Final Project : Visual Search Time in Identifying Cyclists

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1 INTRODUCTION

Visual search is a task in which the subject in an experiment is asked to identify a target item amongst a sea of distractor items. Researchers designing visual search experiments, such as ourselves, are usually interested in the time it takes for the subject to find the target. It is not hard to imagine that tasks end up falling into one of two categories: "pop-out" and "serial search". In the first case, the target is readily apparent, and the response time of the subject is independent of the number of distractors. In the latter case, the target is better hidden, and the subject must examine each item in a sequence. As a result, reaction time increases with the number of distractors, and the increase per distractor is double per "no" responses than for "yes" responses.

In our experiment, we were primarily interested in the amount of time it takes for a subject to identifying a cyclist through varying amounts of visual "clutter". Furthermore, we were interested in seeing if and how different colored tail lights on a cyclist would affect the time it takes for a subject to identify them.

2 METHODS

Using `Python` in hand with its `OpenCV` bindings, we created a program the generates a sequence of images which resemble what a motorist would likely see while driving through rural, highway, and urban environments. After buffering the series of images, the program presented the images to a subject. In exactly half of the images a subject encountered, a cyclist was present with a different colored tail light. Furthermore, the subject was tasked with finding a cyclist if one was present, and then to respond in the affirmative if that was the case. The program records the subjects response as well as the time it took them to do so.

The images with cyclists in them are synthetic and are constructed in a two part process as follows. An example can be seen in Figure 2.

1. We took two photographs of cyclists found online and using `Adobe Photoshop and Illustrator` we manually cropped out everything except the cyclist itself, and then decreased the $\alpha-$ value making the cyclist look slightly transparent. This was done to ensure better blending in the final result. We chose two photographs where one cyclist was wearing very bright clothing and one where a cyclist was wearing darker clothing. Since we were primarily concerned with the affect of the tail light color, we wanted to make sure the data reflects any effects of the clothing color on response time as well. For each of the two cyclists images, we created 8 copies and drew a fully visible (max $\alpha-$ value) "blob" of a different color in the approximate location of where a tail light for a cyclist would likely be situated - one copy is left unmodified as a control. Therefore, in total there were 16 unique cyclist images.

2. The program reads in each of the 16 cyclist images, and places it within an image still from dash-cam footage captured at night. The location at which the cyclist is placed is chosen at random, but constrained to be within the inner 75% of the background image. The stills are hand selected from the footage and are chosen in an attempt to capture a myriad of lighting conditions, clutter, and perspective.

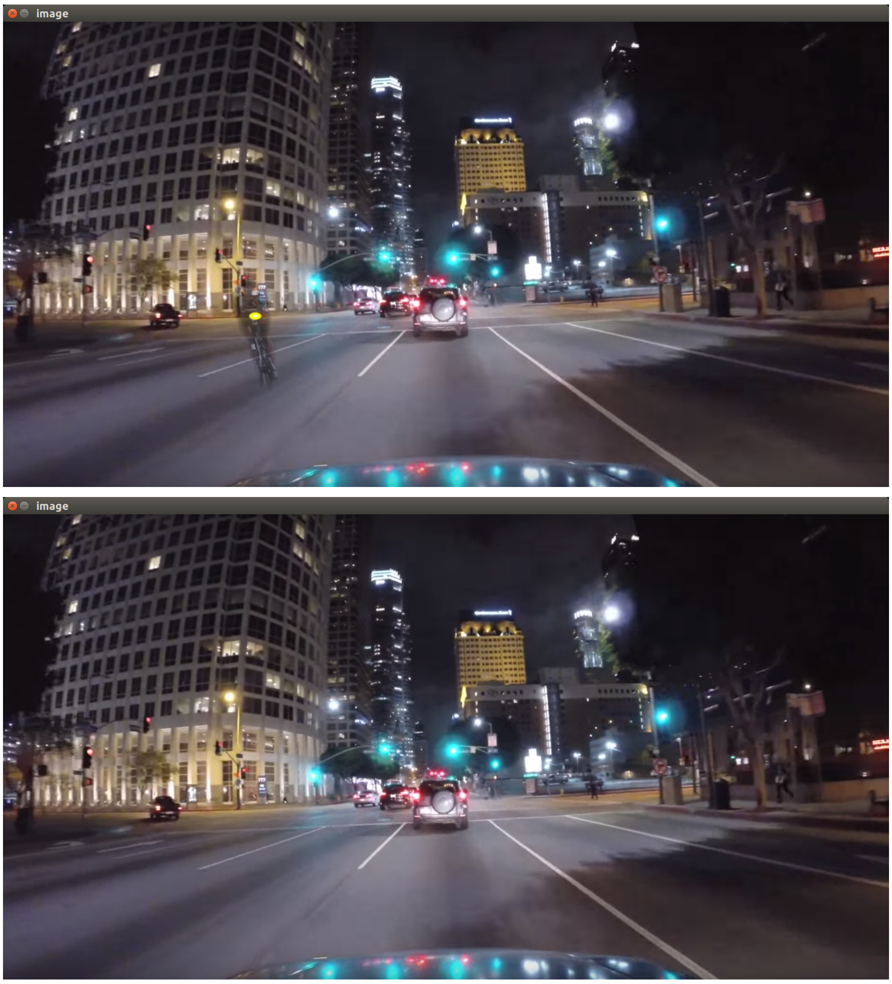

Figure 2.1: A dash-cam still with and without the embedded cyclist.