

Robotic Pong Player

Braden Elliott



Advisors: Dr. Marc Mitchell & Dr. Katherine Chandler
Computer Engineering

Abstract

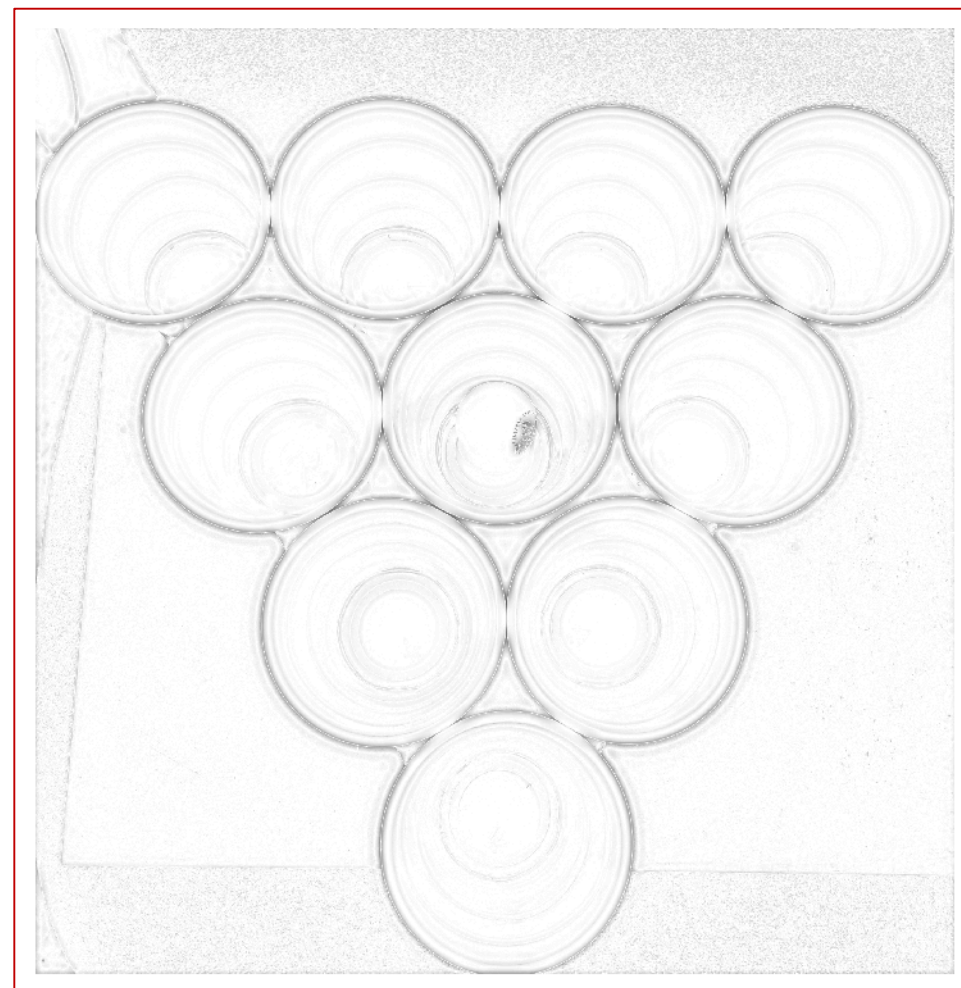
A fun, simple game such as beer pong played between two humans is a great time. Bringing a robot into the mix could be an even better one. One arm, one eye, and a brain are needed to play. So, make a robotic arm to throw ping pong balls, a camera to see where the ping pong balls go, and program a computer to decide what to do next in the game to win against the human.

