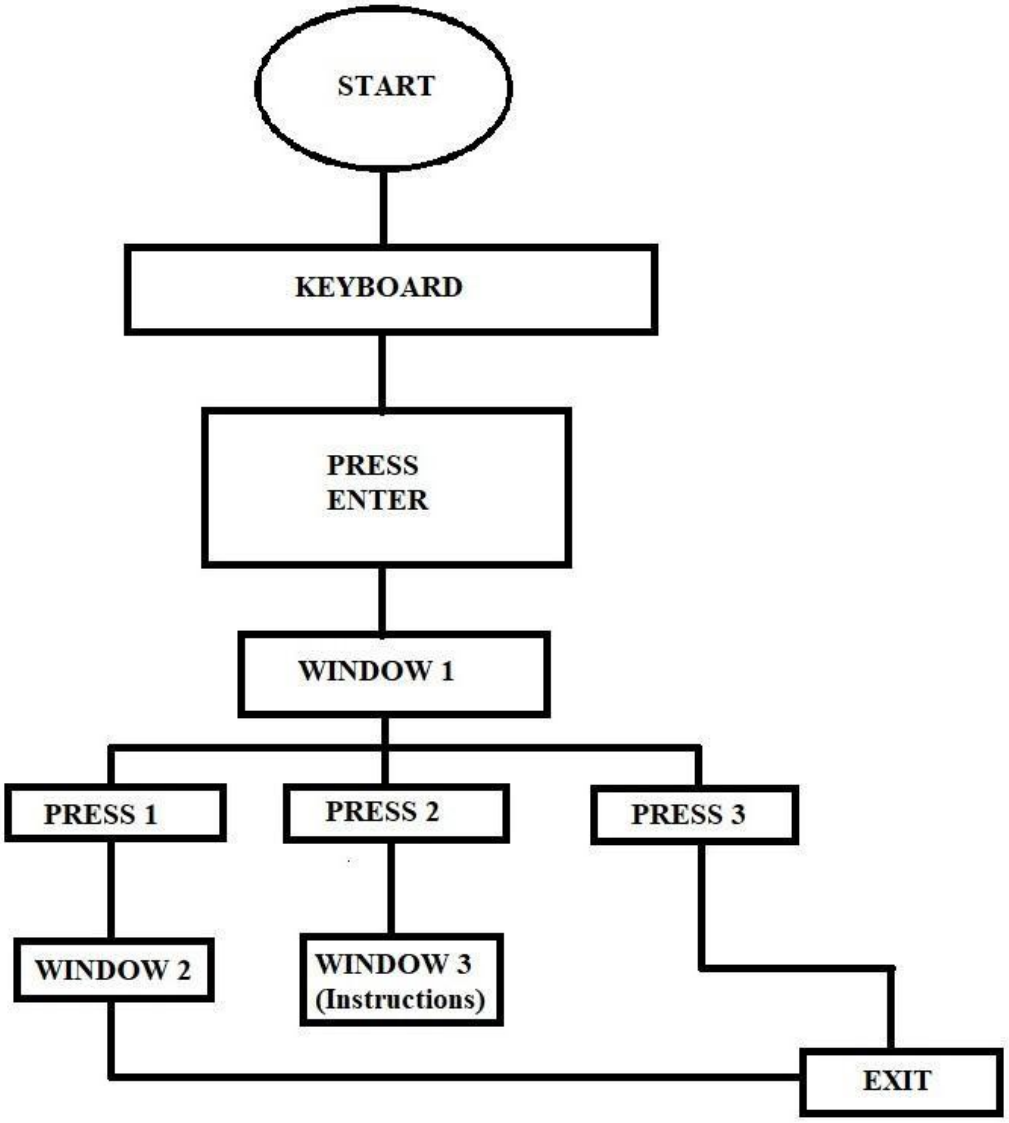

Fig 2.1 Flowchart

2.3 OpenGL APIs used with Description

OpenGL functions used in the code are as follows:

- glClear(GL_COLOR_BUFFER_BIT): This API clears the color buffer, which means it clears the window's color to the specified color.

- glLoadIdentity(): This API replaces the current matrix with the identity matrix. It is typically used to reset any previous transformations applied to the matrix.

- glColor3f(): This API sets the current color for drawing. It takes three floating-point values as arguments, representing the red, green, and blue components of the color.glBegin(GL_POINTS): This API begins the definition of a primitive or type of drawing to be rendered. In this case, it specifies that points will be rendered.
- glVertex2f(): This API specifies a 2D vertex position. It takes two floating-point values as arguments, representing the x and y coordinates of the vertex.

- glEnd(): This API ends the definition of vertices for a primitive. It marks the end of the vertex specification and triggers the rendering of the primitive.
- glRasterPos2f(): This API sets the current raster position for pixel operations. It specifies the position in window coordinates where the next raster operation will occur.
- glutBitmapCharacter(): This API renders a bitmap character at the current raster position. It takes a font and a character as arguments and renders the character on the screen.
- glFlush(): This API forces the execution of OpenGL commands in the pipeline. It ensures that all previously issued commands are processed and the resulting output is displayed on the screen.
- glOrtho2D(): This API defines a 2D orthographic projection matrix. It specifies the coordinates of the left, right, bottom, and top clipping planes, as well as the near and far clipping planes.
- glMatrixMode(GL_PROJECTION): This API sets the current matrix mode to projection. It indicates that subsequent matrix operations will affect the projection matrix stack.
- glPointSize(): This API sets the size of rendered points. It takes a floating-point value as an argument, representing the size of the points in pixels.
- glMatrixMode(GL_MODELVIEW): This API sets the current matrix mode to modelview. It indicates that subsequent matrix operations will affect the modelview matrix stack.
- glViewport(): This API sets the viewport dimensions. It specifies the lower-left corner coordinates and the width and height of the viewport in pixels.
- gluOrtho2D(): This API defines a 2D orthographic projection. It is similar to glOrtho2D(), but it provides a simplified interface for setting up the projection matrix.
- glutInit(): This API initializes the GLUT (OpenGL Utility Toolkit) library. It should be called before any other GLUT functions are used.
- glutInitDisplayMode(): This API sets the initial display mode for the window. It specifies whether the window will have a single or double buffer, the color mode, and other options.
- glutInitWindowSize(): This API sets the initial window size. It specifies the width and height of the window in pixels.
- glutCreateWindow(): This API creates a window with the specified title. It returns a unique identifier for the created window.
- glutReshapeFunc(): This API sets the reshape callback function. It registers a function that will be called whenever the window is resized.
- glutDisplayFunc(): This API sets the display callback function. It registers a function that will be called whenever the window needs to
- glutIdleFunc() is used to register a function that is called when the program is idle, allowing for continuous rendering or background processing. glutSpecialFunc() is used to set a function that is called when a special key (e.g., arrow keys, function keys) is pressed or released.

- glutKeyboardFunc() is used to set the function that handles keyboard input, while glutMainLoop() enters the event processing loop, continuously handling events until the program is terminated or the window is closed.
- glutPostRedisplay() is an OpenGL API used to mark the current window as needing to be redisplayed, triggering the display callback function to update the window contents. It is commonly used to request a redraw of the scene in response to changes in the application state or user input.
- glutSpecialFunc() function is used to register a callback function that handles special keyboard key events. These events include arrow keys, function keys, and other special keys on the keyboard.
- glutMainLoop() is an OpenGL API that starts the main event processing loop. It continuously listens for events such as keyboard input, mouse input, and window updates, calling the appropriate callback functions to handle these events and update the display accordingly.

