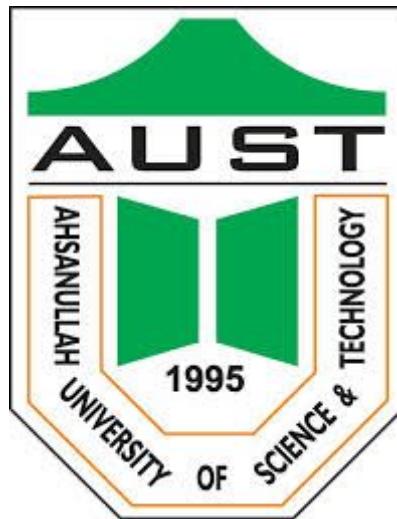


Ahsanullah University of Science & Technology
Department of Computer Science & Engineering



Computer Graphics Project Report

Project Title
3D Model of India Gate

Course No. **CSE 4204**

Course Name. **Computer Graphics Lab**
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1 Project Description

1.1 Introduction

The **India Gate** (originally called the All India War Memorial) is a war memorial located astride the Rajpath, on the eastern edge of the "ceremonial axis" of New Delhi, India, formerly called Kingsway.

India Gate is a memorial to 70,000 soldiers of the British Indian Army who died in the period 1914-21 in the First World War, in France, Flanders, Mesopotamia, Persia, East Africa, Gallipoli and elsewhere in the Near and the Far East, and the Third Anglo-Afghan War.

1.2 Motivation

As we learned some functionality of OpenGL throughout the course, we are trying to apply all the functions to make a 3D model. **India Gate** seems to be a perfect monument to design because it gives us the opportunity to implement all the functions.

1.3 Features

1. 3D model of India Gate as accurate as possible
2. Texture identical to the original one in real life
3. Animation (Rotation) on key press
4. Zooming feature
5. Day night view
6. Sky box

1.4 Some useful functions

To design the model we must use the following functions:

- GL_QUADS:
GL_QUADS draws quad for given vertices. GL_QUADS vertices order is as follows :
 1. top left

2. bottom left
3. top right
4. bottom right

- GL_TRIANGLES:

GL_TRIANGLES draws triangle using given vertices.

- GL_POLYGON:

GL_POLYGON draws polygon using vertices.

- glTransletf():

glTransletf performs translation operation.

- glColor3f():

Set the current color. 3 indicates Red, Green, Blue these three colors and we can use floating point values.

- loadBMP():

This function loads bmp type image file.

- glBindTexture():

Binds a named texture to a texturing target.

1.5 Tools we used

To design the model we used the following materials:

- **IDE:** CodeBlocks
- **Library:** OpenGL
- **External Header File:** imageloader.h

2 Project Illustration

Two real life pictures of the monument we are trying to design is given below.



Figure 1: India Gate View 1



Figure 2: India Gate View 2

An existing 3D model of the monument is given below.



Figure 3: India Gate 3D Model

3 Significant Functions with Code

3.1 drawArc(...)

This function was used for drawing arc. The code is given below

```
void drawArc(float ang, float xx, float yy, float
zz)
{
    glTranslatef(xx, yy, zz);
    glColor3f(0.43f, 0.324f, 0.215f);
    glRotatef(ang, 0.0f, 1.0f, 0.0f);
    float y=-0.8f, x=-1.0f;
    for(float i=90; i>=-90; i-=1)
    {
        float irad = (i/360.0)*3.1416;
        point* a = new point(x,y,0.5f); point* b =
            new point(x+0.01111,y+0.01111*sin(irad)
            ,0.5);
        point* c = new point(x+0.01111,-0.25,0.5);
        point* d = new point(x,-0.25,0.5f);
        point* e = new point(x,y,-0.5f); point* f
            = new point(x+0.01111,y+0.01111*sin(irad
            ),-0.5);
        point* g = new point(x+0.01111,-0.25,-0.5)
            ; point* h = new point(x,-0.25,-0.5f);
        drawCube(a,b,c,d,e,f,g,h);
        x = x+0.01111f; y = y+0.01111*sin(irad);
    }
    glRotatef(-1*ang, 0.0f, 1.0f, 0.0f);
    xx = -1*xx; yy = -1*yy; zz = -1*zz;
    glTranslatef(xx, yy, zz);
}
```

3.2 drawHalfCir(...)