Image Recognition

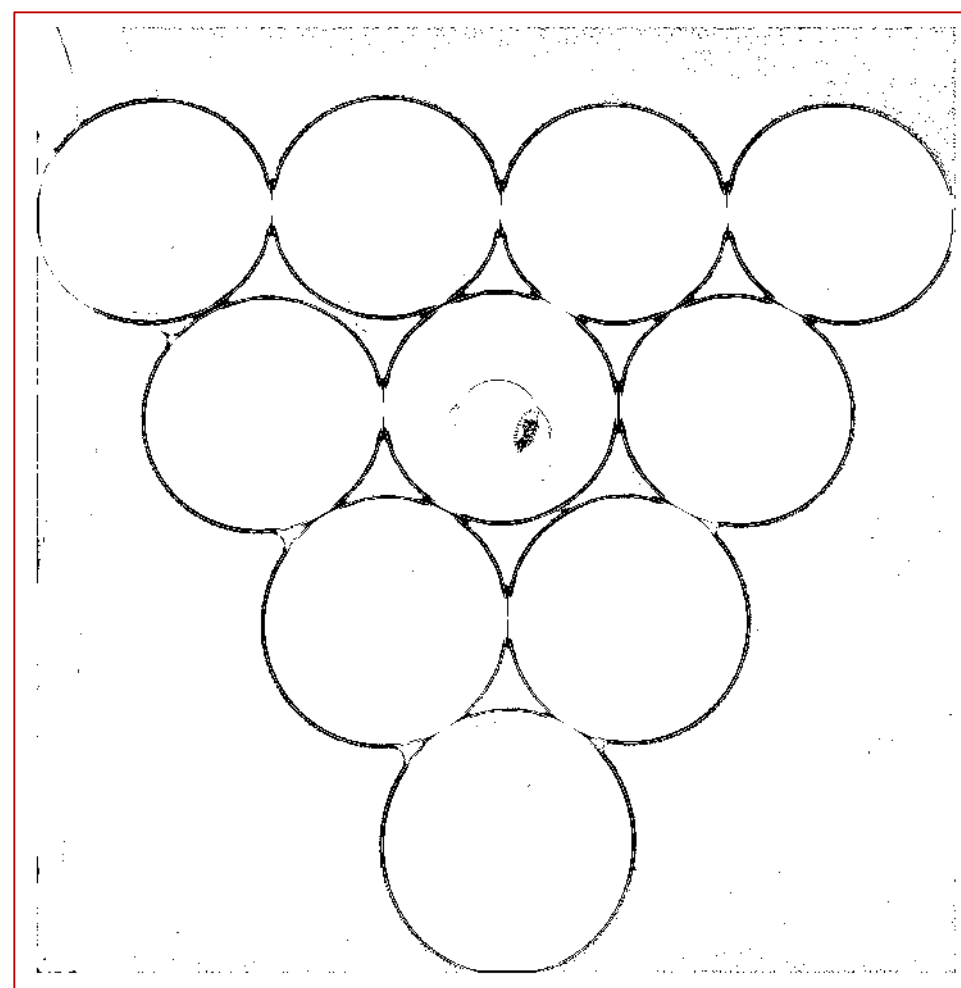
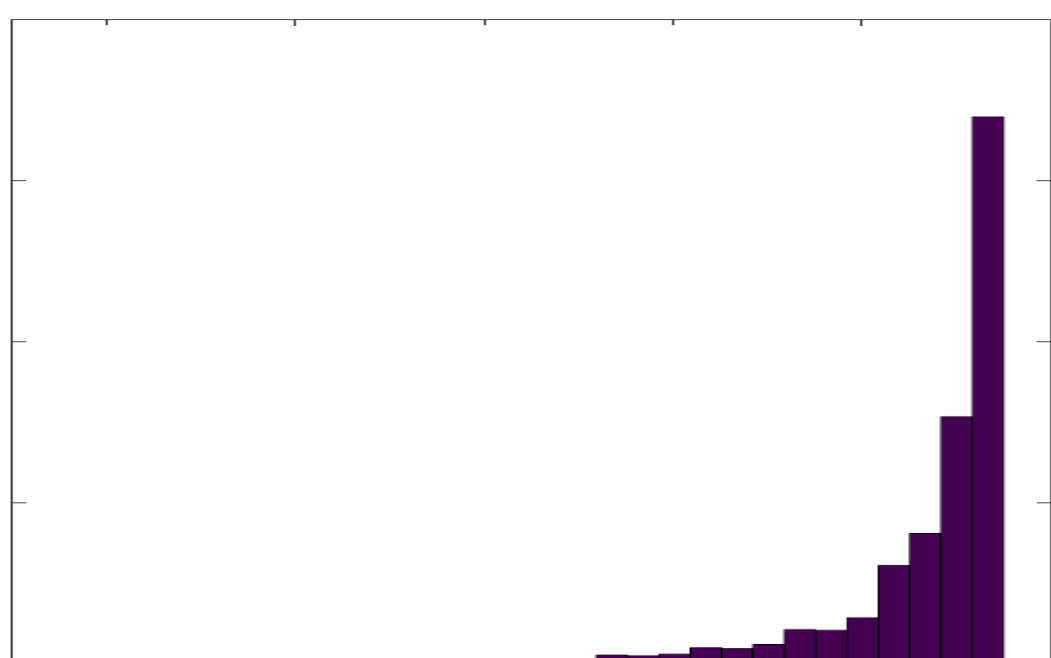
A picture is taken after every throw so if the ball is not found it is known as a miss. The recognition consists of multiple filters, such as:

