Journal Report 8
10/28/19-11/11/19
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Daily Log

Monday October 28

Talked to Mr. White about gnumpy and not going that route. However, it is decided to change everything to matrix operations. Had to research numpy library, been two years since last use.

Tuesday October 29

Started modifying lists into numpy arrays. Found that an extremely useful place to do that are my BGR lists. Somehow in python openCV arrays can also be interpreted as numpy arrays. Came up with an idea and tried researching for that quick operation involving [] in python that can replace for loop, forgot name. I presented today.

Thursday October 31

The name that I was stumped on I figured out at home. It's called comprehension. Tried to work on comprehension for rgb list before presentations start and after presentations end. Pretty hard with two variables.

Wednesday November 6

Figured out how to make comprehensions with two variables. Now carried it over to another application for background subtractor heuristic. Learned you can do if/else in comprehensions. Struggled to figure out syntax with if/else comprehensions. Finally realized that if/else needs to be moved to the front of the comprehension instead of the back.

Thursday November 7

Everything is now transferred to comprehensions/matrix operations. Couldn't find old version, but luckily I had previous code on Google Drive. Loaded that version and modified a bit to be the previous slow version before changing to matrix/comprehension. Initiated timed trials. Tested times were not desirable. Repeated trials three times. Looks like only slight if not any improvement.

Timeline

Date	Goal	Met
Nov 4	Optimize matrix operations with gnumpy	Decided to not use gnumpy yet with computer I have
Nov 11	Optimize code with just matrix operations	Matrix operations achieved, optimized–not really.
Nov 18	Diagnose why it is not going fast and work on Kalman filter	
Nov 25	Finish implementing Kalman filter	
Dec 2	Optimize Kalman filter	

Reflection

This past week(s) was initially pretty successful. I was able to face a problem, research it, and synthesize prior knowledge to create a solution. The only problem the solution was short of what I had hoped.

Originally, my code was making rgb lists and through nested for loops, it was going through every 100th pixel to get an average value for background and then going to each pixel with nested for loops to threshold values. Now, I figured out how to use numpy arrays instead of lists. Also, instead of nested for loops, I remembered from my AI days that comprehensions were a thing.

Here's a comparison of my two versions of code:

(Old):

```
for a in range(0, frame.shape[0],100):
    for j in range(0, frame.shape[1],100):
        k = frame[a,j]
        r.append(k[0])
```

(New):

```
r = np.array([frame[x,y,2] for y in range(0, 1280, 100) for x in range (0, 720, 100)])
```

I found a way essentially to replace all my for loops with comprehensions, which according to my research should have noticably sped my program up.

However after testing how long it took to implement the background subtractor through one frame, my results were not fruitful:

Old algorithm times: 17.642, 16.254, 17.165 (seconds)

Comprehension/Matrix times: 14.500, 18.761, 18.779 (seconds)

One thing I noticed was how between each trial the times seemed to be quite different, however I was testing the same data set. There was nothing random or changed between trials. This leads me to believe something with my computer (honestly might be considering how lousy I discovered it is), or my algorithm is not performing how it should.