Was used for drawing half circle

```
void drawHalfCirc(float ang, float rad, float xx,
float yy, float zz, float ymin)
{
    glTranslatef(xx, yy, zz);

```

```

glColor3f(0.43f, 0.324f, 0.215f);
glRotatef(ang, 0.0f, 1.0f, 0.0f);

float y=-0.8;
for(float x=0.005-rad; x<=rad-0.005; x+=0.005)
{
    point* a = new point(x,y,0.5f); point* b =
        new point(x+0.005,ymin+sqrt(1-(x*x))
        ,0.5);
    point* c = new point(x+0.005,-0.36,0.5);
    point* d = new point(x,-0.36,0.5f);
    point* e = new point(x,y,-0.5f); point* f
        = new point(x+0.005,ymin+sqrt(1-(x*x))
        ,-0.5);
    point* g = new point(x+0.005,-0.36,-0.5);
    point* h = new point(x,-0.36,-0.5f);
    drawCube(a,b,c,d,e,f,g,h);
    y = ymin+sqrt(1-(x*x));
}
glRotatef(-1*ang, 0.0f, 1.0f, 0.0f);
xx = -1*xx; yy = -1*yy; zz = -1*zz;
glTranslatef(xx, yy, zz);
}

```

3.3 drawQuad(...)

Whenever we draw any quad we used this function

```

void drawQuad(point *a, point *b, point *c, point
*d)
{
    glBegin(GL_QUADS);
        glVertex3f(a->x, a->y, a->z);
        glVertex3f(b->x, b->y, b->z);
        glVertex3f(c->x, c->y, c->z);
        glVertex3f(d->x, d->y, d->z);
    glEnd();
}

```

3.4 drawQuadTex(...)

We gave texture on a quad by this function

```
void drawQuadTex(point *a, point *b, point *c,
                  point *d, GLuint _texture, float n, float m)
{
    glEnable(GL_TEXTURE_2D);
        glBindTexture(GL_TEXTURE_2D, _texture);
        glTexParameteri(GL_TEXTURE_2D,
                        GL_TEXTURE_MIN_FILTER, GL_LINEAR);
        glTexParameteri(GL_TEXTURE_2D,
                        GL_TEXTURE_MAG_FILTER, GL_LINEAR);

    glBegin(GL_QUADS);
        glTexCoord2f(0.0f, 0.0f);
        glVertex3f(a->x, a->y, a->z);
        glTexCoord2f(n, 0.0f);
        glVertex3f(b->x, b->y, b->z);
        glTexCoord2f(n, m);
        glVertex3f(c->x, c->y, c->z);
        glTexCoord2f(0.0f, m);
        glVertex3f(d->x, d->y, d->z);
    glEnd();
    glDisable(GL_TEXTURE_2D);
}
```

