Final Project Proposal: Buggy Bomber

General Program Description:

Buggy Bomber is a simple game intended for gamers of all ages. The player controls a futuristic cyber-tank that can be driven forwards and backwards, and can rotate and fire a deadly cannon at various targets. The goal of the game is to shoot down the alien invaders to save the Earth, while at the same time avoiding an explosive death.

Buggy Bomber is played from a side view. When the game first starts up, the player's tank is located in the center of the battlefield, and the player possesses three “lives” or chances to continue after their tank is destroyed. Enemies appear from multiple directions, both flying in from the sides, and dropping down from above. Some enemies will attack the player's tank directly, by crashing into it, while others will drop small bombs of their own. In order to survive, the player must either destroy the enemies with their gun, or try to move the tank out of harm's way by driving it forwards or backwards.

There will be various enemies to fight, from flying saucers and alien fighter planes, to falling meteors and orbital bombs. To combat these, the player will have various forms of munitions for their cannon, including standard explosive rounds and nukes.

Game States:

At any one time, the game can be in one of three possible states:

- **Start** – In the start state, there are no enemies on the screen, the player's tank is positioned in its centered, starting position, and all the controls which manipulate the tank are unresponsive.
- **Play** – In the play state, enemies appear on the screen and attack the player's tank, and the controls which manipulate the tank are enabled.
- **Pause** – In the pause state, the game is frozen, with all enemies immobile and the controls which manipulate the tank disabled.

Scenery:

The scenery for the game is composed of the following:

- **Ground** – The ground is a light brown rectangle that occupies the extreme bottom of the game world. Within the ground are grey and dark brown rocks represented by small circles. Just above the light brown rectangle is a thin green rectangle representing grass. Nothing (aside from the rocks) may be superimposed over the ground.
- **Trees** – Trees are composed of a dark brown rectangle (the trunk) upon which sits either a green triangle or a green ellipse, representing the foliage. Trees sit just above, and are connected to, the ground.
- **Mountains** – Mountains are large triangles which are colored various shades of gray, brown, and/or green. They sit atop the ground, and any and all other scenery features (like trees and clouds) are superimposed over them.
- **Clouds** – Clouds are white ellipses which are positioned randomly in the upper portion of the game world. During the course of the game, the clouds will drift in a random direction (either left or right), with new clouds replacing those which drift off the screen.

Aliens:

The different aliens in the game are:

- **Flying Saucers** – Flying saucers are composed of a grey ellipse, with the long axis positioned horizontally, and a lighter grey ellipse on top. A dark grey line bisects the center of the main grey ellipse, going from left to right. Three small circles are positioned beneath this line, but within the body of the ellipse, and are colored green, blue and red.
- **Alien Fighter Jets** – Alien fighter jets are composed of a long, horizontal rectangle for the body, a triangle at the front for the nose, and a triangle at the top rear for the tail. All of these shapes are shades of grey. In addition to these parts, a black line running the length of the rectangle represents the wings, while a white ellipse at the front of the plane represents a cockpit.
- **Orbital Bombs** – Orbital Bombs are composed of a dark grey ellipse (positioned vertically) with a lighter grey triangle on top (pointing down) for fins and a small red circle at the very bottom.
- **Dropped Bombs** – Dropped bombs are identical to orbital bombs, though they are much smaller.
- **Meteors** – Meteors are light brown polyhedrons with a random number of sides between six and ten.

**Cyber-tank:**

The player's cyber-tank is composed of several parts:
- **Body** – The body of the tank is composed of a light grey rectangle running horizontally, with a hemi circle at the back and a triangle at the front, both of which are the same color as the body.
- **Turret** – The tank's turret is composed of a small horizontal rectangle with a partially obscured circle on top of it. The turret sits at the top back of the tank's body.
- **Treads** – The tank's treads are composed of four medium-sized grey circles which are connected along both their tops and bottoms by two grey lines. At the center of each of the circles lie smaller circles which are of a darker grey color.
- **Gun** – The tank's gun, which stick out from the center of the turret/circle, is a long grey rectangle with a shorter, but fatter rectangle at the end.
- **Shield** – The tank's shield is a light blue circle which is partially obscured by the ground. The circle is centered on the tank and obscures any background scenery directly “behind” it.

