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LIGHTING AND SHADING



Keerthishree R Doddamani

Research scholar Dept Of Research and Master of Computer Science.

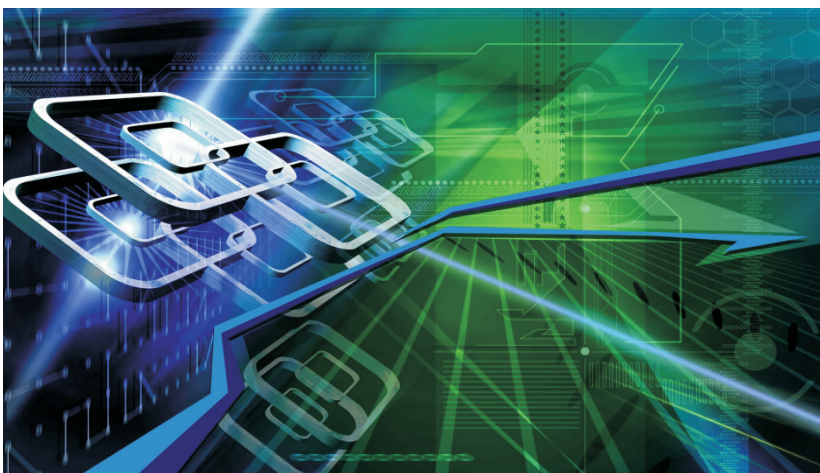
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ABSTRACT:

Computer graphics is concerned with all aspects of producing pictures or images using a computer. The field began humbly almost 50 years ago, with a display of a few lines on a cathode-ray tube(CRT); now, we can create images by computer that are indistinguishable from photographs of real objects.

KEYWORDS

Computer graphics, cathode-ray tube(CRT), characteristics.

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INTRODUCTION :

OpenGL, which has become a widely accepted standard for developing graphics applications. Fortunately, OpenGL is easy to learn, and it possesses most of the characteristics of other popular graphics systems.

DESIGN

Our project demonstrates lighting and shading effect on various 3D objects. Light source rotates around each object in specified direction by 30 degrees.

We used function `glutWireCube(double size)` for light source.

The various API's used in our project code are listed below:

- We register the mouse callback function, usually in the main function by means of the GLUT function as follows:

```
glutMouseFunc(mouse);
```

Mouse callback must have the form:

```
Void mouse (int button, int state, int x, int y);
```

- On pressing left mouse button, the light source will rotate around the 3D object by 30 degrees. On pressing middle mouse button, the light source will rotate around the 3D object by -30 degrees. On pressing the right mouse button, we display menu containing various 3D objects
- This mouse interface helps us in viewing lighting and shading effect on 3D objects clearly.
- We register the keyboard callback function in the main function, by means of the GLUT function as follows:

```
glutKeyboardFunc(keyboard);
```

Keyboard callback must have the form:

```
void keyboard(unsigned char key, int x, int y);
```

- We used keys 'q' or 'Q' to terminate the program.

• The menu interface is created by using the function :

```
glutCreateMenu(objects);
```

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The main menu consists of 4 options:

- 1.Solid torus
- 2.Solid teapot
- 3.Solid dodecahedron
- 4.Solid sphere

- glEnable(GL_LIGHTING) – To enable the lighting effect
- glEnable(GL_LIGHT0) – To enable a particular light source
- glEnable(GL_DEPTH_TEST) – To enable hidden surface removal
- glDisable(GL_LIGHTING) – Disables the lighting effect.
- glShadeModel(GL_SMOOTH) – Shades a polygon in a constant color.
- gluLookAt(GLdouble eyex, GLdouble eyey, GLdouble eyez, GLdouble atx, GLdouble aty, GLdouble atz, GLdouble upx, GLdouble upy, GLdouble upz) – Post multiplies the current matrix by a matrix determined by a viewer at the eye point looking at the at point with the specified up direction.

- Void gluPerspective(GLdouble fovy, GLdouble aspect, GLdouble near, GLdouble far) – Defines a perspective viewing volume using the y-direction field of view fovy measured in degrees, the aspect ratio of the front clipping plane, and the near and far distances.

- glTranslated(GLdouble x, GLdouble y, GLdouble z) – Alters the current matrix by a displacement of (x,y,z).
- glRotated(GLdouble angle, GLdouble dx, GLdouble dy, GLdouble dz) – Alters the current matrix by a rotation of angle degrees about the axis (dx,dy,dz).
- glLightfv(GL_LIGHT0, GL_POSITION, position) – Sets the scalar and vector parameters for light source.
- glutSolidTorus(double innerradius, double outerradius, int sides, int rings) – It renders a solidtorus.
- glutSolidSphere(GLdouble radius, GLint slices, GLint stacks) – It displays a solid sphere.
- glutSolidTeapot(GLdouble size) – It displays a solid teapot.
- glutSolidDodecahedron(void) – It displays a dodecahedron.
- glPushMatrix()

glPopMatrix() – Pushes to and pops from the matrix stack corresponding to the current matrix mode.

