Adjunct Proceedings of the Second International Conference on Automotive User Interfaces and Interactive Vehicular Applications (AutomotiveUI 2010), November 11-12, 2010, Pittsburgh, Pennsylvania, USA

User Adaptive Lane Deviation Warnings

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ABSTRACT

We propose and explore user adaptive early warning systems for vehicles. In particular we explore a lane departure warning system.

Categories and Subject Descriptors

H.4 [**Information Systems Applications**]: Miscellaneous

Keywords

automotive, user adaptive systems

1. INTRODUCTION

Early warning systems for lane departure and blind spot avoidance are beginning to become commercially available `http://www.banks.com/blogs/auto/2010/05/22/infinity-blind-spot-intervention-system/`.

Unfortunately studies have shown that such systems are annoying and often give false or unnecessary warnings `http://www.thecarconnection.com/marty-blog/1039302_do-volvo-infiniti-accident-avoidance-systems-make-a-difference`.

2. SYSTEM

We propose a computer vision based lane deviation system combined with a facial expression recognition system (Figure 1). Facial expression recognition systems measure through computer vision technology the contractions and relaxations of the facial muscles. There are a total of 46 muscles for describing all facial expression, called Action Units (AU) 12 of which describe the change in gaze direction and orientation [4, 2].

The overall system could use the facial expression and lane detection outputs as inputs to machine learning algorithms for outlier detection [3]. The positive examples could automatically be extracted when the driver uses the blinkers and successfully changes lane.

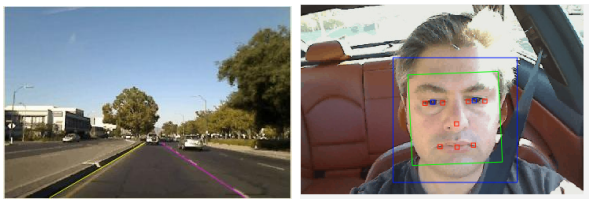

Figure 1: A computer vision based lane departure warning system, augmented with facial expression recognition system. The system learns not to give unintentional warnings based on the driver's gaze.

3. EXPERIMENTS

In our experiments we used the Computer Expression Recognition Toolbox (CERT) from Machine Perception Techologies `http://mpt4u.com`. For the lane deviation detection system we implemneted a line detection algorithm based on the Hough Transform [1]. As a first experiment we drove for about 30 minutes in a personal car and video–taped both the road and the face of the driver in real time of 30 frames per second. We encoded the videos using CERT and our lane detector. Our results showed statistically significant correlations between the position of the face, yaw, pitch, roll and the x,y coordinates of he left and right lane markers. These are encouraging results in that they promise the feasibility for predicting intentional and unintentional lane deviations.

4. REFERENCES

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