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

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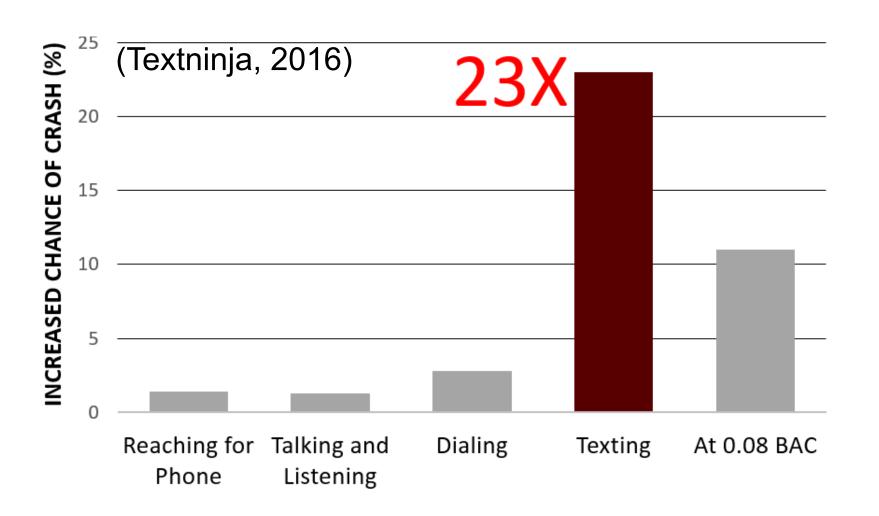
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# 1. Background

#### **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

3.3 Design of experiment

play at the same time

Hypothesis

processing

Driver Verification

driver-passenger

identification test

#### 3.1 Literature review for distracted driving

#### Risk of crash and in-vehicle glance duration

If the cognitive capability required for a

particular task (in this case trying to play

is higher than visual short term memory

(VSTM) capacity, significant number of

drivers might find it difficult to drive and

introduced in the game would increase the

A driver-passenger identification test

cognitive burden and decrease the

cognitive capability being allocated

towards two simultaneous visual tasks

In order to prove if the user is a passenger,

increased

risk while driving

Pokémon go) and driving at the same time

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**

Glance at the incoming text

when a message is received

or new development in a

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

# cognitive process of texting/playing games

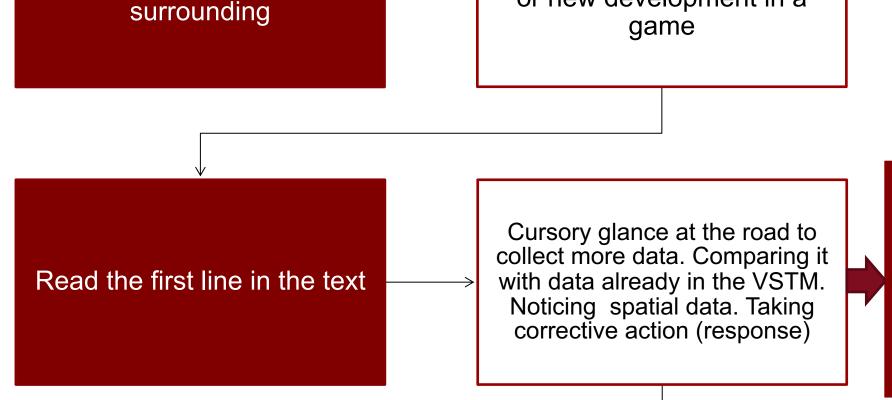
In that time constrained environment the working memory will be filled with data from the test and a cursory glance at the road will erase that test data to make way for road information, driving

environment (visual data)

Visual and audio data

collection from the vehicle

while driving



the user needs to correctly answer series of

five questions correctly and a wrong answer would restart the test No expectation forming Glancing at the text, partial data Forming expectation from interpretation from expectation from previous question the first line in the text and and partial comes from the as there is no preparing to read second second line to reduce glance correlation between statement in the text duration at the screen questions No cursory glance at Preparing a response to the the road option Second glance at the road and text, familiarity with the repeat previous processes, because of time screen options and spatial comparing it with data already constraint and chance in the VSTM. Noticing spatial arrangement of buttons of failing if taking a data. Taking corrective action reduce glance time at the cursory glance at the (response) vehicle surrounding With excessive burden on the VSTM, driver Third glance at the road and Glance at the screen and will miss audio cues repeat the cognitive process repeat the cognitive process from the surrounding resulting in additional

## **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

The time constrained test will not allow cursory glance. As a total o 4 secs are given for data collection, subconscious data interpretation, spatial arrangement of the data (two secs), reading the question, data interpretation, recollection, response thought response action of typing (two secs)

#### **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 driverpassenger 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

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