- Butterworth Low Pass Filter for smoothed edge detection

$$H(k_1, k_2) = \frac{1}{1 + [D(k_1, k_2)/D_0]^{2x}}$$

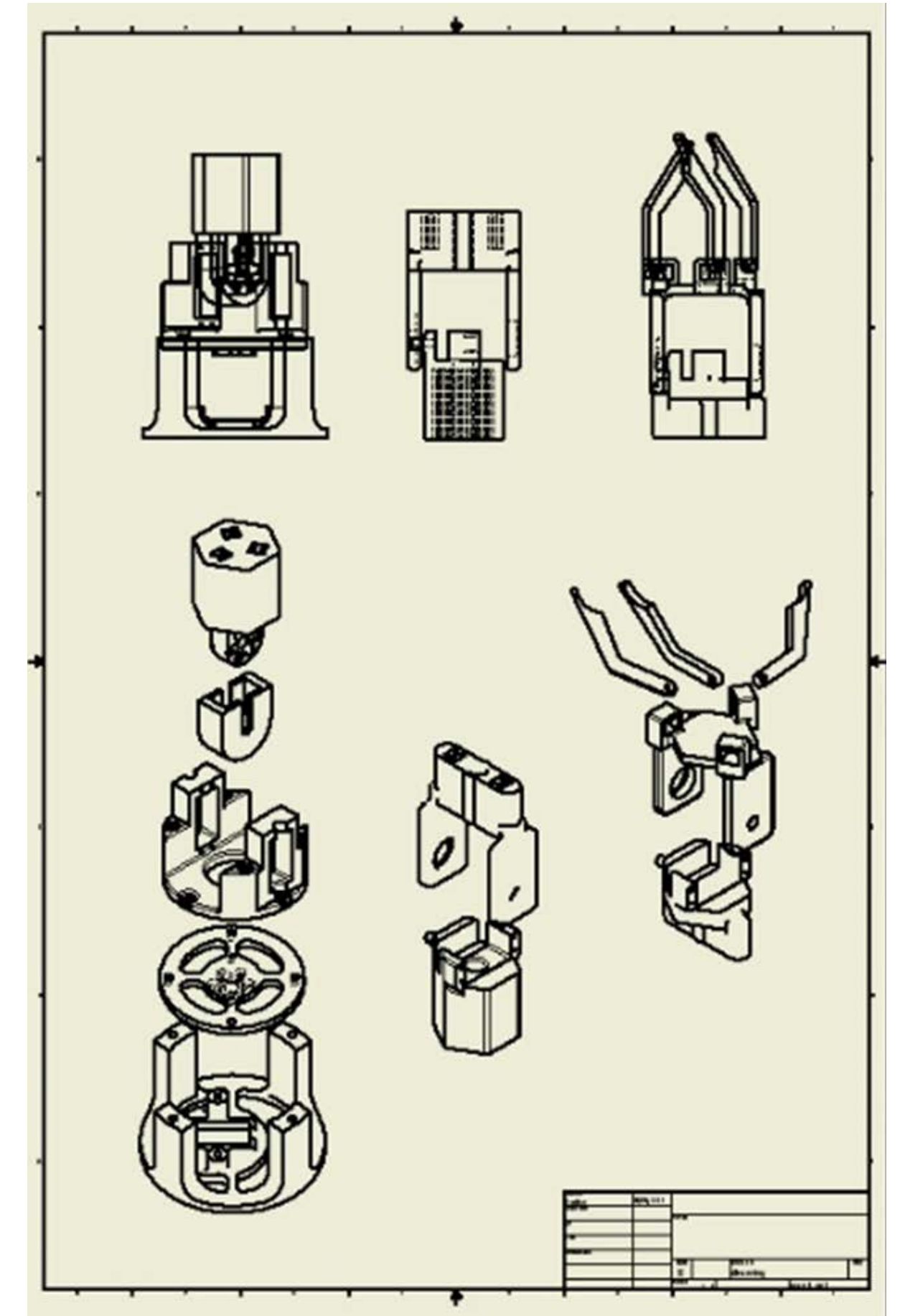


- Cutoff Filter to remove less intensive edges

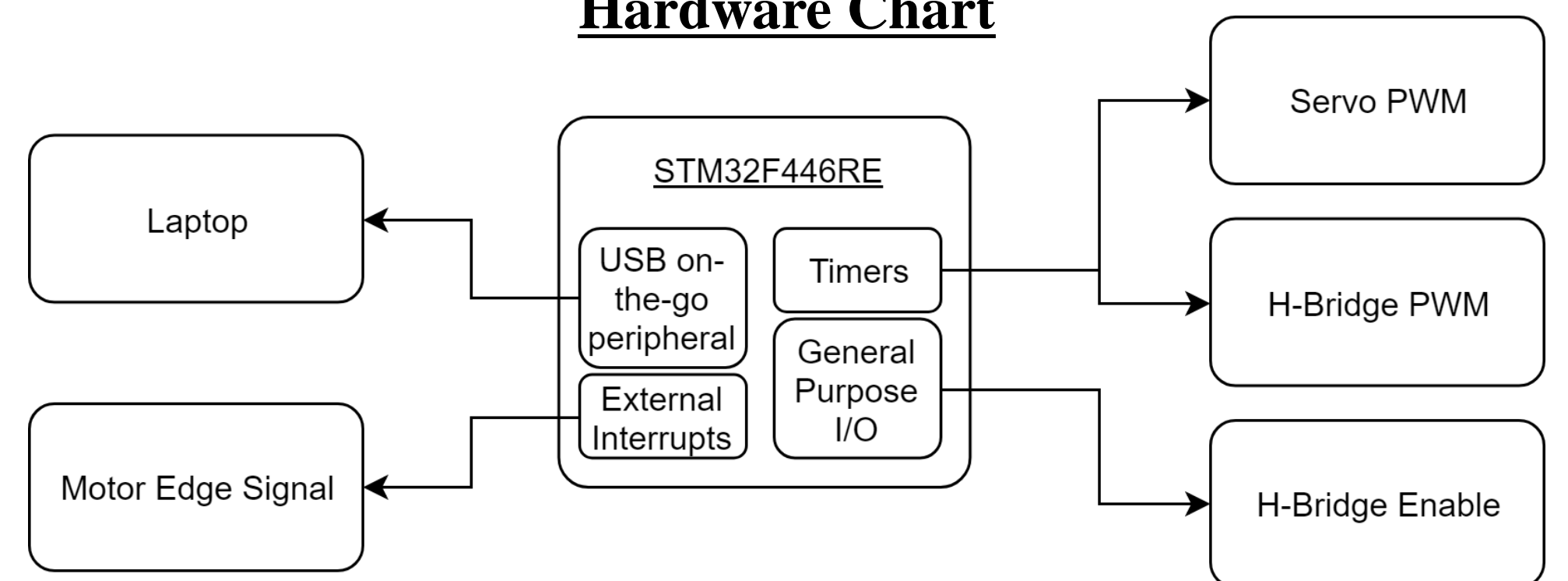


Arm Model

- Modeled in Autodesk Inventor
- Each 3D printed part was custom designed
- The rest of the arm is comprised of:
 - Motors
 - Wires
 - Extruded Aluminum
 - Lazy Susan Bearing



Hardware Chart



Results

The arm has been modeled, built, and programmed for handling a ping pong ball. A computer can give instructions to the arm via USB communication. The image recognition program can filter an image of the cups so the ball can be found.

Software Flow Chart