2.4 Source Code

```
#include<stdio.h>
#include<stdlib.h>
#include<GL/glut.h>
#include<math.h>
#include<string.h>
#include<time.h>
int x,y;
int i,count;
char t[2];
float px=0.0,py=175.0;
int flag, df=10;
clock_t start,end;
void point()
{

 glColor3f(0.0,0.0,1.0);
 glBegin(GL_POINTS);
 glVertex2f(px,py);
 glEnd();
}
void point1()
{

 glColor3f(.0,1.0,0.0);
 glBegin(GL_POINTS);
 glVertex2f(0.0,175.0);
 glEnd();
}
void point2()
{

 glColor3f(1.0,0.0,.0);
 glBegin(GL_POINTS);
 glVertex2f(0.0,165.0);
 glEnd();
}

void output(int x, int y, char *string)
{
     int len, i;

          glRasterPos2f(x,y);
          len=(int) strlen(string);
          for (i = 0; i < len; i++)
```

```
                        {
          glutBitmapCharacter(GLUT_BITMAP_TIMES_ROMAN_24,string[i]);
                        }
}

void drawstring(int x, int y, char *string,void *font)
{
     int len, i;

          glRasterPos2f(x,y);
          len=(int) strlen(string);
          for (i = 0; i < len; i++)
                        {
           glutBitmapCharacter(font,string[i]);
                        }
}

 void frontscreen(void)
{

         glClear(GL_COLOR_BUFFER_BIT);
         glLoadIdentity();
         glColor3f(1,1,1);
   drawstring(120,5," Press ENTER to go To next screen",GLUT_BITMAP_HELVETICA_18);
         drawstring(-45,5,"Maximize window for better view",GLUT_BITMAP_HELVETICA_12);
   glColor3f(1,1,1);
         output(5,160,"MAHARAJA INSTITUTE OF TECHNOLOGY MYSORE");
         glColor3f(1,1,1);
         output(10.0,150,"DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING");
         glColor3f(1,0,1);
         output(60,130,"A Mini Project On:-");
         glColor3f(0,1,0.5);
         output(38,120,"\"PATH FINDING USING OPENGL\"");
         glColor3f(1,0,1);
         output(40,100,"By :");
         glBegin(GL_LINES);
         glVertex2f(40,98);
         glVertex2f(50,98);
         glEnd();
         glColor3f(1,0,0);
         output(40,90,"Dhyan Medappa B and Mohammad Huzaifa Baig ");

         output(40,80,"");
         glColor3f(1,0,1);
         output(40,60,"Under the Guidance of : Prof. Ambika K");
         glBegin(GL_LINES);
         glVertex2f(40,58);
         glVertex2f(98,58);
         glEnd();
         glColor3f(1,0,0);
```

```
        output(40,50,"");
        glColor3f(1,0,0);
        //drawstring(72,50,"(B.E.)",GLUT_BITMAP_HELVETICA_12);
        glColor3f(1,0,0);
        //output(70,40,"Lecturer,Dept. of CSE");
        glColor3f(1,0,0);
        output(40,30,"");
        glColor3f(1,0,0);
        //drawstring(72,30,"(B.E.)",GLUT_BITMAP_HELVETICA_12);

        //output(70,20,"Lecturer,Dept. of CSE");
        glFlush();

}

 void winscreen()
 {
        glClear(GL_COLOR_BUFFER_BIT);
        glLoadIdentity();
        glColor3f(0.0,1.0,0.0);
        output(55,120,"CONGRATS!!!");
        glColor3f(1.0,0.0,1.0);
        output(15,100,"YOU HAVE SUCCEEDED IN FINDING OUT THE PATH");
         output(35,60,"* PRESS ESC TO GO TO MAIN MENU");
    output(35,45,"* PRESS 1 TO RESTART THE GAME");
        glFlush();
 }
void startscreen()
{

glClear(GL_COLOR_BUFFER_BIT);
glColor3f(0.0,1.0,0.0);
output(25,140,"WELCOME TO THE GAME FINDING THE PATH");
output(50,100,"1.NEW GAME");
output(50,80,"2.INSTRUCTIONS");
output(50,60,"3.QUIT");
glFlush();
}

void instructions()
{
 glClear(GL_COLOR_BUFFER_BIT);
        glColor3f(1.0,1.0,0.0);
   output(45,140,"INSTRUCTIONS:");
        glBegin(GL_LINES);
        glVertex2f(45,138);
        glVertex2f(90,138);
        glEnd();
        glColor3f(0,1,0);
 output(-20,120,"* TO MOVE THE POINT USE ARROW KEYS");
```

```
 output(-20,100,"* FIND THE WAY TO MOVE INTO THE MAZE AND GET OUT");
 output(-20,80,"* GREEN COLOURED POINT INDICATE THE POINT FROM WHERE YOU
HAVE TO START");
 output(-20,60,"* RED COLOURED POINT INDICATE THE POINT WHERE YOU HAVE TO
REACH");
 output(-20,40,"* YOU WILL HAVE TO HURRY AS YOU HAVE LIMITED TIME");
 output(-20,20,"* PRESS ESC TO GO TO MAIN MENU");
  glFlush();
}

void timeover()
{
 glClear(GL_COLOR_BUFFER_BIT);
 glColor3f(1.0,0,0);
 output(70,110,"TIMEOVER");
 glColor3f(0,1,0);
 output(50,100,"YOU HAVE LOST THE GAME");
 output(50,90,"BETTER LUCK NEXT TIME");
 output(40,40,"* PRESS ESC TO GO TO MAIN MENU");
 output(40,30,"* PRESS 1 TO RESTART THE GAME");
 glFlush();
}


void idle()
{
 if(df==1)
  {
   end=clock();
   count=(end-start)/CLOCKS_PER_SEC;
   if(count==60)
   {
     df=4;
   }
        else
        if((count<60) && ((px>=0 && px<=4) && (py>=162 && py<=168)))
        {
                df=5;
        }
 }

  glutPostRedisplay();
}

void wall(GLfloat x1,GLfloat y1,GLfloat x2,GLfloat y2,GLfloat x3,GLfloat y3,GLfloat
x4,GLfloat y4)
{

 glBegin(GL_POLYGON);
        glVertex3f(x1,y1,0);
```

```
        glVertex3f(x2,y2,0);
        glVertex3f(x3,y3,0);
        glVertex3f(x4,y4,0);
  glEnd();

}

void SpecialKey(int key, int x, int y)
{
  switch (key)
  {
        case GLUT_KEY_UP:
                flag=0;
           if(py<175)
                if(!((px>=8 && px<=12) && (py>=145 && py<=162)))
                if(!((px>=168 && px<=172) && (py>=5 && py<=22)))
                if(!((px>=132 && px<=172) && (py>=15 && py<=22)))
                if(!((px>=128 && px<=132) && (py>=5 && py<=32)))
                if(!((px>=142 && px<=162) && (py>=5 && py<=12)))
                if(!((px>=118 && px<=152) && (py>=25 && py<=32)))
                if(!((px>=88 && px<=122) && (py>=5 && py<=12)))
                if(!((px>=48 && px<=82) && (py>=5 && py<=12)))
                if(!((px>=62 && px<=82) && (py>=15 && py<=22)))
                if(!((px>=8 && px<=12) && (py>=5 && py<=18)))
                if(!((px>=0 && px<=12) && (py>=15 && py<=22)))
                if(!((px>=42 && px<=52) && (py>=25 && py<=32)))
                if(!((px>=18 && px<=42) && (py>=5 && py<=12)))
           if(!((px>=0 && px<=8) && (py>=155 && py<=162)))
                if(!((px>=0 && px<=72) && (py>=165 && py<=172)))
                if(!((px>=18 && px<=62) && (py>=155 && py<=162)))
                if(!((px>=48 && px<=52) && (py>=125 && py<=158)))
                if(!((px>=18 && px<=48) && (py>=145 && py<=152)))
                if(!((px>=18 && px<=38) && (py>=135 && py<=142)))
                if(!((px>=68 && px<=112) && (py>=145 && py<=152)))
                if(!((px>=88 && px<=118) && (py>=135 && py<=142)))
                if(!((px>=132 && px<=138) && (py>=155 && py<=162)))
                if(!((px>=138 && px<=142) && (py>=135 && py<=162)))
                if(!((px>=128 && px<=162) && (py>=125 && py<=132)))
                if(!((px>=78 && px<=122) && (py>=155 && py<=162)))
                if(!((px>=78 && px<=102) && (py>=165 && py<=172)))
                if(!((px>=108 && px<=142) && (py>=165 && py<=172)))
                if(!((px>=148 && px<=180) && (py>=165 && py<=172)))
                if(!((px>=138 && px<=152) && (py>=65 && py<=72)))
                if(!((px>=148 && px<=172) && (py>=155 && py<=162)))