**Other Objects:**
- **Explosions** – Explosions are orange circles.
- **Death Rays** – Death rays are blue, green, and red lines with a VERY small ellipse on their tips.
- **Projectiles** – Projectiles, which are fired from the tank’s gun, are dark grey circles that burst into explosions when they reach their targeted destination.

**Object Attributes:**
- The player’s tank can be manipulated in the following ways:
  - The tank can be moved right or left (forward or backwards).
  - The tank’s gun can be rotated 180 degrees, from level right to level left.
  - The tank’s shield will become invisible (and offer no protection) after it has taken ten units of damage (by default). Different enemy weapons do different amounts of damage, and the shield strength can be changed through the GUI.
  - The tank can fire projectiles from its cannon so long as the targeted location is outside of the gun's minimum range.
- Flying Saucers move slowly across the screen (either left or right) and fire death rays randomly in a cone centered on the players tank.
- Alien fighter jets move quickly across the screen (either left or right) and drop small bombs which fall to the ground and cause explosions.
- Meteors drop from the top of the screen and cause explosions when they hit the ground or the player's tank.
- Orbital Bombs fall from the top of the screen to the bottom at a constant velocity. They cause explosions and disappear when they intersect the ground or the player’s tank.
- Dropped Bombs fall from the alien fighter jets at a constant velocity. They cause explosions and disappear when they intersect the ground or the player’s tank.
- Explosions grow in size from small circles to larger circles, and then shrink again before disappearing. Any enemy caught in the collision box of an explosion is destroyed and removed from the game. The player's tank has its shield reduced by explosions, and is itself destroyed when the shield is depleted. Dropped bomb explosions do two points of damage, orbital bomb explosions do six points of damage, meteor explosions do three points of damage.
- Death rays appear instantly when created, stay visible for a short period of time, and then disappear. If the player's tank is hit by a death ray, its shield is reduced and the tank is destroyed when the shield is depleted. Death rays do two points of damage.

**Displays:**
- There are two size-by-side displays.
- The left display is the active world, where enemies attack the tank and may be attacked.
- The right display is the greater world, where the active world is represented by a white-bordered rectangle.
- When the player moves their tank left or right, the active world moves with it (keeping the tank centered). This is true until the active world bumps up against the edge of the greater world. At this point the player can still move to the edge of the active/greater world (but not past it), but the active world will stay stationary.

**Sounds:**
- Various sounds may be supported for different events. They include explosions, the main gun of the tank firing, and death rays.

**Potential Areas of Difficulty:**
- Designing an algorithm which allows each type of object to perform its various actions without causing too much slowdown.
- Making sure enemy bombs explode on the surface of the ground rather than within it. This may be tricky if bomb velocity is set too high.

**User Events:**
- **Mouse Service:**
  - **LMB_DOWN** – If the game is in its play state, and if the mouse cursor is pointing to a spot outside of the tank’s minimum range but still in the active world, then the tank’s gun fires a projectile at the targeted location.
  - **RMB_DOWN** – If the game is in its play state, this cycles through the tank’s munitions (if there are any available aside from the default).
- **Keyboard Service:**
  - ‘a’ or ‘A’ or ‘←’ – This moves the tank left.
  - ‘d’ or ‘D’ or ‘→’ – This moves the tank right.
  - ‘p’ or ‘p’ – This sets the game to its pause state.
- **GUI:**
  - **Difficulty Slider** – This alters the game’s difficulty by changing the number of enemies that are generated as well as changing the frequency with which the alien fighter jets drop their bombs and the flying saucers fire their death rays.
  - **Gravity Slider** – This alters the rate at which bombs and meteors fall. This is only active in the game’s pause and start states.
  - **Pause Button** – This toggles the games pause state on and off.
  - **Reset Button** – This sets the game back to its start state.
  - **Quit Button** – This exits the game.
Diagram: