ECEn 490 – Quadrotor Project
Vision Group
Assignment 1

Purpose: To ensure that we fully understand the basic geometry of camera imaging.

Projects:

1. Write a "renderer" (in MATLAB is fine) that will take in
    a. Location of the MAV (in North, East, down)
    b. Attitude of the MAV (assume the camera is a downward facing camera)
    c. Calibration parameters of the camera
    d. World location of a point

    and computes the image location of that object. To pass this part off, you will need to show several examples to the TA of your renderer working (they will give you all the parameters, and the right answers need to fall out. See below for some example scenarios with correct answers.)

2. Use the program provided on the web page to calibrate your webcam. Using these calibration parameters, set up an example (using a tennis ball or other easily identified object) image capture. I would suggest that your basic image capture involve placing the object directly in front of the camera a known distance away. Plug the parameters of the image capture into your rendering program from part 1. Show that your renderer gives results similar to the actual image capture. Now show that your renderer gives similar results to the real image capture if you:
    a. Move the object
    b. Move the camera
    c. Rotate the camera

Examples:
Default values:
Yaw=0, pitch=0, roll=0, az=0, el = 90 degrees, K=I, T = [10;0;-20], X_w = [10;0;0], k1=0, k2=0

Rendered point = [0;0]

Default + yaw=5 degrees, T=[11;0;-20]; -- Rendered point = [.0044; .0498]

Default + yaw = 5 degrees, pitch = 2 degrees, roll = 1 degree, az=-2 degrees, k1=.2, k2=-.1 – Rendered point = [.0176; .0358]