                if(!((px>=148 && px<=172) && (py>=165 && py<=172)))
                if(!((px>=148 && px<=172) && (py>=95 && py<=102)))
                if(!((px>=158 && px<=168) && (py>=145 && py<=152)))
                if(!((px>=158 && px<=168) && (py>=135 && py<=142)))
                if(!((px>=168 && px<=172) && (py>=119 && py<=162)))
                if(!((px>=152 && px<=172) && (py>=115 && py<=122)))
```

```
if(!((px>=138 && px<=148) && (py>=105 && py<=112)))
if(!((px>=148 && px<=152) && (py>=95 && py<=122)))
if(!((px>=158 && px<=172) && (py>=105 && py<=112)))
if(!((px>=162 && px<=172) && (py>=105 && py<=112)))
if(!((px>=158 && px<=162) && (py>=89 && py<=112)))
if(!((px>=158 && px<=180) && (py>=85 && py<=92)))
if(!((px>=132 && px<=142) && (py>=115 && py<=122)))
if(!((px>=128 && px<=132) && (py>=109 && py<=122)))
if(!((px>=122 && px<=132) && (py>=105 && py<=112)))
if(!((px>=118 && px<=122) && (py>=99 && py<=162)))
if(!((px>=108 && px<=142) && (py>=95 && py<=102)))
if(!((px>=128 && px<=132) && (py>=89 && py<=98)))
if(!((px>=128 && px<=152) && (py>=85 && py<=92)))
if(!((px>=148 && px<=152) && (py>=79 && py<=88)))
if(!((px>=118 && px<=152) && (py>=75 && py<=82)))
if(!((px>=92 && px<=122) && (py>=85 && py<=92)))
if(!((px>=92 && px<=102) && (py>=95 && py<=102)))
if(!((px>=118 && px<=122) && (py>=75 && py<=88)))
if(!((px>=88 && px<=92) && (py>=85 && py<=118)))
if(!((px>=58 && px<=62) && (py>=125 && py<=152)))
if(!((px>=108 && px<=112) && (py>=109 && py<=128)))
if(!((px>=58 && px<=112) && (py>=125 && py<=132)))
if(!((px>=98 && px<=102) && (py>=109 && py<=118)))
if(!((px>=48 && px<=52) && (py>=15 && py<=32)))
if(!((px>=32 && px<=42) && (py>=105 && py<=112)))
if(!((px>=12 && px<=28) && (py>=125 && py<=132)))
if(!((px>=28 && px<=32) && (py>=105 && py<=132)))
if(!((px>=8 && px<=12) && (py>=119 && py<=132)))
if(!((px>=0 && px<=22) && (py>=115 && py<=122)))
if(!((px>=18 && px<=22) && (py>=109 && py<=122)))
if(!((px>=12 && px<=22) && (py>=105 && py<=112)))
if(!((px>=8 && px<=12) && (py>=85 && py<=112)))
if(!((px>=98 && px<=112) && (py>=105 && py<=112)))
if(!((px>=38 && px<=102) && (py>=115 && py<=122)))
if(!((px>=48 && px<=52) && (py>=109 && py<=118)))
if(!((px>=48 && px<=78) && (py>=105 && py<=112)))
if(!((px>=82 && px<=102) && (py>=75 && py<=82)))
if(!((px>=78 && px<=82) && (py>=65 && py<=112)))
if(!((px>=72 && px<=78) && (py>=95 && py<=102)))
if(!((px>=62 && px<=72) && (py>=65 && py<=72)))
if(!((px>=28 && px<=32) && (py>=119 && py<=152)))
if(!((px>=92 && px<=108) && (py>=65 && py<=72)))
if(!((px>=88 && px<=92) && (py>=59 && py<=72)))
if(!((px>=62 && px<=92) && (py>=55 && py<=62)))
if(!((px>=38 && px<=58) && (py>=75 && py<=82)))
if(!((px>=68 && px<=72) && (py>=45 && py<=62)))
if(!((px>=8 && px<=12) && (py>=65 && py<=82)))
if(!((px>=32 && px<=62) && (py>=85 && py<=92)))
if(!((px>=28 && px<=52) && (py>=65 && py<=72)))
if(!((px>=32 && px<=52) && (py>=55 && py<=62)))
```

```
            if(!((px>=28 && px<=32) && (py>=55 && py<=98)))
            if(!((px>=18 && px<=62) && (py>=95 && py<=102)))
            if(!((px>=0 && px<=18) && (py>=75 && py<=82)))
            if(!((px>=18 && px<=22) && (py>=59 && py<=92)))
            if(!((px>=12 && px<=22) && (py>=55 && py<=62)))
            if(!((px>=8 && px<=52) && (py>=45 && py<=52)))
            if(!((px>=18 && px<=22) && (py>=39 && py<=48)))
            if(!((px>=12 && px<=22) && (py>=35 && py<=42)))
            if(!((px>=8 && px<=12) && (py>=25 && py<=42)))
            if(!((px>=118 && px<=122) && (py>=59 && py<=72)))
            if(!((px>=112 && px<=122) && (py>=55 && py<=62)))
            if(!((px>=138 && px<=152) && (py>=55 && py<=62)))
            if(!((px>=148 && px<=158) && (py>=45 && py<=52)))
            if(!((px>=138 && px<=142) && (py>=39 && py<=72)))
            if(!((px>=128 && px<=132) && (py>=49 && py<=72)))
            if(!((px>=122 && px<=132) && (py>=45 && py<=52)))
            if(!((px>=118 && px<=122) && (py>=35 && py<=52)))
            if(!((px>=118 && px<=158) && (py>=35 && py<=42)))
            if(!((px>=158 && px<=162) && (py>=35 && py<=78)))
            if(!((px>=158 && px<=168) && (py>=75 && py<=82)))
            if(!((px>=168 && px<=172) && (py>=29 && py<=82)))
            if(!((px>=168 && px<=180) && (py>=25 && py<=32)))
            if(!((px>=98 && px<=108) && (py>=15 && py<=22)))
            if(!((px>=108 && px<=112) && (py>=15 && py<=82)))
            if(!((px>=88 && px<=92) && (py>=35 && py<=48)))
            if(!((px>=68 && px<=92) && (py>=45 && py<=52)))
            if(!((px>=98 && px<=102) && (py>=29 && py<=62)))
            if(!((px>=78 && px<=82) && (py>=25 && py<=48)))
            if(!((px>=68 && px<=72) && (py>=25 && py<=38)))
            if(!((px>=32 && px<=72) && (py>=35 && py<=42)))
            if(!((px>=22 && px<=32) && (py>=19 && py<=22)))
            if(!((px>=22 && px<=32) && (py>=15 && py<=22)))
            if(!((px>=18 && px<=22) && (py>=15 && py<=32)))
            if(!((px>=78 && px<=102) && (py>=25 && py<=32)))
            if(!((px>=88 && px<=92) && (py>=9 && py<=28)))
            py=py+5;
            glutPostRedisplay();
            break;
    case GLUT_KEY_DOWN:

    flag=0;
       if(py>5)
       if(!((px>=0 && px<=8) && (py>=158 && py<=165)))
       if(!((px>=8 && px<=12) && (py>=148 && py<=165)))
            if(!((px>=0 && px<=72) && (py>=168 && py<=175)))
            if(!((px>=18 && px<=62) && (py>=158 && py<=165)))
            if(!((px>=18 && px<=48) && (py>=148 && py<=155)))
            if(!((px>=18 && px<=38) && (py>=138 && py<=145)))
            if(!((px>=72 && px<=82) && (py>=138 && py<=145)))
            if(!((px>=68 && px<=112) && (py>=148 && py<=155)))
```

```
            if(!((px>=88 && px<=118) && (py>=138 && py<=145)))
            if(!((px>=132 && px<=138) && (py>=158 && py<=165)))
            if(!((px>=138 && px<=152) && (py>=68 && py<=75)))
            if(!((px>=108 && px<=142) && (py>=168 && py<=175)))
            if(!((px>=128 && px<=162) && (py>=128 && py<=135)))
            if(!((px>=68 && px<=72) && (py>=158 && py<=175)))
            if(!((px>=78 && px<=122) && (py>=158 && py<=165)))
        if(!((px>=78 && px<=102) && (py>=168 && py<=175)))
          if(!((px>=148 && px<=180) && (py>=168 && py<=175)))
            if(!((px>=148 && px<=172) && (py>=158 && py<=165)))
            if(!((px>=148 && px<=172) && (py>=168 && py<=175)))
            if(!((px>=148 && px<=172) && (py>=98 && py<=105)))
            if(!((px>=158 && px<=168) && (py>=148 && py<=155)))
            if(!((px>=158 && px<=168) && (py>=138 && py<=145)))
            if(!((px>=148 && px<=172) && (py>=118 && py<=125)))
            if(!((px>=138 && px<=148) && (py>=108 && py<=115)))
        if(!((px>=158 && px<=172) && (py>=108 && py<=115)))
            if(!((px>=162 && px<=172) && (py>=108 && py<=115)))
            if(!((px>=158 && px<=180) && (py>=88 && py<=95)))
            if(!((px>=132 && px<=142) && (py>=118 && py<=125)))
            if(!((px>=122 && px<=132) && (py>=108 && py<=115)))
