

Beyond Breathalyzers: Towards Pre-Driving Sobriety Testing with a Driver Monitoring Camera

Simon Stent, John Gideon, Kimimasa Tamura, Avinash Balachandran, Guy Rosman

Toyota Research Institute, Cambridge MA, USA



IEEE

Goal

Predict alcohol impairment of driver *before* they drive, using only a driver monitoring camera.



Round 1 Round 2 38 inches LCD 20 impaired 4 tests 4 tests BAC 0.1% 30 control 4 tests 4 tests

Dataset

Visuomotor test

Driver sensing

Decision

Model

Why?

- >¹/₅ fatal road traffic accidents alcohol-related
- Driver monitoring cameras more common

Early detection better

What's new?



Existing field sobriety tests: Require assessment by a human expert or specialist sensors Easy to deploy Convenient

Proposed sobriety tests: Carried out in-cabin using available sensors 7.2h gaze tracking & reaction data from 50 subjects (total 100 samples per test)





Experiments





Choice reaction test most promising Gaze tracking may be too noisy with fast motion



More data (input observation window, training data) would likely improve performance

Automated, objective, convenient (<10s) No need for extra sensors or equipment Focus on gaze (privacy, generalizability)

Proposed tests



There are two stop and go lights.

What's next?

Promising, but plenty more to do: \rightarrow data (repeats, subjects)

- \rightarrow models (self-supervised, modalities)
- \rightarrow test designs (many possibilities) \rightarrow in-situ testing (real vehicle)

Data & code available!





(c) Silent Reading (SR) Test: in-vehicle information messages appear at random positions on screen; subject must read each message once

(d) Choice Reaction (CR) Test: traffic lights switch color at random; subject presses/releases steering wheel shift paddles in response

We designed four candidate visuomotor tests, to stress different types of user behavior to try to quickly elicit detectable signs of drunkenness.