

Total Memory:
5.9 MB

UNITY

RGB VGA current Img (7.03 MB)

MATLAB

Grayscale VGA current Img (2.34 MB)

FPGA

• Sobel Filter current Img
• Threshold pixel → Binarized
- Binarized VGA current Img (0.293 MB)
• Background Subtraction

Binarized Ball-Isolated Img
0.293 MB

MP

- Circle find algorithm
- x, y pixel coordinate of centroid
- Given Left/Right
- (X, Y, Z) of ball in 3-D space
- Store XYZ at t
- Now have array of XYZ over t

1. Coefficient Mode

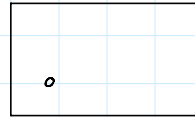
- Calculate V as Ball on \downarrow trajectory
- Calculate V as Ball on \uparrow trajectory
- $\frac{\downarrow V}{\uparrow V} = \text{coefficient}$

2. Shot Mode

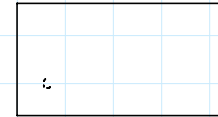
- Given Shot parameter to determine "JN" box
- Find point at which ball changes direction (bounce)
- Use V to estimate point, is point "JN"

3. Replay Mode

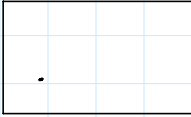
- Give MATLAB array of XYZ over t
- Ask UNITY to produce series of these images and display back on MATLAB



or



or



- MATLAB first sends to uP
- Streamed in 64bit packages
 - Could store Blank left and blank right in DDR (4k? Binarized sobel filter)
 - Could stream in current image and left/right blank together in the 64bit package
 - Each pixel streaming in can be looked at individually to do background subtraction
 - uP can do the ball finding algorithm instead of the FPGA because FPGA cannot filter out random noise of white pixels in output img
 - Encode x, y position of the ball within the pixel stream that is sent back up to the uP??

- Potential Flow
- MATLAB sends gray VGA? img to uP pixel by pixel.
 - The uP is then passing off each pixel to the FPGA in 64 bit packages
 - o First half has current pixel
 - o Second half has pixel from blank left/right img
 - FPGA gets this 64bit package and can run kernel based and pixel based operations to Sobel filter, binarize, background subtract the two halves
 - FPGA can then pass this output back to uP to form the output img
 - o Output img ran through circle detection algo to find x, y pixel of centroid in currentimg
 - Pass this x, y coordinate back to FPGA to perform XYZ calculation
 - Pass XYZ back to uP to determine if in. (Create XYZ array over t to determine V , position over time)