            if(!((px>=108 && px<=142) && (py>=98 && py<=105)))
            if(!((px>=128 && px<=152) && (py>=88 && py<=95)))
            if(!((px>=118 && px<=152) && (py>=78 && py<=85)))
            if(!((px>=92 && px<=122) && (py>=88 && py<=95)))
            if(!((px>=92 && px<=102) && (py>=98 && py<=105)))
            if(!((px>=118 && px<=152) && (py>=28 && py<=35)))
            if(!((px>=88 && px<=92) && (py>=88 && py<=121)))
            if(!((px>=58 && px<=62) && (py>=128 && py<=155)))
            if(!((px>=108 && px<=112) && (py>=112 && py<=131)))
            if(!((px>=58 && px<=112) && (py>=128 && py<=135)))
            if(!((px>=98 && px<=102) && (py>=112 && py<=121)))
            if(!((px>=38 && px<=42) && (py>=102 && py<=115)))
            if(!((px>=32 && px<=42) && (py>=108 && py<=115)))
            if(!((px>=12 && px<=28) && (py>=128 && py<=135)))
            if(!((px>=28 && px<=32) && (py>=108 && py<=135)))
            if(!((px>=8 && px<=12) && (py>=122 && py<=135)))
            if(!((px>=0 && px<=22) && (py>=118 && py<=125)))
            if(!((px>=18 && px<=22) && (py>=112 && py<=125)))
            if(!((px>=12 && px<=22) && (py>=108 && py<=115)))
            if(!((px>=8 && px<=12) && (py>=88 && py<=115)))
            if(!((px>=98 && px<=112) && (py>=108 && py<=115)))
            if(!((px>=38 && px<=102) && (py>=118 && py<=125)))
            if(!((px>=48 && px<=52) && (py>=112 && py<=118)))
            if(!((px>=48 && px<=78) && (py>=108 && py<=115)))
            if(!((px>=82 && px<=102) && (py>=78 && py<=85)))
            if(!((px>=78 && px<=82) && (py>=68 && py<=115)))
            if(!((px>=72 && px<=78) && (py>=98 && py<=105)))
            if(!((px>=68 && px<=72) && (py>=72 && py<=105)))
            if(!((px>=62 && px<=72) && (py>=68 && py<=75)))
```

```
if(!((px>=28 && px<=32) && (py>=122 && py<=155)))
if(!((px>=92 && px<=108) && (py>=68 && py<=75)))
if(!((px>=88 && px<=92) && (py>=62 && py<=75)))
if(!((px>=62 && px<=92) && (py>=58 && py<=65)))
if(!((px>=38 && px<=58) && (py>=78 && py<=85)))
if(!((px>=68 && px<=72) && (py>=48 && py<=65)))
if(!((px>=8 && px<=12) && (py>=68 && py<=85)))
if(!((px>=32 && px<=62) && (py>=88 && py<=95)))
if(!((px>=28 && px<=52) && (py>=68 && py<=75)))
if(!((px>=32 && px<=52) && (py>=58 && py<=65)))
if(!((px>=28 && px<=32) && (py>=58 && py<=101)))
if(!((px>=18 && px<=62) && (py>=98 && py<=105)))
if(!((px>=0 && px<=18) && (py>=78 && py<=85)))
if(!((px>=18 && px<=22) && (py>=62 && py<=95)))
if(!((px>=12 && px<=22) && (py>=58 && py<=65)))
if(!((px>=8 && px<=12) && (py>=52 && py<=65)))
if(!((px>=8 && px<=52) && (py>=48 && py<=55)))
if(!((px>=18 && px<=22) && (py>=42 && py<=51)))
if(!((px>=12 && px<=22) && (py>=38 && py<=45)))
if(!((px>=8 && px<=12) && (py>=28 && py<=45)))
if(!((px>=118 && px<=122) && (py>=62 && py<=75)))
if(!((px>=112 && px<=122) && (py>=58 && py<=65)))
if(!((px>=142 && px<=152) && (py>=58 && py<=65)))
if(!((px>=148 && px<=158) && (py>=48 && py<=55)))
if(!((px>=138 && px<=142) && (py>=42 && py<=75)))
if(!((px>=128 && px<=132) && (py>=52 && py<=75)))
if(!((px>=122 && px<=132) && (py>=48 && py<=55)))
if(!((px>=118 && px<=122) && (py>=38 && py<=55)))
if(!((px>=118 && px<=158) && (py>=38 && py<=45)))
if(!((px>=158 && px<=162) && (py>=38 && py<=78)))
if(!((px>=158 && px<=168) && (py>=78 && py<=85)))
if(!((px>=168 && px<=172) && (py>=32 && py<=85)))
if(!((px>=168 && px<=180) && (py>=28 && py<=35)))
if(!((px>=98 && px<=108) && (py>=18 && py<=25)))
if(!((px>=108 && px<=112) && (py>=18 && py<=85)))
if(!((px>=88 && px<=92) && (py>=38 && py<=53)))
if(!((px>=68 && px<=92) && (py>=48 && py<=55)))
if(!((px>=98 && px<=102) && (py>=32 && py<=65)))
if(!((px>=78 && px<=82) && (py>=28 && py<=53)))
if(!((px>=68 && px<=72) && (py>=28 && py<=43)))
if(!((px>=32 && px<=72) && (py>=38 && py<=45)))
if(!((px>=28 && px<=32) && (py>=18 && py<=45)))
if(!((px>=22 && px<=32) && (py>=18 && py<=25)))
if(!((px>=18 && px<=22) && (py>=18 && py<=35)))
if(!((px>=78 && px<=102) && (py>=28 && py<=35)))
if(!((px>=88 && px<=92) && (py>=12 && py<=31)))
if(!((px>=118 && px<=122) && (py>=8 && py<=35)))
if(!((px>=158 && px<=162) && (py>=22 && py<=35)))
if(!((px>=168 && px<=172) && (py>=8 && py<=25)))
if(!((px>=132 && px<=172) && (py>=18 && py<=25)))
```

```
            if(!((px>=128 && px<=132) && (py>=8 && py<=35)))
            if(!((px>=142 && px<=162) && (py>=8 && py<=15)))
            if(!((px>=138 && px<=142) && (py>=0 && py<=15)))
            if(!((px>=88 && px<=122) && (py>=8 && py<=15)))
            if(!((px>=48 && px<=82) && (py>=8 && py<=15)))
            if(!((px>=62 && px<=82) && (py>=18 && py<=25)))
            if(!((px>=8 && px<=12) && (py>=8 && py<=21)))
            if(!((px>=0 && px<=12) && (py>=18 && py<=25)))
            if(!((px>=58 && px<=62) && (py>=8 && py<=85)))
            if(!((px>=48 && px<=52) && (py>=18 && py<=31)))
            if(!((px>=42 && px<=52) && (py>=28 && py<=35)))
            if(!((px>=38 && px<=42) && (py>=0 && py<=35)))
            if(!((px>=18 && px<=42) && (py>=8 && py<=15)))
            py=py-5;
            glutPostRedisplay();
            break;

    case GLUT_KEY_LEFT:
            flag=0;
       if(px>0)
       if(!((px>=8 && px<=15) && (py>=148 && py<=162)))
       if(!((px>=68 && px<=75) && (py>=158 && py<=168)))
            if(!((px>=138 && px<=155) && (py>=68 && py<=72)))
            if(!((px>=18 && px<=25) && (py>=162 && py<=168)))
            if(!((px>=18 && px<=65) && (py>=58 && py<=62)))
            if(!((px>=48 && px<=55) && (py>=128 && py<=158)))
            if(!((px>=18 && px<=25) && (py>=142 && py<=148)))
            if(!((px>=38 && px<=45) && (py>=122 && py<=142)))
            if(!((px>=72 && px<=85) && (py>=138 && py<=142)))
            if(!((px>=68 && px<=75) && (py>=132 && py<=148)))
            if(!((px>=68 && px<=115) && (py>=148 && py<=152)))
            if(!((px>=138 && px<=145) && (py>=138 && py<=162)))
            if(!((px>=18 && px<=145) && (py>=168 && py<=172)))
            if(!((px>=128 && px<=135) && (py>=132 && py<=172)))
            if(!((px>=128 && px<=165) && (py>=128 && py<=132)))
            if(!((px>=68 && px<=75) && (py>=158 && py<=172)))
            if(!((px>=78 && px<=125) && (py>=158 && py<=162)))
        if(!((px>=98 && px<=105) && (py>=162 && py<=172)))
            if(!((px>=78 && px<=105) && (py>=168 && py<=172)))
            if(!((px>=108 && px<=145) && (py>=168 && py<=172)))
            if(!((px>=148 && px<=180) && (py>=168 && py<=172)))
            if(!((px>=148 && px<=155) && (py>=132 && py<=162)))
            if(!((px>=148 && px<=175) && (py>=158 && py<=162)))
            if(!((px>=148 && px<=175) && (py>=168 && py<=172)))
            if(!((px>=148 && px<=175) && (py>=98 && py<=102)))
            if(!((px>=168 && px<=175) && (py>=122 && py<=162)))
            if(!((px>=152 && px<=175) && (py>=118 && py<=122)))
            if(!((px>=148 && px<=155) && (py>=98 && py<=122)))
