Autonomous Laser Turret

Running TensorFlow on a Raspberry Pi 3B+

The purpose of the Raspberry Pi for this project was to detect an object and point a laser at it.

It does this using TensorFlow, this program will use a Pi Camera to detect objects and decide if they are a target. If so, the coordinates of the target will be sent to the servos via an ESP32 in order to move the camera and laser. This signal is being sent as a Json string using UART. Once the object is in the center of the screen and the laser is on target, a command will be sent though the digital I/O pins to activate the laser.

Installing TensorFlow on the Raspberry Pi is not trivial. Here is the link to a tutorial on how to install it.

<https://www.youtube.com/watch?v=npZ-8Nj1YwY&t=540s>

Once TensorFlow, OpenCV, the object detection model, and all other dependencies have been installed, there is only a single file that needs to be altered in order to make the program act the way you need it to. Changing the procedural programming in Object\_detection\_picamera.py will give you full control of how the system operates. In this file I was able to draw boxes and display the FPS, change what the target object is, and even send the coordinates of the target though the UART.

This project has been a great learning experience. Especially when it comes to machine learning, python, serial commination, and Linux. The biggest change that I would make in the future is use something more powerful than a Raspberry Pi. One of the biggest challenges that we found was increasing the frame rate. We found that if you decrease the resolution of the pictures and turned off the video feed to the console than it could be increased slightly, but it was no were near smooth. Another challenge was being able to train our own object. It turns out that a lot of pictures and patience is necessary for this process. The last big challenge that we had was the object detection itself. Because we were using a lite model for the object detection, it tended to be less accurate. This resulted in objects not being detected and objects being mistaken for something else.