**Comp Sci 3GC3 – Final Project – 3D Asteroids**

How to run: In console, make sure you are in directory with all final project files, then type:

“make –f makefile”

Features:

* 3D Asteroid Shooter Simulation
  + Textured asteroids of varying shapes and sizes fly at the user’s spaceship. The ship has a missile launcher which can be used to cause asteroids to violently explode into particles. The user has 3 lives, if hit by an asteroid, the ship will explode and the user will respawn. When no lives remain the game will end.
* Basic Game Features:
  + Player ship model: Constructed with hierarchical matrix transformation using multiple quadric objects. Bound to dimensions of viewport so it does not go off-screen.
  + Missiles: User-launchable missiles, only one allowed to be active at a time.
  + Asteroids: Textured and lit asteroids. Randomly generated parameters (location, speed, size, etc.).
  + Collisions: Tests for collisions with missiles, asteroids and player ship.
  + Dynamically allocated vectors for object storage.
  + Custom “Game Over” Screen: Asteroids accelerate off screen and do not respawn, player ship explodes and disappears and “Game Over” text appears.
* Advanced Graphics Features:
  + Lighting: Lighting calculated with vertex normals for each object in the scene. Gouraud shading used for all objects. Directed light source positioned outside screen.
  + Textures mapped to asteroids using OpenGL’s texture coordinate system and a provided PPM file.
  + Particle system present for asteroid and ship explosions. Modified due to the constraints of the game.
  + Fully animated characters in asteroids, missiles and player ship. Asteroids move autonomously, player ship is user controllable and missiles are launcher by user, then autonomous.
  + Non-geometric primitive (bitmap/PPM file) used to draw elements of user interface (Heads Up Display) at bottom left of screen.
  + Geometrically defined Stroke Font rendering used to indicate number of lives, above main heads up display.
* Extra Feature:
  + Sound: Sound effect plays when firing missiles and when player ship explodes. (Please make sure your sound is on. Only tested on Windows 8 Laptop).

*Keyboard Controls*:

* q: Quit program.
* Arrow Keys: Move ship left, right, up and down.
* Light Positioning
* T: Moves light up .
* G: moves light down.
* F: moves light left .
* H: moves light right .
* Spacebar: Shoots missile forward.

*References*:

* Tessellators and Quadrics: <http://www.glprogramming.com/red/chapter11.html>
* Asteroid texture credit to Vasily Tserekh: <http://www.codeproject.com/script/Membership/View.aspx?mid=5457472>
* User Interface/Heads Up Display Picture credit to Giertler and Klein: <https://wiki.colby.edu/display/~bkgiertl/Giertler+and+Klein+-+Assignment+V>
* Credit for implementation details of select program functions to Dr. R. Teather (Sample Code, Comp Sci 3GC3, McMaster University).