            if(!((px>=158 && px<=175) && (py>=108 && py<=112)))
            if(!((px>=162 && px<=175) && (py>=108 && py<=112)))
```

```
        if(!((px>=158 && px<=165) && (py>=92 && py<=112)))
        if(!((px>=158 && px<=180) && (py>=88 && py<=92)))
        if(!((px>=132 && px<=145) && (py>=118 && py<=122)))
        if(!((px>=128 && px<=135) && (py>=112 && py<=122)))
        if(!((px>=122 && px<=135) && (py>=108 && py<=112)))
        if(!((px>=118 && px<=125) && (py>=102 && py<=162)))
        if(!((px>=108 && px<=145) && (py>=98 && py<=102)))
        if(!((px>=128 && px<=135) && (py>=92 && py<=98)))
        if(!((px>=128 && px<=155) && (py>=88 && py<=92)))
        if(!((px>=148 && px<=155) && (py>=82 && py<=88)))
        if(!((px>=118 && px<=155) && (py>=78 && py<=82)))
        if(!((px>=92 && px<=125) && (py>=88 && py<=92)))
        if(!((px>=92 && px<=105) && (py>=98 && py<=102)))
        if(!((px>=118 && px<=125) && (py>=78 && py<=88)))
        if(!((px>=88 && px<=95) && (py>=88 && py<=118)))
        if(!((px>=58 && px<=65) && (py>=128 && py<=152)))
        if(!((px>=108 && px<=115) && (py>=112 && py<=128)))
        if(!((px>=58 && px<=115) && (py>=128 && py<=132)))
        if(!((px>=98 && px<=105) && (py>=112 && py<=118)))
        if(!((px>=38 && px<=45) && (py>=102 && py<=108)))
        if(!((px>=32 && px<=45) && (py>=108 && py<=112)))
        if(!((px>=28 && px<=35) && (py>=108 && py<=132)))
        if(!((px>=8 && px<=15) && (py>=122 && py<=132)))
        if(!((px>=0 && px<=25) && (py>=118 && py<=122)))
        if(!((px>=18 && px<=25) && (py>=112 && py<=122)))
        if(!((px>=12 && px<=25) && (py>=108 && py<=112)))
        if(!((px>=8 && px<=15) && (py>=88 && py<=112)))
        if(!((px>=98 && px<=115) && (py>=108 && py<=112)))
        if(!((px>=38 && px<=105) && (py>=118 && py<=122)))
        if(!((px>=48 && px<=55) && (py>=112 && py<=118)))
        if(!((px>=82 && px<=105) && (py>=78 && py<=82)))
        if(!((px>=78 && px<=85) && (py>=68 && py<=112)))
        if(!((px>=68 && px<=75) && (py>=72 && py<=102)))
        if(!((px>=62 && px<=75) && (py>=68 && py<=72)))
    if(!((px>=28 && px<=35) && (py>=108 && py<=132)))
        if(!((px>=88 && px<=95) && (py>=62 && py<=72)))
        if(!((px>=62 && px<=95) && (py>=58 && py<=62)))
        if(!((px>=68 && px<=75) && (py>=48 && py<=62)))
        if(!((px>=8 && px<=15) && (py>=68 && py<=82)))
        if(!((px>=32 && px<=65) && (py>=88 && py<=92)))
        if(!((px>=28 && px<=55) && (py>=68 && py<=72)))
        if(!((px>=32 && px<=55) && (py>=58 && py<=62)))
        if(!((px>=28 && px<=35) && (py>=58 && py<=98)))
        if(!((px>=18 && px<=65) && (py>=98 && py<=102)))
        if(!((px>=18 && px<=25) && (py>=62 && py<=92)))
        if(!((px>=12 && px<=25) && (py>=58 && py<=62)))
        if(!((px>=8 && px<=15) && (py>=52 && py<=62)))
        if(!((px>=8 && px<=55) && (py>=48 && py<=52)))
        if(!((px>=18 && px<=25) && (py>=42 && py<=48)))
        if(!((px>=12 && px<=25) && (py>=38 && py<=42)))
```

```
            if(!((px>=8 && px<=15) && (py>=28 && py<=42)))
            if(!((px>=118 && px<=125) && (py>=62 && py<=72)))
            if(!((px>=112 && px<=125) && (py>=58 && py<=62)))
            if(!((px>=142 && px<=155) && (py>=58 && py<=62)))
            if(!((px>=138 && px<=145) && (py>=42 && py<=72)))
            if(!((px>=128 && px<=135) && (py>=52 && py<=72)))
            if(!((px>=122 && px<=135) && (py>=48 && py<=52)))
            if(!((px>=118 && px<=125) && (py>=38 && py<=52)))
            if(!((px>=118 && px<=155) && (py>=28 && py<=32)))
            if(!((px>=158 && px<=165) && (py>=38 && py<=78)))
            if(!((px>=168 && px<=175) && (py>=32 && py<=82)))
            if(!((px>=168 && px<=180) && (py>=28 && py<=32)))
            if(!((px>=98 && px<=108) && (py>=18 && py<=22)))
            if(!((px>=108 && px<=115) && (py>=18 && py<=82)))
            if(!((px>=88 && px<=95) && (py>=38 && py<=48)))
            if(!((px>=68 && px<=95) && (py>=48 && py<=52)))
            if(!((px>=98 && px<=105) && (py>=32 && py<=62)))
            if(!((px>=78 && px<=85) && (py>=28 && py<=48)))
            if(!((px>=68 && px<=75) && (py>=28 && py<=38)))
            if(!((px>=32 && px<=75) && (py>=38 && py<=42)))
            if(!((px>=28 && px<=35) && (py>=22 && py<=42)))
            if(!((px>=22 && px<=35) && (py>=18 && py<=22)))
            if(!((px>=18 && px<=25) && (py>=18 && py<=32)))
            if(!((px>=78 && px<=105) && (py>=28 && py<=32)))
            if(!((px>=88 && px<=95) && (py>=12 && py<=28)))
            if(!((px>=118 && px<=125) && (py>=8 && py<=32)))
            if(!((px>=158 && px<=165) && (py>=22 && py<=32)))
            if(!((px>=168 && px<=175) && (py>=8 && py<=22)))
            if(!((px>=132 && px<=175) && (py>=18 && py<=22)))
            if(!((px>=128 && px<=135) && (py>=8 && py<=32)))
            if(!((px>=142 && px<=165) && (py>=8 && py<=12)))
            if(!((px>=138 && px<=145) && (py>=0 && py<=12)))
            if(!((px>=88 && px<=125) && (py>=8 && py<=12)))
            if(!((px>=48 && px<=85) && (py>=8 && py<=12)))
            if(!((px>=62 && px<=85) && (py>=18 && py<=22)))
            if(!((px>=8 && px<=15) && (py>=8 && py<=18)))
            if(!((px>=0 && px<=15) && (py>=18 && py<=22)))
            if(!((px>=58 && px<=65) && (py>=8 && py<=82)))
            if(!((px>=48 && px<=55) && (py>=18 && py<=28)))
            if(!((px>=42 && px<=55) && (py>=28 && py<=32)))
            if(!((px>=38 && px<=45) && (py>=0 && py<=32)))
            px=px-5;
            glutPostRedisplay();
            break;
    case GLUT_KEY_RIGHT:
            flag=0;
       if(px<175)
       if(!((px>=115 && px<=122) && (py>=98 && py<=162)))
       if(!((px>=5 && px<=12) && (py>=148 && py<=162)))
       if(!((px>=65 && px<=72) && (py>=158 && py<=168)))
```

```
        if(!((px>=15 && px<=22) && (py>=162 && py<=168)))
        if(!((px>=45 && px<=52) && (py>=128 && py<=158)))
        if(!((px>=15 && px<=22) && (py>=138 && py<=152)))
        if(!((px>=35 && px<=42) && (py>=122 && py<=142)))
        if(!((px>=65 && px<=72) && (py>=132 && py<=148)))
        if(!((px>=65 && px<=112) && (py>=148 && py<=152)))
        if(!((px>=85 && px<=118) && (py>=138 && py<=142)))
        if(!((px>=135 && px<=142) && (py>=138 && py<=162)))
        if(!((px>=105 && px<=142) && (py>=168 && py<=172)))
        if(!((px>=125 && px<=132) && (py>=132 && py<=172)))
        if(!((px>=125 && px<=162) && (py>=128 && py<=132)))
        if(!((px>=65 && px<=72) && (py>=158 && py<=172)))
        if(!((px>=75 && px<=122) && (py>=158 && py<=162)))
if(!((px>=95 && px<=102) && (py>=162 && py<=172)))
        if(!((px>=75 && px<=102) && (py>=168 && py<=172)))
        if(!((px>=145 && px<=180) && (py>=168 && py<=172)))
        if(!((px>=145 && px<=152) && (py>=132 && py<=162)))
        if(!((px>=145 && px<=172) && (py>=158 && py<=162)))
        if(!((px>=145 && px<=172) && (py>=168 && py<=172)))
