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CE (3rd year/ 2nd sem)

Simulation of Solar System (Earth, Moon And Sun)

Introduction

The Solar System is the gravitationally bound planetary system of the Sun and the objects that orbit it, either directly or indirectly. Of the objects that orbit the Sun directly, the largest are the eight planets, with the remainder being smaller objects, such as the five dwarf planets and small Solar System bodies.

The Moon orbits Earth in the prograde direction and completes one revolution relative to the stars in about 27.32 days (a sidereal month) and one revolution relative to the Sun in about 29.53 days (a synodic month). Earth and the Moon orbit about their barycenter (common center of mass), which lies about 4,600 km (2,900 mi) from Earth's center (about three-quarters of the radius of Earth). On average, the distance to the Moon is about 385,000 km (239,000 mi) from Earth's center, which corresponds to about 60 Earth radii.The Moon's orbital plane is inclined by about 5.1° with respect to the ecliptic plane, whereas the Moon's equatorial plane is tilted by only 1.5°. Times and orbits are scaled down to represent simple model of earth, moon and sun.

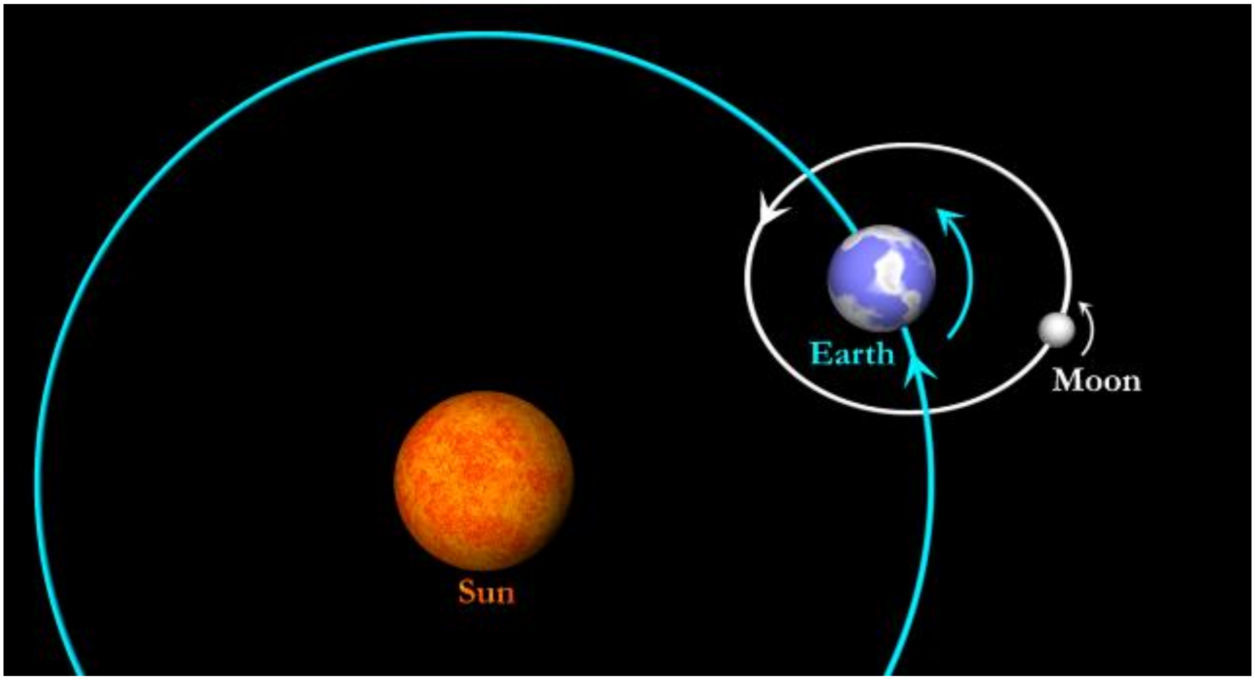

Fig: Model of sun, earth and its moon

Objectives

The main objective of this project is to represent simple model of sun, earth and its moon.

Tools Used

- Graphics Library: OpenGL
- IDE: Code::Blocks
- Language: C++

OpenGL functions used

1. glBegin(GL_LINE_LOOP): Draws a connected group of line segments from the first vertex to the last, then back to the first. Vertices n and n + 1 define line n. The last line, however, is defined by vertices N and 1 . N lines are drawn.
2. glVertex3d(GLdouble x, GLdouble y, GLdouble z): Specifies a vertex.
3. glMatrixMode(GL_MODELVIEW): Applies subsequent matrix operations to the modelview matrix stack.
4. glLoadIdentity(): Replace the current matrix with the identity matrix.
5. glPushMatrix(): Push and pop the current matrix stack.
6. glTranslatef(GLfloat x, GLfloat y, GLfloat z): Multiply the current matrix by a translation matrix.
7. glPopMatrix(): Pops the current matrix stack, replacing the current matrix with the one below it on the stack.
8. glRotatef(GLfloat angle, GLfloat x, GLfloat y, GLfloat z): Multiply the current matrix by a rotation matrix.
9. glutSolidSphere(GLdouble radius, GLint slices, GLint stacks): Renders a sphere centered at the modeling coordinates origin of the specified radius. The sphere is subdivided around the Z axis into slices and along the Z axis into stacks.
10. glMatrixMode(GL_PROJECTION): Applies subsequent matrix operations to the projection matrix stack.
11. gluPerspective(GLdouble fovy, GLdouble aspect, GLdouble zNear, GLdouble zFar): Set up a perspective projection matrix.
12. glViewport(GLint x, GLint y, GLsizei width, GLsizei height): Set the viewport.