Assignment 2e: Task Review
CSE 440 Section AB | Distracted Drivers

Task 1: Tracking Driver's Distracting Behaviors in Real-Time

Rob is a product manager for a tech company in Seattle. He likes to track different aspects of his life, including his sleeping habits, daily step count, and computer productivity. He has recently heard about insurance companies tracking customers to determine coverage rates. He is interested in a similar system where he can track his own driving behavior. As a busy man with a family and career, he frequently finds himself exhausted at the wheel. He also texts while driving, because his career demands quick correspondence with his co-workers. Finally, he wants to see how his eye and body positions differ from when he is alert. In addition, he is often the driver for family road trips. His spouse and children love to point out beautiful scenery along coastal routes, so his eyes leave the road. With a system that tracks his distracting behaviors such as eye movement, body movements, and/or phone usage, he can track his overall attentiveness while driving.

Task 2: Education on Consequences of Distracted Driving

Kendall is a student at the University of Washington with several years of driving experience. She primarily drives around University District for leisure and errands. While scrolling through her social media feed, she stumbles upon a local news article that reports a motor vehicle accident caused by inattentive driving. In addition, a TV advertisement from the Department of Transportation reminds viewers of the fatal consequences of texting and driving. Jane is curious about current statistics on the causes of accidents and how she can prevent distracted driving in her own life. Since it has been several years since she passed her driver's license test, she wants to refresh her memory on safe driving habits. She is also planning to go on a road trip across the U.S. and she is aware that traffic laws varies between states; her friends encourage her to do research on ways she can avoid trouble with the law.

Task 3: Getting Alerted of Distracting Behavior While Driving

Kanye is an Uber driver in Seattle, so he drives his own 2014 Toyota Prius around town, picking up and dropping off people. He has an air vent phone mount where he keeps his iPhone 6s while driving so that he does not have to hold it in his hand. He uses his cell phone for GPS navigation as well as communication with his riders. To be a good driver, Kanye prepares bottled water and candy for passengers and he always follows traffic rules, considering the safety of the riders and his own. Driving all day can be tiring, and he notices that he sometimes gets distracted by incoming text messages and phone calls as well as interesting conversations with passengers. Kanye is aware of the consequences of distracted driving, so he would like to be alerted every time he loses focus at the wheel; at the same time, he hopes the alerts will not become a new distraction while driving.

Task 4: Sharing and Comparing Safe Driving Habits

Tyga is a driving instructor at Safe Driving School. He and his coworkers partake in friendly competition to figure out which one of them has the safest driving habits. Tyga thinks he is the safest driver because he never interacts directly with his phone while driving. But Kylie claims that she is the safest because she recognizes and manages distractions beyond just phone interactions. Both Tyga and Kylie have developed their own driving habits that they are proud of, but they don't have a quantitative way of comparing their habits so they can know who is the safest.

Task 5: Processing and Visualizing Information About Driving Behavior

Kim is a racecar driver who has competed in Formula One and NASCAR. She is a member of an exclusive driving club called SilverStone, which provides high tech equipment for their drivers. Kim has been using a GoPro Camera along with Kinect-like sensors to collect data while she is racing, and that data is analyzed by professionals to improve her performance as a racecar driver. Off work, Kim has also installed tracking equipment on her family vehicles and has been interested in finding out more about driving behaviors of her family members and herself. However, she doesn't have the time to sit through and watch videos of people driving, nor has the knowledge or tools to understand data outputs from the Kinect-like sensors.

Task 6: Monitoring Driving Behaviors in Employees/Children

Khloé is a new manager of A1Express, a Seattle courier service. Khloé is reviewing car accident reports for the past 4 years of their drivers and notices that long-distance truck drivers have been in significantly more accidents than other types of drivers. She further investigates into those accidents by requesting police/public records and finds that the cause of those accidents are mainly driver-related. Khloé suspects that some employees are not driving safely and might be engaged in distracting activities, such as texting or eating. Khloé wants to monitor her employees' driving behaviors on the road to further evaluate the cause of high accidents. If employees are distracted, she would like to be able to monitor drivers' driving behavior in real-time.

Design 1: Mobile App Tracking Phone Usage

The first design is a mobile app that aims to track distracting phone usage while the user is driving. It automatically detects driving using the phone's internal speedometer and gyroscope. Whenever the user texts, navigates using GPS, or answers a phone call, the mobile app will record and visualize the activity. In order to motivate safe driving behavior, the app also maintains a leaderboard for the current user and their contacts. Finally, the app contains a settings view that allows the user to adjust their profile, alert style, and friends list. This design is targeted to users who may not be interested in tracking finer-grained details such as their eye and body movements.

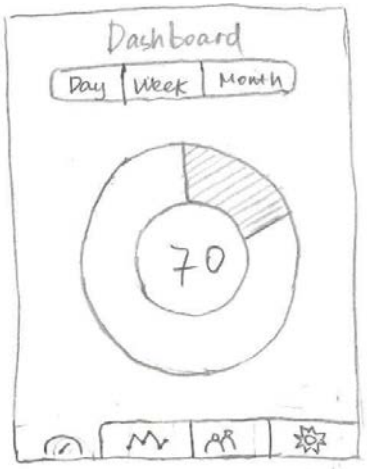
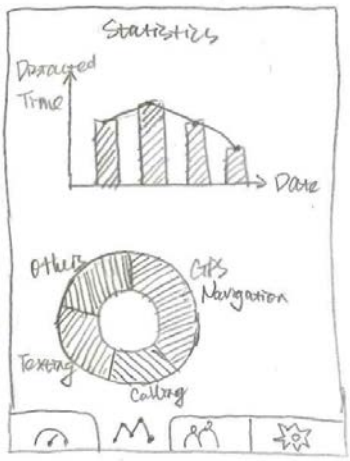


Figure 1



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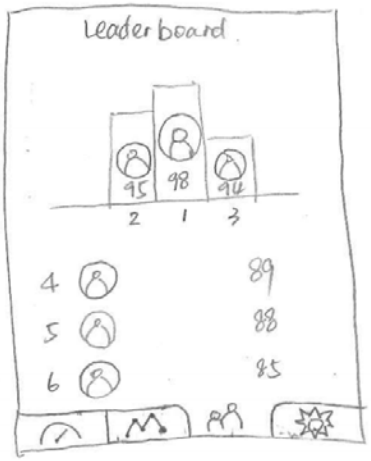


Figure 3

Figure 4

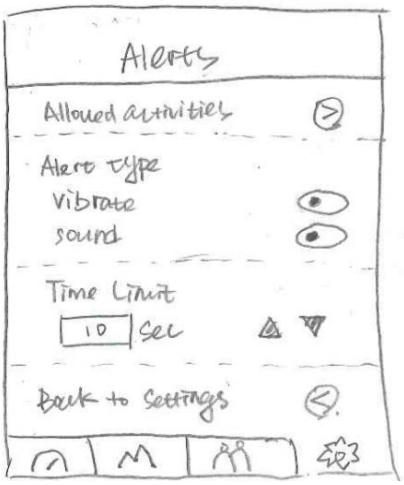


Figure 5

Design 1 (*cont.*)

Task 1: Tracking Driver's Distracting Behaviors in Real-Time ***(Figure 1)***

- App detects driving based on gyroscope/speedometer
- App detects and records phone interaction (other app usage, texts, calls)
- The Dashboard tab displays most recent trip, but user can also toggle to Week/Month
    - Safety Score in the middle of the pie graph reflects percentage of safe driving
    - Pie graph shows *safe* and *distracted* percentages

Task 3: Getting Alerted of Distracting Behavior While Driving ***(Figures 4, 5)***

- App can be configured to alert drivers when they are using their phone while driving
- App can be configured to prohibit phone usage while driving

Task 4: Sharing and Comparing Safe Driving Habits ***(Figure 3)***

- App will display a leaderboard with user's friends/contacts
    - Displays Safety Score

Task 5: Processing and Visualizing Information About Driving Behavior ***(Figure 2)***

- App displays detailed statistics on cumulative driving behavior
    - Percentage of driving time spent sending texts,
    - Percentage time spent receiving phone calls,
    - Percentage time spent using phone GPS navigation,
    - Percentage time spent interacting with other apps, etc.