        if(!((px>=145 && px<=172) && (py>=98 && py<=102)))
        if(!((px>=155 && px<=168) && (py>=148 && py<=152)))
        if(!((px>=155 && px<=168) && (py>=138 && py<=142)))
        if(!((px>=165 && px<=172) && (py>=122 && py<=162)))
        if(!((px>=149 && px<=172) && (py>=118 && py<=122)))
        if(!((px>=135 && px<=148) && (py>=108 && py<=112)))
        if(!((px>=145 && px<=152) && (py>=98 && py<=122)))
        if(!((px>=155 && px<=172) && (py>=108 && py<=112)))
        if(!((px>=159 && px<=172) && (py>=108 && py<=112)))
        if(!((px>=155 && px<=162) && (py>=92 && py<=112)))
        if(!((px>=155 && px<=180) && (py>=88 && py<=92)))
        if(!((px>=129 && px<=142) && (py>=118 && py<=122)))
        if(!((px>=125 && px<=132) && (py>=112 && py<=122)))
        if(!((px>=119 && px<=132) && (py>=108 && py<=112)))
        if(!((px>=119 && px<=118) && (py>=102 && py<=162)))
        if(!((px>=105 && px<=142) && (py>=98 && py<=102)))
        if(!((px>=125 && px<=132) && (py>=92 && py<=98)))
        if(!((px>=125 && px<=152) && (py>=88 && py<=92)))
        if(!((px>=145 && px<=152) && (py>=82 && py<=88)))
        if(!((px>=115 && px<=152) && (py>=78 && py<=82)))
        if(!((px>=89 && px<=122) && (py>=88 && py<=92)))
        if(!((px>=89 && px<=102) && (py>=98 && py<=102)))
        if(!((px>=115 && px<=122) && (py>=78 && py<=88)))
        if(!((px>=85 && px<=92) && (py>=88 && py<=118)))
        if(!((px>=55 && px<=62) && (py>=128 && py<=152)))
        if(!((px>=105 && px<=112) && (py>=112 && py<=128)))
        if(!((px>=55 && px<=112) && (py>=128 && py<=132)))
        if(!((px>=95 && px<=102) && (py>=112 && py<=118)))
        if(!((px>=35 && px<=42) && (py>=102 && py<=108)))
        if(!((px>=29 && px<=42) && (py>=108 && py<=112)))
        if(!((px>=9 && px<=28) && (py>=128 && py<=132)))
```

```
if(!((px>=25 && px<=32) && (py>=108 && py<=132)))
if(!((px>=5 && px<=12) && (py>=122 && py<=132)))
if(!((px>=-3 && px<=22) && (py>=118 && py<=122)))
if(!((px>=15 && px<=22) && (py>=112 && py<=122)))
if(!((px>=9 && px<=22) && (py>=108 && py<=112)))
if(!((px>=5 && px<=12) && (py>=88 && py<=112)))
if(!((px>=95 && px<=112) && (py>=108 && py<=112)))
if(!((px>=35 && px<=102) && (py>=118 && py<=122)))
if(!((px>=45 && px<=52) && (py>=112 && py<=118)))
if(!((px>=45 && px<=78) && (py>=108 && py<=112)))
if(!((px>=75 && px<=82) && (py>=68 && py<=112)))
if(!((px>=65 && px<=72) && (py>=72 && py<=102)))
if(!((px>=25 && px<=32) && (py>=108 && py<=132)))
if(!((px>=85 && px<=92) && (py>=62 && py<=72)))
if(!((px>=35 && px<=58) && (py>=78 && py<=82)))
if(!((px>=65 && px<=72) && (py>=48 && py<=62)))
if(!((px>=5 && px<=12) && (py>=68 && py<=82)))
if(!((px>=25 && px<=52) && (py>=68 && py<=72)))
if(!((px>=25 && px<=32) && (py>=58 && py<=98)))
if(!((px>=15 && px<=62) && (py>=98 && py<=102)))
if(!((px>=0 && px<=18) && (py>=78 && py<=82)))
if(!((px>=15 && px<=22) && (py>=62 && py<=92)))
if(!((px>=5 && px<=12) && (py>=52 && py<=62)))
if(!((px>=5 && px<=52) && (py>=48 && py<=52)))
if(!((px>=15 && px<=22) && (py>=42 && py<=48)))
if(!((px>=5 && px<=12) && (py>=28 && py<=42)))
if(!((px>=115 && px<=122) && (py>=62 && py<=72)))
if(!((px>=109 && px<=122) && (py>=58 && py<=62)))
if(!((px>=145 && px<=158) && (py>=48 && py<=52)))
if(!((px>=135 && px<=142) && (py>=42 && py<=72)))
if(!((px>=125 && px<=132) && (py>=52 && py<=72)))
if(!((px>=115 && px<=122) && (py>=38 && py<=52)))
if(!((px>=115 && px<=158) && (py>=38 && py<=42)))
if(!((px>=155 && px<=162) && (py>=38 && py<=78)))
if(!((px>=155 && px<=168) && (py>=78 && py<=82)))
if(!((px>=165 && px<=172) && (py>=32 && py<=82)))
if(!((px>=165 && px<=180) && (py>=28 && py<=32)))
if(!((px>=95 && px<=108) && (py>=18 && py<=22)))
if(!((px>=105 && px<=112) && (py>=18 && py<=82)))
if(!((px>=85 && px<=92) && (py>=38 && py<=48)))
if(!((px>=65 && px<=92) && (py>=48 && py<=52)))
if(!((px>=95 && px<=102) && (py>=32 && py<=62)))
if(!((px>=75 && px<=82) && (py>=28 && py<=48)))
if(!((px>=65 && px<=72) && (py>=28 && py<=38)))
if(!((px>=25 && px<=32) && (py>=22 && py<=42)))
if(!((px>=15 && px<=22) && (py>=18 && py<=32)))
if(!((px>=75 && px<=102) && (py>=28 && py<=32)))
if(!((px>=85 && px<=92) && (py>=12 && py<=28)))
if(!((px>=115 && px<=122) && (py>=8 && py<=32)))
if(!((px>=155 && px<=162) && (py>=22 && py<=32)))
```

```
                if(!((px>=165 && px<=172) && (py>=8 && py<=22)))
                if(!((px>=125 && px<=132) && (py>=8 && py<=32)))
                if(!((px>=139 && px<=162) && (py>=8 && py<=12)))
                if(!((px>=135 && px<=142) && (py>=0 && py<=12)))
                if(!((px>=85 && px<=122) && (py>=8 && py<=12)))
                if(!((px>=45 && px<=82) && (py>=8 && py<=12)))
                if(!((px>=5 && px<=12) && (py>=8 && py<=18)))
                if(!((px>=0 && px<=12) && (py>=18 && py<=22)))
                if(!((px>=55 && px<=62) && (py>=8 && py<=82)))
                if(!((px>=45 && px<=52) && (py>=18 && py<=28)))
                if(!((px>=35 && px<=42) && (py>=0 && py<=32)))
                if(!((px>=15 && px<=42) && (py>=8 && py<=12)))
                px=px+5;;
                glutPostRedisplay();
                break;
  }
}

void display()
{

  glClear(GL_COLOR_BUFFER_BIT);
if(df==10)
frontscreen();

else  if(df==0)
     startscreen();
   else if(df==1)
    {
                output(-21,172,"---->");
                output(-21,163,"<----");
                glColor3f(0.0,0.0,1.0);
                output(185,160,"TIME REMAINING : ");
                drawstring(190,130,"HURRY UP",GLUT_BITMAP_HELVETICA_18);
                glColor3f(1,0,0);
           drawstring(190,140,"Time is running out",GLUT_BITMAP_HELVETICA_18);
                sprintf(t,"%d",60-count);
      output(240,160,t);
      glutPostRedisplay();
                point();
                point1();
                point2();
                //line();
      glColor3f(1.0,1.0,1.0);
                wall(-4,-4,0,-4,0,162,-4,162);
        wall(-4,178,-4,184,184,184,184,178);
                wall(180,178,184,178,184,-4,180,-4);
                wall(180,0,180,-4,-4,-4,0,0);
                wall(18,8,42,8,42,12,18,12);
                wall(38,0,38,32,42,32,42,0);
```

```
        wall(42,28,42,32,52,32,52,28);
        wall(48,18,48,28,52,28,52,18);
        wall(58,8,58,82,62,82,62,8);
        wall(0,18,0,22,12,22,12,18);
        wall(8,8,12,8,12,18,8,18);
        wall(62,18,62,22,82,22,82,18);
        wall(48,8,48,12,82,12,82,8);
        wall(88,8,88,12,122,12,122,8);
        wall(138,0,138,12,142,12,142,0);
        wall(142,8,142,12,162,12,162,8);
        wall(128,8,132,8,132,32,128,32);
        wall(132,18,132,22,172,22,172,18);
        wall(168,18,168,8,172,8,172,22);
        wall(158,22,158,32,162,32,162,22);
        wall(118,8,118,32,122,32,122,8);
        wall(88,12,88,28,92,28,92,12);
        wall(78,28,78,32,102,32,102,28);
        wall(18,18,18,32,22,32,22,18);
wall(22,18,22,22,32,22,32,18);
        wall(28,22,32,22,32,42,28,42);