4 Screen Shots from different views

4.1 Front Day

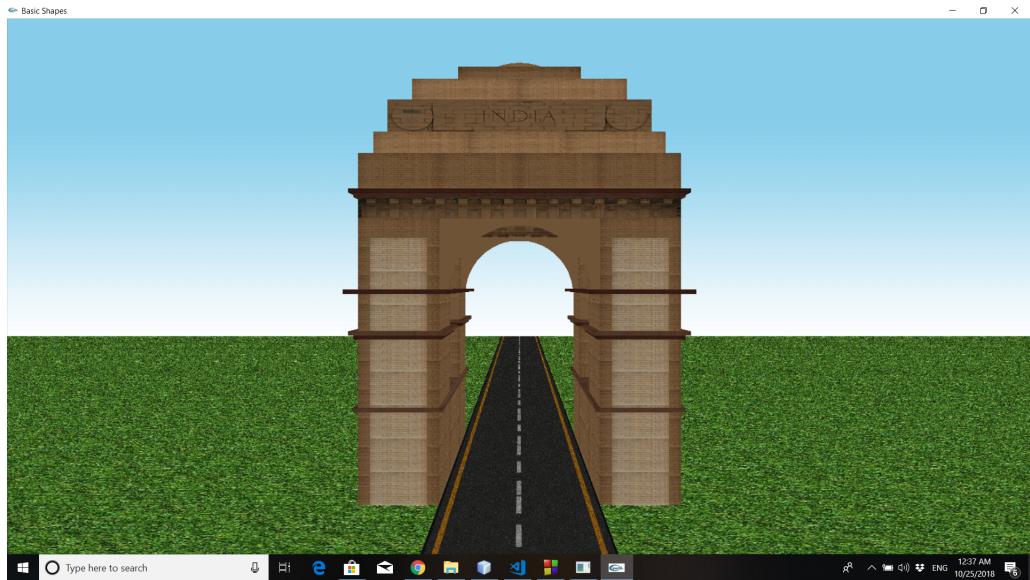


Figure 4: Front view of India Gate in day mode

4.2 Front Night

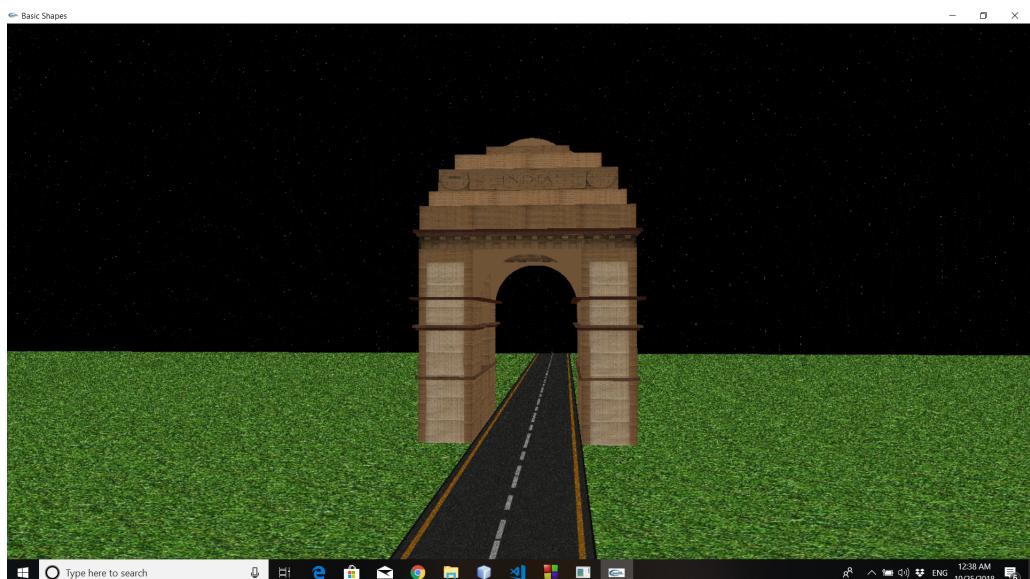


Figure 5: Front view of India Gate in night mode

4.3 Side Angle Day

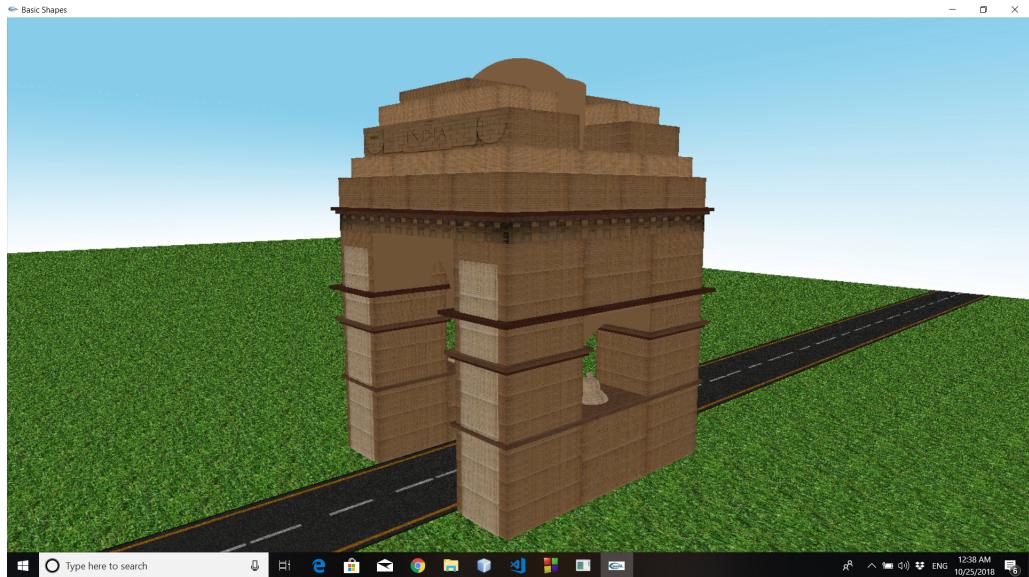


