COMP 465 – Warbird Simulator Phase 2 Documentation

# Updates from Phase 1:

* 1. Fixed moon orbits for Primus and Secundus on planet Duo.
  2. Dynamic Cameras were added for Unum and Duo.
  3. Using separate rotation matrices for each space body.
  4. Refactored to OOP approach.
     1. Object3D, Warbird, Missile classes were added with their own methods and attributes.
        1. Warbird and Missile classes are child classes of Object3D with more specific functionality.
  5. Huge code cleanup.

# Phase 2:

* 1. Missiles
     1. Tracking
        1. Missile silo missiles acquire the Warbird as a target and tracks its location moving towards (chasing) it until it collides with it.
        2. Warbird missile acquires either the Unum or Duo Missile Silos as targets (whichever one is closer) and tracks its location moving towards (chasing) it until it collides with it.
        3. Tracking algorithm utilizes Dot product to figure out the amount of rotation the missile needs to do and the Cross product to figure out the axis of rotation the missile needs to rotate on.
        4. Sometimes (rarely) the missile goes away from the target and then turns around and chases it again.
        5. It’s somewhat difficult for the missile to collide with the Duo Missile Silo. It’s easier for it to hit the Unum Missile Silo due to its slower rotation speed. So it’s somewhat difficult to win the game.
     2. Created and utilized custom models for missiles.
     3. Warbird Missile
        1. When it’s fired the warbird can’t fire another one until the current missile explodes after its lifetime or when it collides with an object.
     4. Missile Silo Missiles
        1. Each Missile silo can shoot one missile at a time and lasts for its lifetime or if it collides with an object.
     5. Missiles face its target correctly as it travels to it.
  2. Missile Silos
     1. There are two missile silos added to the project one on Duo and one on Unum.
        1. Model created and placed on top of each planet.
  3. Collision Detection
     1. The warbird is able to collide with all the objects in the space.
     2. The missiles collide with all the objects in the space.
        1. Missile collision only applies when it becomes smart (activates tracking).
     3. Collision detection is done by calculating the distances between the objects and comparing the sum of their model’s bounding radius. When their distance is less than the sum a collision is triggered.
  4. Utilized new model for Duo called Mountain Planet since the old model made it difficult to place the missile silo on top of it.
  5. Warbird Movement
     1. The warbird is able to move in six degrees of freedom.
        1. Move forward and backward
        2. Turn left or right.
        3. Rotate left or right.
        4. Rotate up or down.
     2. Speed
        1. The warbird has three levels of speed.
  6. Time Quantum
     1. Added four levels of time quantum which alters the rate of updates.
  7. Camera
     1. Added chase camera to warbird.
  8. Gravity
     1. There is a gravity affect from Ruber that applies to the space ship only.
     2. Is set off initially when the simulation starts.
  9. Warping
     1. The ship is able to warp to Unum and Duo and back to its original starting position. The ship warps to the planet’s orbit path and then rotates 180 degrees to be looking at the planet.
  10. The player has the ability to pass or resign from the war college.
      1. If the ship is hit or runs out of missiles then the player loses.
      2. If the ship destroys both missile silos the user wins.
      3. Title screen changes based on this status.

**Building/Running the Project (beyond the obvious):**

Developed on the Windows Platform.

# Extra things we added:

* Missile Silo Missiles
  + Can be seen at the bottom base of the missile silos when it hasn’t been fired at the warbird yet.
* Warbird Missile
  + Appears on the ship when it’s ready to fire.
* Tracking
  + Extra Credit: Utilizes Quaternions for smoother rotations, eliminating nervousness from missiles.
* Restart Button
  + Added a restart button ‘r’ to reset the ship to its original starting position and resets the missile counts for the warbird and missile silos.
* Collision
  + Missiles can collide with each other.