Passenger-Driver Identification Test for Location-Specific Augmented Reality Games Such As Pokémon Go

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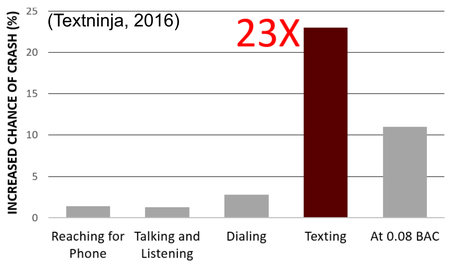
APPLIED COGNITIVE ERGONOMICS LAB

1. Background

Distracted Driving

59% of all crashes among young drivers involve distractions within **six seconds** of the accident (AAA Foundation for Driving Safety, 2007-2015)



Driving and Gaming Simultaneously

Augmented and virtual realty games make it tempting to play and drive at the same time

Predicted Rise in Augmented Reality Games

Expected increase in worldwide revenues for the augmented reality and virtual reality (AR/VR) up from **$5.2 billion in 2016 to more than $162 billion in 2020** (IDC, 2016)

Popularity of Pokémon Go, 2016

- **500 million** Pokémon Go downloads
- **110,000** discrete instances (33% of the total tweets surveyed) in **TEN** days of drivers or pedestrians being distracted by Pokémon GO (Ayers et al., 2016)
- As of today, only control to prevent drivers from playing Pokémon Go while driving is a warning about not playing while driving

- Warning can be easily waived off by clicking on 'I'm a passenger' button in the warning
- Drivers might take advantage of this lax control to play

in-game warning for drivers

Critical Need: to identify if the gamer is driving vs. being a passenger

2. Research Aim

Aim : *Assess the feasibility of a test to differentiate between the driver and passengers of a vehicle, to facilitate safe transportation while users are playing games on their hand held devices*

3. Methods

3.1 Literature review for distracted driving

Risk of crash and in-vehicle glance duration

- Literature states that increasing in-vehicle glances as complexity of the non-driving task increases results in more crashes, **80%** of crashes happen when glance durations are more than **1.6 seconds**

(Horrey & Wickens, 2007; Liang et al., 2012; Green, 2002; Reimer et al., 2012)

3.2 Lab Study

Participants

- Within subject driving simulator study was conducted
- Ten (10) participants that have a license to drive were studied with mean age=24.8 years, SD=1.81 years, Male/Female=6/4

Equipment

- The STISIM Drive® M100 system an interactive driving simulator powered by the programmable STISIM Drive® software engine

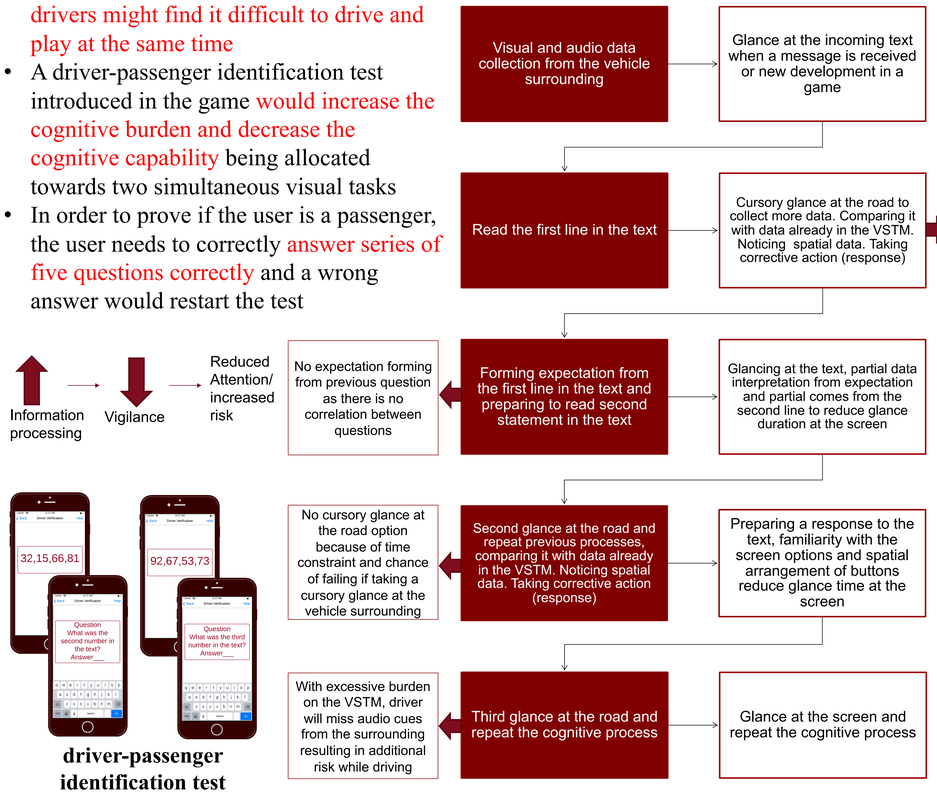
3.3 Design of experiment

Hypothesis

- If the cognitive capability required for a particular task (in this case trying to play Pokémon go) and driving at the same time is higher than visual short term memory (VSTM) capacity, significant number of drivers might find it difficult to drive and play at the same time
- A driver-passenger identification test introduced in the game would increase the cognitive burden and decrease the cognitive capability being allocated towards two simultaneous visual tasks
- In order to prove if the user is a passenger, the user needs to correctly answer series of five questions correctly and a wrong answer would restart the test

cognitive process of texting/playing games while driving

In that time constrained environment the working memory will be filled with data from the test and a cursory glance at the road will erase that test data to make way for road information, driving environment (visual data)



driver-passenger identification test

Experiment

- *Performance metric*: completion of the test (Five correct in a series)
- *Task:* Pokémon driver-passenger identification test and drive simultaneously with an objective to complete the test correctly in Scenario I (simultaneous tasks) and take the test without distractions in Scenario II (single task)
- Users were also required to drive at a minimum speed of 20 mph

Data collection

- Crash and traffic violations committed by the participant were recorded
- Answers typed in by the driver on a handheld device while maintaining control of the vehicle

Variables

Dependent variable:

- Ability to complete driver-passenger identification test

Independent variables:

- Test performance:
  - Simulated driving
  - Independent of other activities (without distractions)

Driver's view

4. Discussion and Results

A cognitive task based test **shows promise to differentiate between the driver & passenger**

Results

The table shows number of correct answers participants provided for different scenarios

Test Parameters	Values
Mean for driving + memory test	3.4*
Mean for memory test	4.7*
T-test value (two tailed test)	2.14
P-value	0.061

*- number of correct answers in a series

- Participants exceeded the speed limit in more than 80% of the cases; however, crashes were low, due to the suburban environment

Limitations

- Somewhat irritating to genuine passengers
- How usage of wearable technology would change driver dynamics is not discussed
- Optimization of the identification test to reduce difficulties for average population
- The age and sex of the user were not independent variables

5. Implications

- Cognitive information processing principles show promise for driver-passenger identification for mobile usage
- This is a **low cost option**, unlike public ordinances (estimated cost **up to $40,000**)
- **Could deters drivers** from playing games while driving
- **No restriction on passenger freedom** to play games
- Useful in highly focused attention tasks to increase vigilance & reduce distractions

6. Future Work

Focus on visual information processing, cognitively intensive task's relationship with motor function control for simultaneous tasks