Design 2: Webapp & Hardware Monitoring Driving Behavior

The second design involves two components: *(1)* hardware to track eye and body movements and *(2)* a webapp that visualizes driving behavior. This design is targeted to users who are concerned about their safety on the road as well as employers/guardians who would like to monitor driving behavior of their employees/children. The hardware will be a kinect-like device that can record and analyze movements, which can then be translated into different activities such as "eyes closed," "checking rearview/side mirrors," "changing car/radio controls," and more. When the system detects potentially distracting behaviors--like a driver falling asleep or taking eyes off the road--it can alert the driver with a friendly noise. These activities are visualized in a webapp that may be used to calculate a Safety Score.

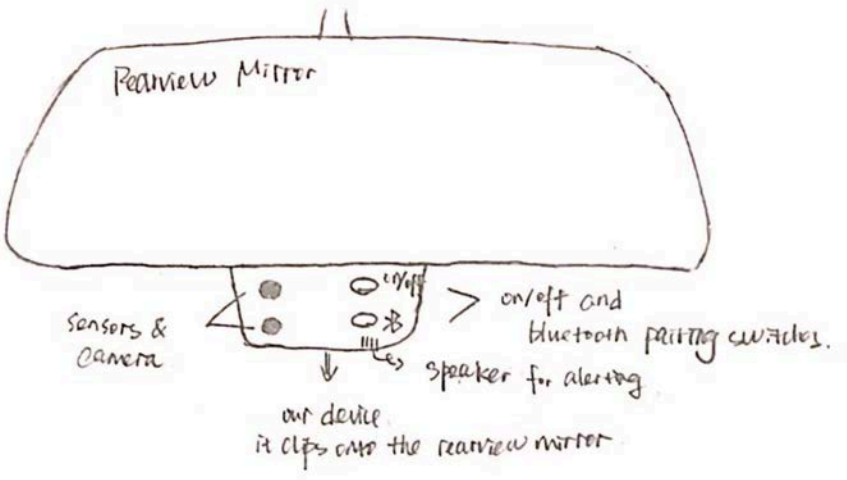
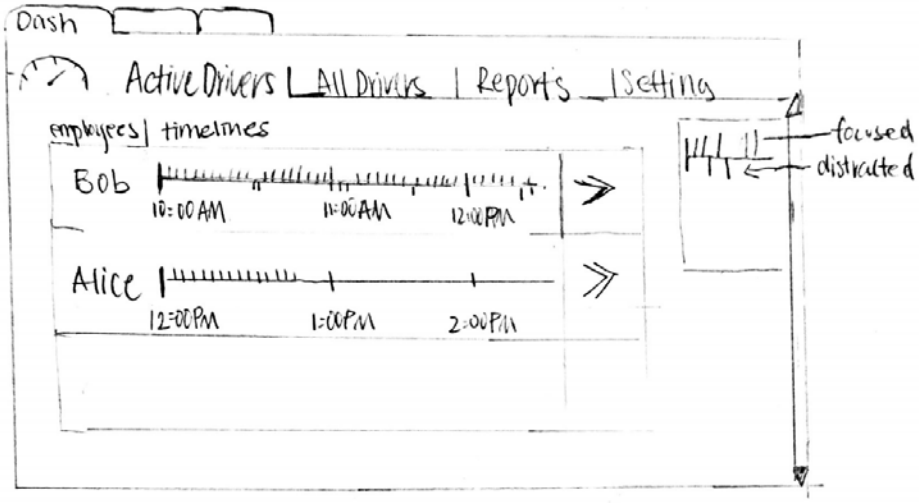


