CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

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Project Number

31264

Project Title

Position and Vector Detection of Blind Spot Vehicle with Horn-Schunck Optical Flow

Abstract

Objectives/Goals

The main goal is to try to create a cost-effective way to find information about a vehicle present in the blind spot. Our three calculation goals are the object's position, velocity and acceleration in the blind spot. We based our coding off of the Horn-Schunck Optical Flow algorithm to make statistical analysis based on the vector plot of motion.

Methods/Materials

The materials used were limited to a minimal for conservation: a video camera and a coding system.. The overall Optical Flow method was adjusted with a convulsion approach, meaning that a grouping of pixels is compared within two subsequent frames. Since each specific pixel has a unique luminescence, Optical Flow is able to trace the pixel onto the next frame and draw a vector arrow to represent the movement. We then split the vectors into car and background vectors. To detect the position, we created a box to surround the object of motion and then trace it throughout the video. The center of the box is found by averaging the (x,y) coordinate of all the car vectors while the size of the box is directly proportional to the ratio of car to background vectors. Then a standard deviation filter is used to rule out any outlier vectors X standard deviations away from the initial center, till an accurate new center is found. Further improvements like a threshold for the box movement were made to prevent miscalculation; a beeping system was created to alert the viewer when a box was formed. Velocity could be estimated from the movement of the center of the box and acceleration is easily calculated through a derivative.

Results

We coded the output rose plot and quiver plot to play in a movie format. These video trials will be available for viewing during the fair. Since the project was more conceptual, no actual numbers are presentable.

Conclusions/Discussion

In the trials that we ran, the program was able to accurately detect the vehicle and follow it throughout the frames. It was also able to give a decent estimation of relative velocity. The main goal from now is to get the program to run in real time. This way, we can see exactly whether not the code would function properly in real life implementation.

Summary Statement

To detect the presence of motion in the blind spot by using a video camera and computer coding software in order to alert the driver of the position, velocity and acceleration of any changing object in the blind spot.

Help Received

Brendan Morris helped introduce Matlab coding to us and teach us coding strategies .