Working with the window system

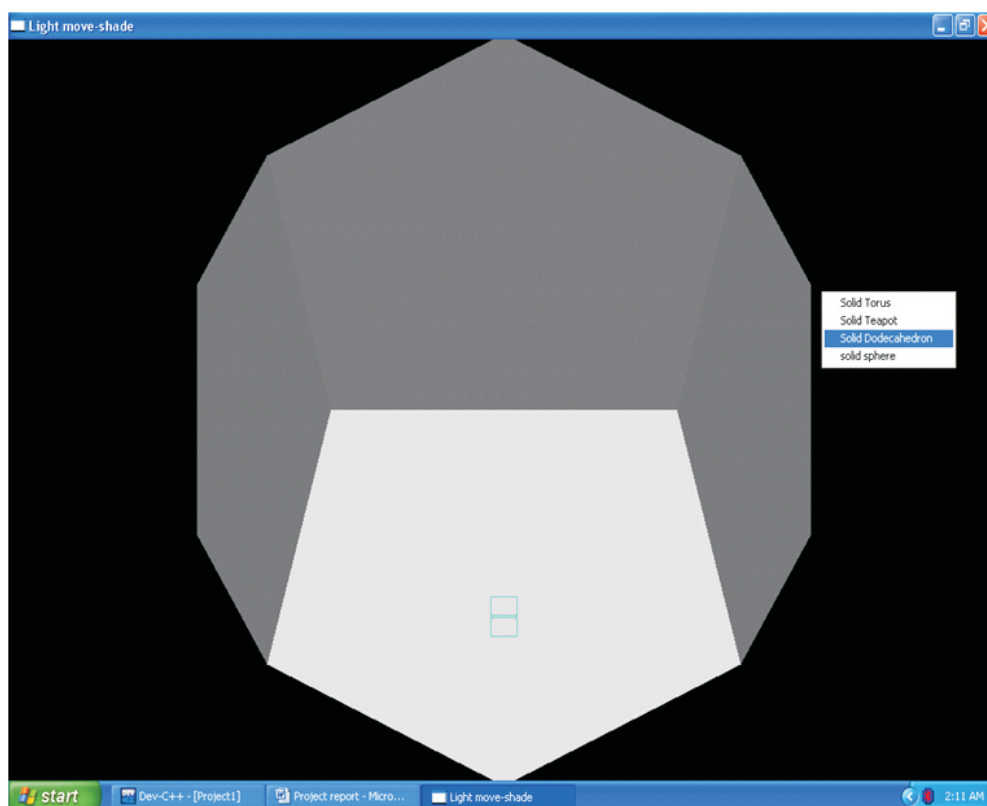
- glFlush() – forces any buffered openGL commands to execute.
- glutInit(int *argc, char **argv) – initializes GLUT. The arguments from main are passed in and can be used by the application.
- glutCreateWindow(“Light move-shade”) – Creates a window on the display.

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LIGHTING AND SHADING

- `glutInitDisplayMode(unsigned int mode)` – Requests a display with a properties in mode. The value of mode is determined by the logical OR of options including the color model (`GLUT_RGB, GLUT_INDEX`) and buffering (`GLUT_SINGLE, GLUT_DOUBLE`).
- `glutInitWindowSize(int width, int height)` – Specifies the initial height and the width of the window in pixels.
- `glutInitWindowPosition(int x, int y)` – Specifies the initial position of the top left corner of the window in pixels.
- `width*height` viewport in pixels whose lower left corner is at (x,y) measured from the origin of the window.
- `glutMainLoop()` – Cause the program to enter an event-processing loop. It should be the last statement in main.
- `glutDisplayFunc(void (*func)(void))` – Registers the display function that is executed when the window needs to be redrawn.
- `glutPostRedisplay()` – Requests that the display callback be executed after the current callback returns.
- `glutReshapeFunc(void *f(int width, int height))` – Registers the reshape callback function `f`. The callback function returns the height and width of the new window.
- `glutAddMenuEntry(char *name, int value)` – Adds an entry with the string name displayed to the current menu. Value is return to the menu callback when the entry is selected.
- `glutAttachMenu(int button)` – Attaches the current menu to the specified mouse button.



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CONCLUSION

OpenGL serves as efficient platform to create graphics applications. So to conclude we have demonstrated the lighting and shading effect on different 3 dimensional objects using basic primitives.

REFERENCE

Interactive Computer Graphics A Top-Down Approach using OpenGL-Edward Angel, 5th Edition

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