## Student name:

## Homework 4: Basics of Image Processing

Use the images and videos provided to complete the questions below. All images, plots, and code must be included in the submitted files. **Please comment your code clearly.** 

1. How many bits is the provided image? How can you tell? What values constitute "black" and "white"?

2. Using the image provided, separate the color image into red, green, and blue (R, G, and B, respectively). Compare the R, G, and B images to the original image.

3. Convert the image to grayscale. Is the grayscale image the same as any of the R, G, or B images?

4. Convert the image to hue, saturation, and value (H, S, and V, respectively). Separate the HSV image into H, S, and V. Compare the V image to the grayscale image from Problem 3. Are they the same?

5. Binarize the grayscale image. This process converts pixel values into 1's and 0's depending on whether the pixel value is above or below a threshold. Explore the various settings for the binarization function in MATLAB. Provide your binarized image.

6. Detect the edges of the bowls using any combination of the above methods. Feel free to manipulate the pixel values arithmetically (i.e. brightening or darkening the image). The final image should look similar to Figure 1.



Figure 1. A sample edge detection image. The goal is to have clearly defined edges and very little noise.

7. Track the ball in the provided video using any of the above methods and imfindcircles(), a MATLAB function designed to detect circles in an image.

8. Calculate the acceleration due to gravity from the video given that there are 1496 pixels per meter.