**Wild Swans Mini Project Documentation**

1. Marker detection scheme

Marker detection is done with OpenCV. First, the picamera is opened and calibrated to a specific framerate and white balance. This camera then repeatedly captures an image and does processing on that image. The first step is the filtercolor(frame) function which filters the image to have only a specific color using the hsv colorspace and a bit mask. The correct color to look at was found using a color\_calibration.py where a static photo of the marker was taken and then the hsv values were determined from it. The image then goes through the cleanimg(img) function that uses a 5x5 kernel with the open transformation to get rid of any noise in the image. The next step is findpos(img) function which thresholds the image in grayscale and then uses canny edge detection to get the outline of the remaining objects. From here the largest contour leftover is found so only the largest object in the frame is used for x, y coordinates. Finally, the x, y coordinates and the width and height of the image are used to find what quadrant the image is in in the findquad() function.

1. The PDF titled transferGraph.pdf holds all of this documentation.
2. The Arduino code that implements the controller is in Arduino Code.txt. The Simulink block diagram is within a separate PDF titled PI\_CONT\_SCRIPT.pdf.
3. <https://github.com/JohnRipple/SEED>

The github should be public. If you have a problem viewing it send me an email at jripple@mines.edu