Figure 6: India Gate view from south east in day mode

4.4 Side Angle Night

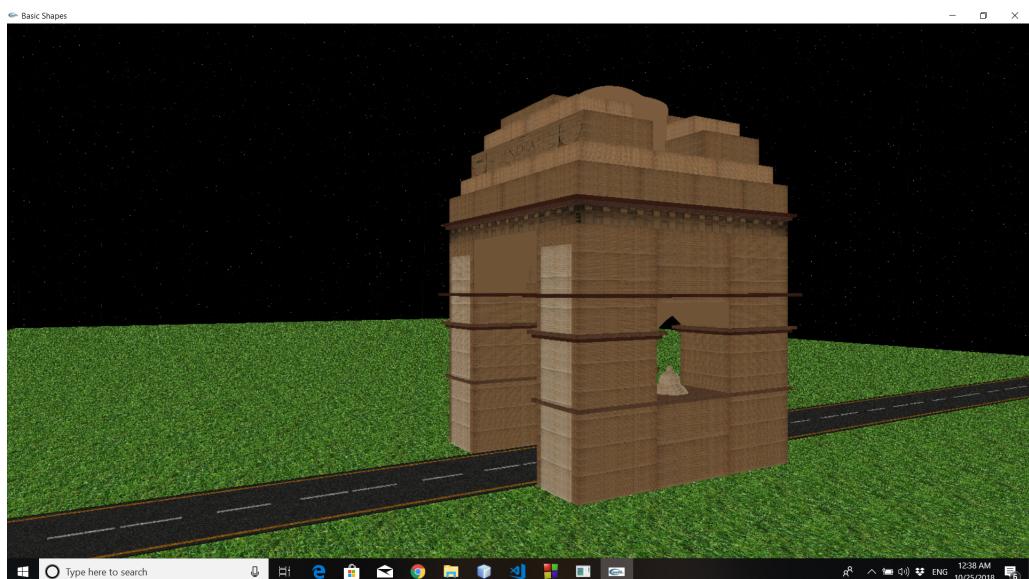


Figure 7: India Gate view from south east in night mode

4.5 Side View

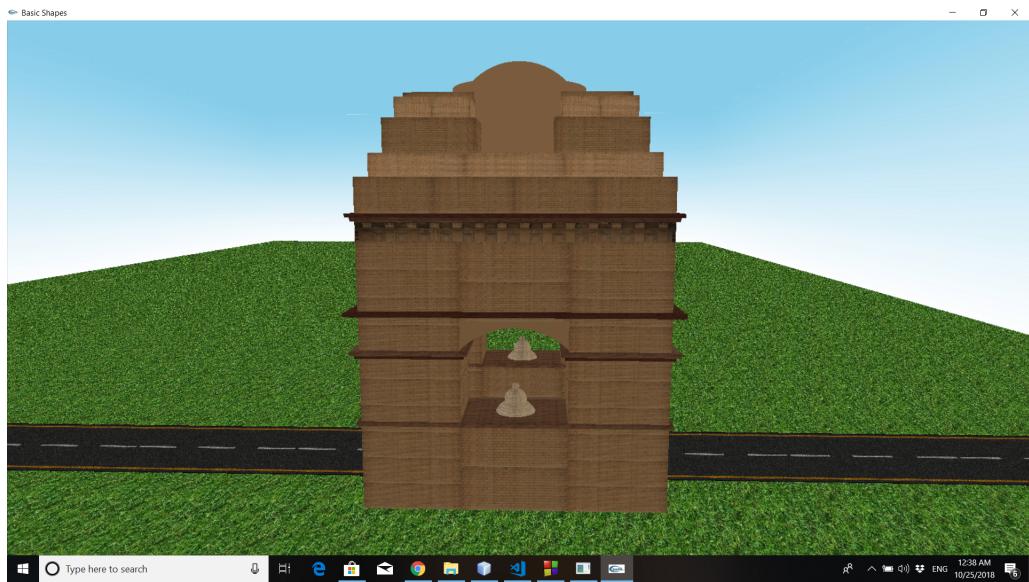


Figure 8: Side view India Gate in day mode

4.6 Top View

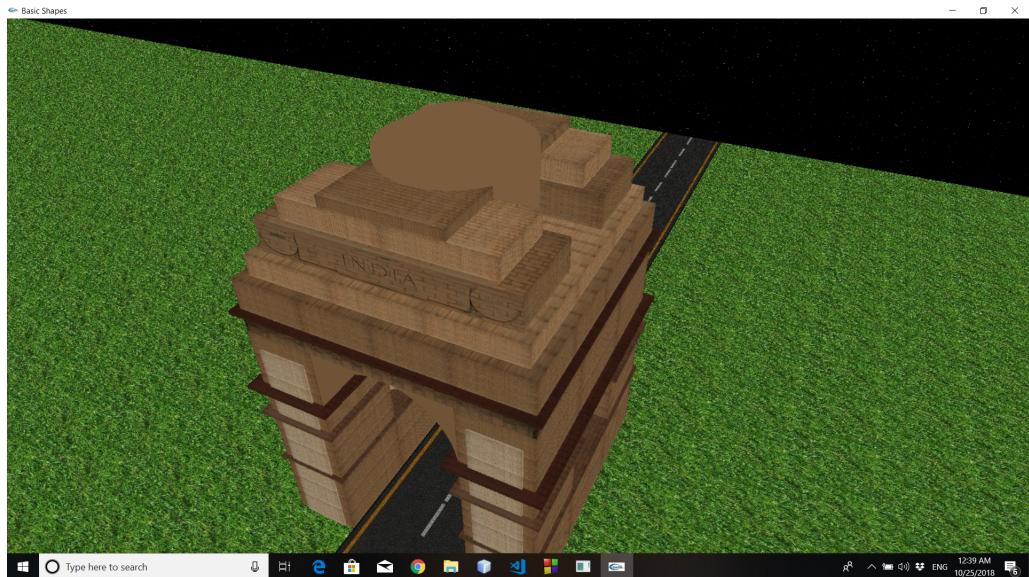


Figure 9: Top view of India Gate