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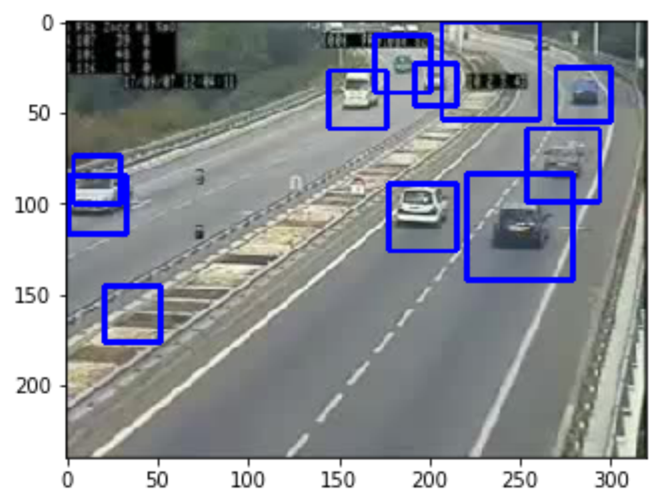
Journal #5

Throughout the past week, I have been working on finalizing my car crash breakdown research and creating a basic linear extrapolation algorithm as a baseline method of depicting the motion of cars in videos. My main goal with respect to car crash research was to find out what percentage of crashes would be relevant to my project. After discussing with you, we concluded that rear-ended crashes would be the most straightforward for my algorithm to detect. From my research, I found that the National Highway Traffic Safety Administration reported that rear-end collisions were the most frequent crash type making up 29% of all accidents. This means that approximately 1.74 million crashes are rear-enders. By demonstrating that my project can be applied to such a vast number of crashes, I have taken steps in proving its validity.

The rest of my lab time was spent creating a basic extrapolation of vehicles in videos. The first step to this approach was being able to identify cars within video footage. I utilized libraries I found online, primarily OpenCV, to complete this task. By adjusting the sensitivity, I can change the number of cars detected in a given frame.

Low Sensitivity



High Sensitivity

These images depict the drawbacks to this detection method, at low sensitivities not all of the cars will be detected and at high sensitivities, the algorithm will label objects and areas as cars when they clearly aren't (this occurs in the "High Sensitivity" picture). In the future, I will look into car detection algorithms that minimize this error. For the linear extrapolation method, I took two consecutive frames and used the OpenCV car detection algorithm to see the difference in each car's position on the image. Then, to model subsequent frames I would simply continue to add this difference to the car's position. To clarify, let the car's position in the first frame and second frame be $(x_1, y_1)$and (x_2, y_2), respectively. The difference in horizontal and vertical positions of the car between these frames is then $dx = x_2 - x_1$ and $dy = y_2 - y_1$, respectively. To model the third frame, I would simply add these differences to the second frame car position, so the car's position in the third frame would be, $(x_2 + dx, y_2 + dy)$. I can repeat this process to extrapolate the car's position multiple frames ahead. This image depicts the linear position extrapolation of two cars. The red and blue boxes are the positions of the cars in the first and second given frames, respectively. The green and yellow boxes are the position extrapolations for each of the cars four frames ahead. In the coming weeks, I hope to extend this application to non-linear car video extrapolation and also determine a method for computing the error in my extrapolative capabilities (how far does the car veer off my predicted path). Completing this task will help me build a sophisticated method of determining when a crash occurs in a video. Overall, during this week I was able to make progress in finishing up my car crash research and predicting a car's motion in a given video.