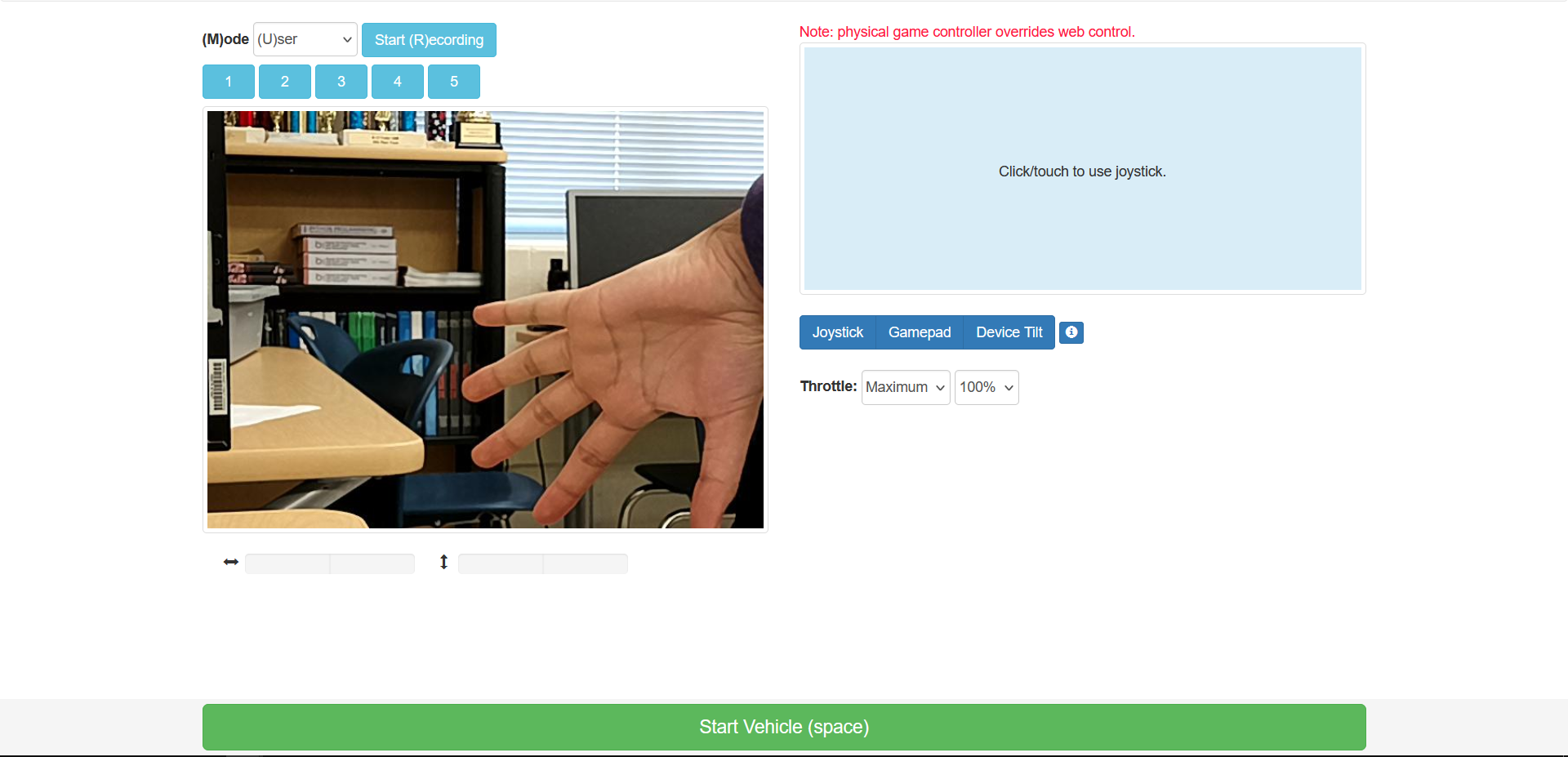
**Friday, February 2nd, 2024**

I started by testing the code I wrote to interface with the camera and the DK library. It worked, however, the RGB channels were flipped, which was easily fixed using OpenCV. Here is what the livestream looks like on the web interface:



Dr. Gabor and I talked about the plan for the project and how I plan to finish it. He identified two key considerations for implementing the reinforcement learning process, one of which I had previously not given much thought to:

1. Determining when an episode of training is over
   1. Both Dr. Gabor and I agreed we would have a track with two sets of parallel lines, most likely colored duct tape, on the ground. The goal of the reinforcement learning is to stay in between the lines. Thus, it’s important to know when the car has gone off the track since it’s no longer collecting useful information. The solution I will implement is to determine whether the boundary lines are visible on the ground. If they aren’t, we assume we have exited the track, and thus need to reset.
2. Resetting the car back to a good position so that training can re-start
   1. The solution which I already thought of was to maintain a “replay buffer” of previous throttle/actuation signals and then play them backwards so that the car would essentially reverse into a position it was previously at. I hope to use the motor controller’s RPM values in order to mitigate the problem of accumulated error. However, Dr. Gabor wanted a more robust solution. I have been doing some tests with the AprilTag, which is a fiducial marker. Given a calibrated camera (e.g. known focal length, image center, distortion coefficients), which I have, there is code online to calculate the pose of an AprilTag relative to the camera. Thus, if I establish a set position for the AprilTag, I will know the pose of the camera. I can use an AprilTag, or multiple AprilTags, to re-localize in this way. By finding out the true position of the camera relative to the AprilTag, I can navigate back to a known position within the track boundaries.

Since I am waiting on the motor controller hardware, Dr. Gabor set a goal for me to get the RL working on the car in the next 3 weeks, assuming it takes 1 week for the parts to arrive, another week to verify control of the motors, and a third week to write the actual reinforcement learning.