

## Computer Vision

Connect camera

Run **take\_picture.py**

Press the spacebar to take pictures of the chessboard at different distances and angles from the camera. Take at least 50 images.

Run **calibration.py**

If the code does not work, run take\_picture.py again and take more images. You may need up to 100 images. This code will create and save a file called **calib.npz**. This file contains all of the camera distortion matrices needed to correct for intrinsic and extrinsic distortion.

Open **aruco\_reader.py**

If you are using a new aruco marker, measure the width of the marker in meters with a caliper, and change the **marker\_size** value. Time, x, y, and z positions will be written into **datafile.csv**, and the rotation vectors for roll, pitch, and yaw, will be written in the **rvec.csv** file. The video will be written as an mp4 in **output.mov**.

Run **aruco\_reader.py**

Press the 0 key to end the program.

## Post-Processing

Run **velocity.py**

This plots the position and velocity of the data from **datafile.csv**. This data is noisy.

Run **Kalman.py**

Implements a 1-D constant velocity Kalman filter to remove sensor noise.