        wall(32,38,32,42,72,42,72,38);
        wall(68,38,68,28,72,28,72,38);
        wall(78,48,78,28,82,28,82,48);
        wall(98,62,98,32,102,32,102,62);
        wall(68,52,68,48,92,48,92,52);
        wall(88,38,88,48,92,48,92,38);
        wall(108,82,108,18,112,18,112,82);
        wall(108,18,108,22,98,22,98,18);
        wall(180,28,180,32,168,32,168,28);
        wall(168,82,168,32,172,32,172,82);
        wall(168,78,168,82,158,82,158,78);
        wall(158,78,158,38,162,38,162,78);
        wall(158,38,158,42,118,42,118,38);
        wall(118,38,118,52,122,52,122,38);
        wall(122,52,122,48,132,48,132,52);
        wall(132,52,132,72,128,72,128,52);
        wall(138,42,138,72,142,72,142,42);
        wall(158,52,158,48,148,48,148,52);
        wall(142,58,142,62,152,62,152,58);
        wall(142,72,142,68,152,68,152,72);
        wall(112,62,112,58,122,58,122,62);
        wall(122,62,122,72,118,72,118,62);
        wall(8,28,8,42,12,42,12,28);
        wall(12,42,12,38,22,38,22,42);
        wall(18,42,18,48,22,48,22,42);
        wall(8,48,8,52,52,52,52,48);
        wall(8,52,8,62,12,62,12,52);
        wall(12,58,12,62,22,62,22,58);
        wall(18,92,18,62,22,62,22,92);
        wall(18,78,18,82,0,82,0,78);
```

```
        wall(18,102,18,98,62,98,62,102);
        wall(28,98,28,58,32,58,32,98);
        wall(32,58,32,62,52,62,52,58);
        wall(52,68,52,72,28,72,28,68);
        wall(62,92,62,88,32,88,32,92);
        wall(8,68,8,82,12,82,12,68);
        wall(68,48,68,62,72,62,72,48);
        wall(38,78,38,82,58,82,58,78);
        wall(62,62,62,58,92,58,92,62);
        wall(92,62,92,72,88,72,88,62);
        wall(108,68,108,72,92,72,92,68);
        wall(122,32,122,28,152,28,152,32);
        wall(62,72,62,68,72,68,72,72);
        wall(72,102,72,72,68,72,68,102);
        wall(72,102,72,98,78,98,78,102);
        wall(78,68,78,112,82,112,82,68);
        wall(82,82,82,78,102,78,102,82);
    wall(78,108,78,112,48,112,48,108);
        wall(48,112,48,118,52,118,52,112);
        wall(38,122,38,118,102,118,102,122);
        wall(98,108,112,108,112,112,98,112);
wall(8,88,12,88,12,112,8,112);
        wall(12,112,12,108,22,108,22,112);
        wall(22,112,22,122,18,122,18,112);
        wall(22,122,22,118,0,118,0,122);
        wall(8,122,8,132,12,132,12,122);
        wall(28,108,28,132,32,132,32,108);
        wall(28,128,28,132,12,132,12,128);
        wall(32,112,32,108,42,108,42,112);
        wall(42,108,42,102,38,102,38,108);
        wall(98,112,98,118,102,118,102,112);
        wall(112,132,112,128,58,128,58,132);
        wall(112,128,112,112,108,112,108,128);
        wall(58,152,58,128,62,128,62,152);
        wall(88,118,88,88,92,88,92,118);
        wall(118,88,118,78,122,78,122,88);
        wall(92,98,92,102,102,102,102,98);
        wall(92,92,92,88,122,88,122,92);
        wall(118,78,118,82,152,82,152,78);
        wall(152,82,148,82,148,88,152,88);
        wall(152,92,152,88,128,88,128,92);
        wall(128,88,128,98,132,98,132,92);
        wall(108,98,108,102,142,102,142,98);
        wall(118,102,118,162,122,162,122,102);
        wall(122,108,122,112,132,112,132,108);
        wall(132,112,132,122,128,122,128,112);
        wall(142,122,142,118,132,118,132,122);
        wall(180,88,180,92,158,92,158,88);
        wall(158,92,158,112,162,112,162,92);
        wall(172,112,172,108,162,108,162,112);
```

```
                wall(172,112,172,108,158,108,158,112);
                wall(152,122,152,98,148,98,148,122);
                wall(148,112,148,108,138,108,138,112);
                wall(152,118,152,122,172,122,172,118);
                wall(168,162,168,122,172,122,172,162);
                wall(168,142,168,138,158,138,158,142);
                wall(168,152,168,148,158,148,158,152);
        wall(148,102,148,98,172,98,172,102);
                wall(-4,172,-4,168,72,168,72,172);
                wall(172,162,172,158,148,158,148,162);
                wall(152,162,152,132,148,132,148,162);
                wall(180,172,180,168,148,168,148,172);
                wall(142,172,142,168,108,168,108,172);
                wall(78,172,78,168,102,168,102,172);
                wall(102,172,102,162,98,162,98,168);
                wall(122,162,122,158,78,158,78,162);
                wall(72,172,72,158,68,158,68,172);
                wall(162,132,162,128,128,128,128,132);
                wall(128,132,128,172,132,172,132,132);
                wall(142,172,142,168,108,168,108,172);
                wall(142,138,142,162,138,162,138,138);
                wall(138,158,138,162,132,162,132,158);
            wall(118,142,118,138,88,138,88,142);
                wall(112,152,112,148,68,148,68,152);
                wall(72,148,72,132,68,132,68,148);
                wall(82,142,82,138,72,138,72,142);
                wall(42,122,42,142,38,142,38,122);
                wall(38,142,38,138,18,138,18,142);
            wall(22,142,22,148,18,148,18,142);
                wall(18,152,18,148,48,148,48,152);
                wall(48,128,52,128,52,158,48,158);
                wall(62,162,62,158,18,158,18,162);
                wall(22,162,22,168,18,168,18,162);
                wall(72,172,72,168,0,168,0,172);
                wall(72,158,72,168,68,168,68,158);
                wall(12,162,12,148,8,148,8,162);
                wall(8,162,8,158,0,158,0,162);
                glutPostRedisplay();

        }

else if(df==2)
       instructions();
   else if(df==3)
    {
     exit(1);
    }
         else if(df==4)
         {
                timeover();
```

```
        }
        else if(df==5)
        {
                winscreen();
        }

  glFlush();

}
void keyboard(unsigned char key,int x,int y)
{

if(df==10 && key==13)
df=0;

    else if((df==0 || df==4 || df==5)&& key=='1')
   {
     df=1;
     start=clock();
          glutPostRedisplay();
   }
  else if(df==0 && key=='2')
   df=2;
  else if(df==0 && key=='3')
   df=3;
  else if(key==27)
   {    df=0;
        }
        if((key=='0' || key=='1')&& (df==4||df==1))
  {
   px=0.0;
   py=175.0;
  }
  glutPostRedisplay ();
}
void myinit()
{
  glMatrixMode(GL_PROJECTION);
  glLoadIdentity();
  glPointSize(18.0);

  glMatrixMode(GL_MODELVIEW);
  glClearColor(0.0,0.0,0.0,0.0);

}

void myreshape(int w, int h)
{
        glViewport(0,0,w,h);
        glMatrixMode(GL_PROJECTION);
```

```
        glLoadIdentity();
        if(w<=h)
                gluOrtho2D(45.0,135.0,-2.0*(GLfloat)h/(GLfloat)w,180.0*(GLfloat)h/(GLfloat)w);
        else
                gluOrtho2D(-45.0*(GLfloat)w/(GLfloat)h,135.0*(GLfloat)w/(GLfloat)h,-2.0,180.0);
 glMatrixMode(GL_MODELVIEW);
 glutPostRedisplay();
}


int main(int argc,char **argv)
{
 glutInit(&argc,argv);
 glutInitDisplayMode(GLUT_SINGLE|GLUT_RGB);
 glutInitWindowSize(600,600);
 glutCreateWindow("Pathfinding game");
 glutReshapeFunc(myreshape);
 glutDisplayFunc(display);
 glutIdleFunc(idle);
 glutSpecialFunc(SpecialKey);
 glutKeyboardFunc(keyboard);
 myinit();
 glutMainLoop();
 return 0;
}
```

