[Computer Science]

Project Name **Synthetic Data Pipeline for Pose Estimation**

Team Lead: William Stern
Team Member(s): William Stern, Hanibal Alazar, Nathan Pichette, Stephane Baruch
Faculty Advisor(s): Dr. Ryan White Dept. of Mathematical Sciences, Florida Tech

Project Description: The objective of our project is to create a program that will allow users to create synthetic data for pose estimation. The program creates render using the 3D animation program blender that contains a satellite in motion with a customizable background and modifiable lighting conditions. The program can be adjusted to the user's needs by updating a configuration file. The user will be able to set the location and strength of a light source, the model of the satellite, as well as the flight path and rotation or both the camera and the satellite.

Features:

Object Path: The user can change the flight path containing x, y, and z fields that will be used to mark the start of the satellites or cameras path. The program contains two different modes for defining a path, point-to-point or equation. Using point-to-point, the object will go between the user inputted points linearly. Using the equation mode, the object will follow the path of a user inputted mathematical equation.

Object Rotation: The user will be able to input the amount of rotation on the x, y, and z axes. This rotation will accompany movement made along the user defined path.

Lighting: The user will be able to set the lighting used for the rendered clip. The light sources will have customizable position and brightness. There are also two different lighting modes: point and sun. The user can also generate stars in the background.

Main Challenges: One of the main challenges we came across was figuring out how to make the object motion easy to use as well as configurable. To do this we tested many different methods of object movement, especially with the camera, the two ones we found that work the best were point-to-point and function. Another challenge we found was figuring out how to use the blender python package (bpy). We also had a problem with the background. When we started, we used a static background but it was hard to detect movement once we incorporated camera movement. To solve this, we generated a 3D star background that can be customized based on the use case. The last challenge was making the program able to run on a variety of operating systems and graphic card configurations.

Graphics: