

Assessment of Motor Vehicle Driver Performance using Eye Movements and other Biometric Data

Introduction

Driver safety has been a concern to the American public for quite some time. Recent developments in data acquisition and sensor capabilities have now made it possible to track intricate biological data and dynamic phenomena with accuracy and precision that just a short time ago was orders of magnitude less. These new driver assessment data are likely to strongly shape the (continuous) rewriting of the standards that define safe operating conditions for motor vehicles.

Project Description

This project seeks to use existing hardware and software available in URI's *Eye Movement Tracking* laboratory (ISE department, COE) and incorporate new devices to collect additional biometric data from the drivers. The biometric data includes blood pressure, skin resistance, heart rate measurements in synchronization with driver eye movements, vehicle performance (lane position, braking pattern, distance from leading vehicle, etc.) as well as traffic conditions (number of passing vehicles, roadway conditions, etc). This data will be collected from drivers both in the laboratory and on-road (closed) courses. We are particularly interested in investigating the effect of low levels of alcohol consumption (up to 0.5% g/ml blood alcohol content [BAC], about half the legal limit) on driver performance. The experiments will also evaluate the effect of operating other devices such as audio and navigation equipment, cell phones, etc. while driving a motor vehicle.

Project Objectives

The objectives of this project are:

- § To train engineering students in the design of instrumentation for recording a variety of data related to driving performance measures.
- § To train students on the use the instrumentation for collecting information about transportation patterns of individual as well as aggregated drivers, adding to the sustainability of transportation systems.
- § To disseminate this engineering design experience in transportation instrumentation design and to integrate this with an existing capstone design course in Electrical Engineering.

Tasks to be performed

- Integration of biometric sensors into current data collection system
- Development of algorithms for correlating biometric data with driving responses
- Design of protocols for testing drivers under various levels of BAC.
- Pilot runs with small sample size for protocol verification
 - a) Laboratory tests
 - b) On road tests on closed track
- Analysis of pilot run data
- Large sample *production runs*
- Data analysis of *production runs*

Engineering skills required

The preferred composition of the team for this project is 2 electrical engineers and 1 computer engineer. The team should possess expertise in the following areas:

- Electronic circuit design
- Digital signal processing, including Matlab
- USB sensor interfaces
- Visual Basic or other GUI software
- Computer software driver design
- Project management and data acquisition software

For further information regarding this project contact the following 2 faculty members:

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