CHAPTER – 3

RESULT ANALYSIS

3.1 Snap shots

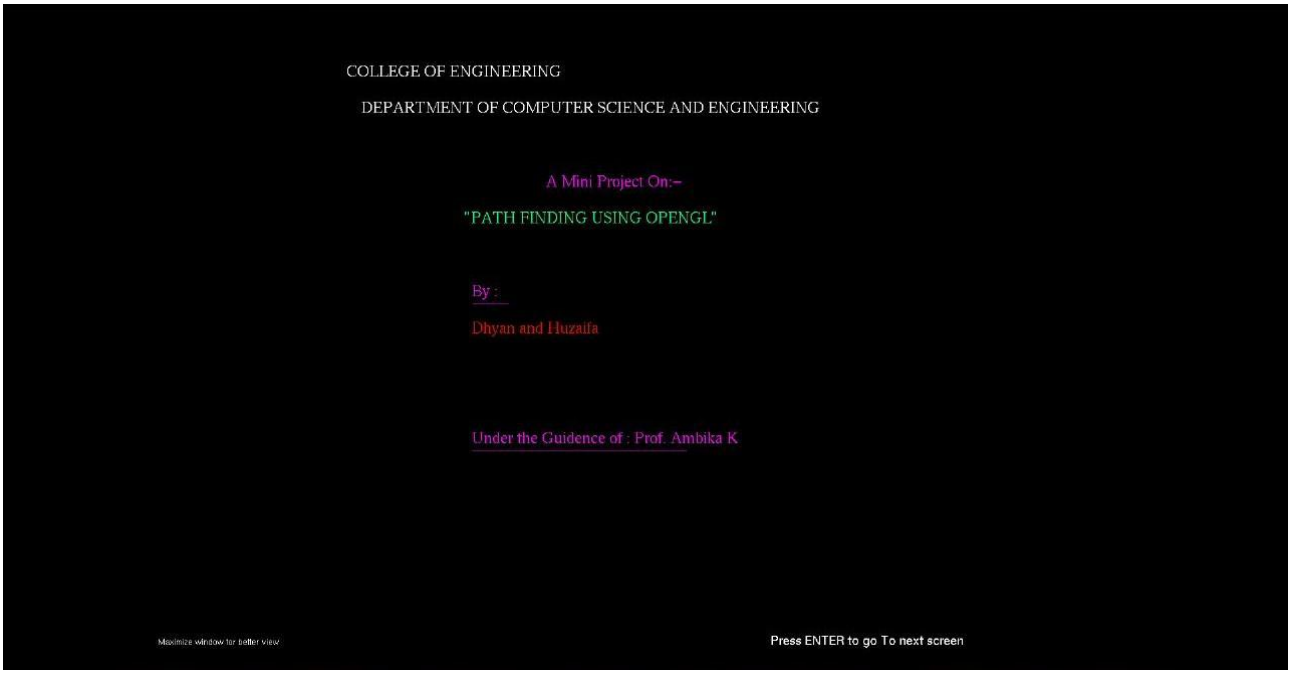

Fig 3.1 Title Screen

Fig 3.2 Main Menu

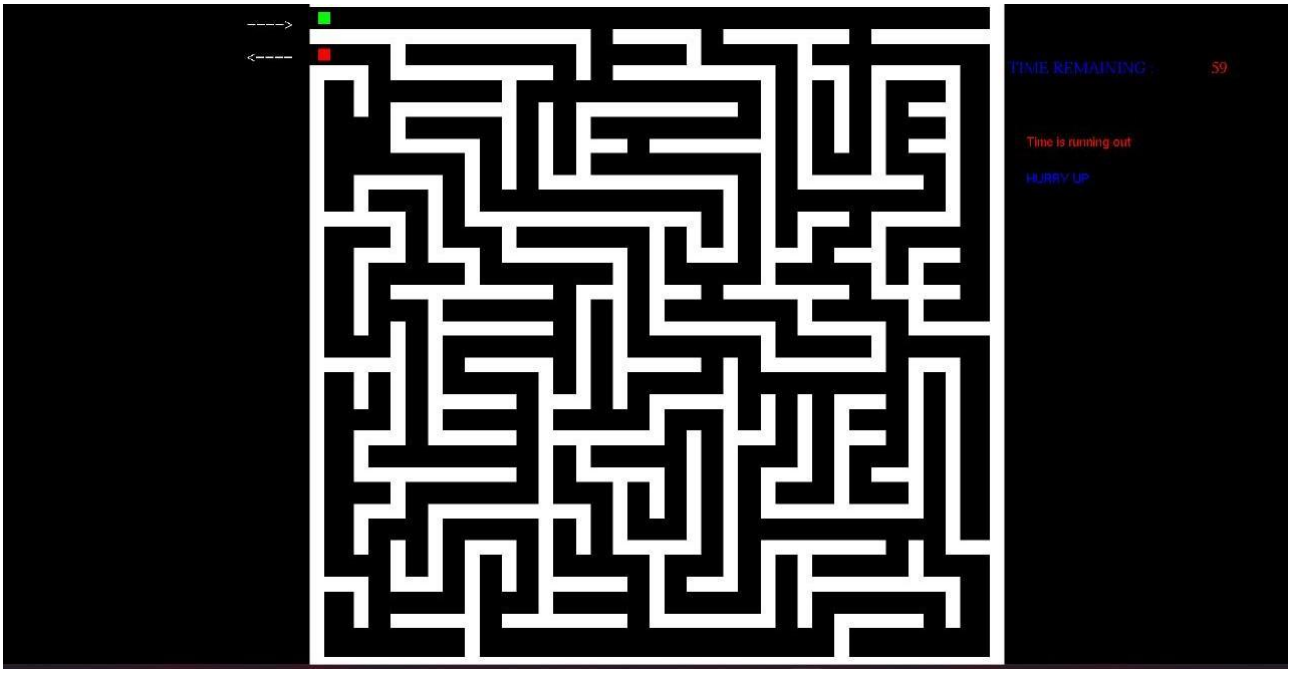

Fig 3.3 Maze Game

3.1 Discussion

- When we run the code, a new window opens up which shows the Title Screen in Fig 3.1.
- When we press ENTER as instructed in Fig 3.1, Main Menu shows up as shown in Fig 3.2.
- The design of the Maze Game is displayed as depicted in Figure 3.3.

CHAPTER – 4

CONCLUSION AND FUTURE ENHANCEMENT

4.1 Conclusion

In conclusion, our maze game project has been successfully developed, incorporating various features and functionalities to enhance the user experience. The utilization of advanced technologies such as OpenGL has allowed us to create an immersive and visually appealing environment. The game includes intricate maze designs, challenging puzzles, and dynamic obstacles that keep the players engaged throughout their journey. The incorporation of interactive elements, such as collectibles and power-ups, adds an extra layer of excitement and rewards to the gameplay. Overall, this project successfully delivers an enjoyable and captivating maze game experience while showcasing the potential of cutting-edge technologies in game development.

4.2 Future Enhancement

The following features are planned to be supported in future versions of the Maze Game:

- Introducing dynamic maze generation algorithms to create unique and challenging mazes each time the game is played.
- Adding a variety of power-ups and obstacles within the maze, such as teleporters, speed boosts, locked doors, hidden switches, and moving platforms, to increase the complexity and excitement of the gameplay.
- Incorporating virtual reality (VR) support, allowing players to fully immerse themselves in the maze environment and navigate through it using VR headsets and controllers for a more immersive and interactive gaming experience.
- Implementing a level editor: Introduce a user-friendly level editor tool that enables players to create and share their custom mazes. This feature empowers players to unleash their creativity, design unique challenges, and share their creations with others, fostering a community-driven experience.
- Adding environmental effects: Enhance the visual and atmospheric elements of the maze game by introducing dynamic weather conditions, such as rain, fog, or changing seasons. Additionally, incorporating ambient sounds and background music that adapt based on the player's progress or location within the maze can further enhance the immersion and overall gameplay experience.

REFERENCES

We have obtained information from many resources to design and implement our mini-project successively. The following are some of the sources :

1. Donald Hearn & Pauline Baker: Computer Graphics with OpenGL Version,3rd / 4th Edition, Pearson Education, 2011
2. Edward Angel: Interactive Computer Graphics- A Top-Down approach with OpenGL, 5th edition, Pearson Education, 2008
3. James D Foley, Andries Van Dam, Steven K Feiner, John F Huges Computer graphics with OpenGL: Pearson education
4. Xiang, Plastock : Computer Graphics , Schaum's outline series, 2nd edition, TMG.