Figure 6



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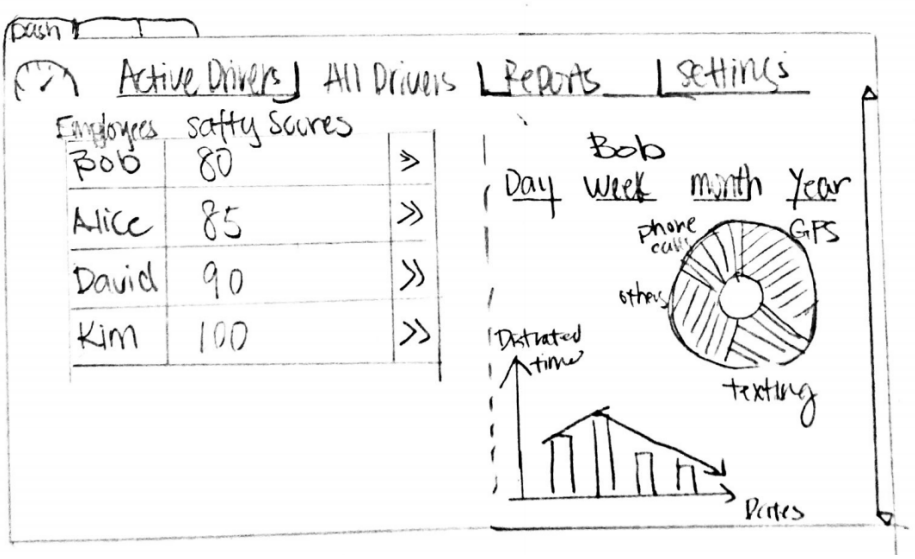


Figure 8

Task 1: Tracking Driver's Distracting Behaviors in Real-Time *(Figure 6)*

- Device on car's rearview mirror tracks the driver's body and eye movements
- Phone transmits real-time data so that companies/parents can track distracting behaviors of their employees/children

Task 3: Getting Alerted of Distracting Behavior While Driving *(Figure 6)*

- The device has a built-in speaker to alert drivers when distracting behavior is detected

Task 5: Processing and Visualizing Information About Driving Behavior *(Figures 7, 8)*

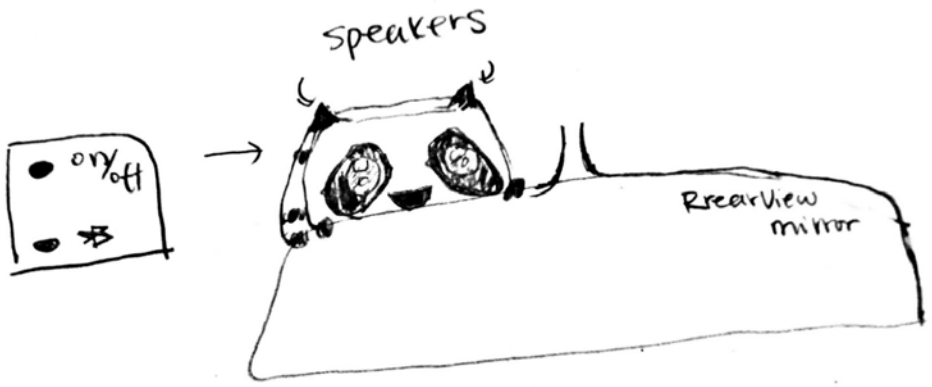
- Webapp displays detailed statistics on cumulative driving behavior
    - Percentage of driving time with eyes ON/OFF road,
    - Percentage time spent interacting with phone
- Webapp allows ability to monitor multiple drivers

Task 6: Monitoring Driving Behaviors in Employees/Children *(Figures 7, 8)*

- Companies/parents have access to the real-time data send back from the car.
- Companies can monitor multiple employees at the same time through the webapp.

Design 3: Mobile App & Hardware Personal Driving Behavior Tracker

The third design includes a mobile app and a hardware tracking device for eye and body movements. Unlike the previous design, this design targets individuals who are interested in mobile informatics. The hardware will have the same functionalities as the one used for monitoring, but its interface is more friendly and less invasive. The device will be a kinect-like device that can record and analyze movements, which can then be translated into different activities such as “eyes closed,” “checking rearview/side mirrors,” “changing car/radio controls,” and more. When the system detects potentially distracting behaviors--like a driver falling asleep or taking eyes off the road--it can alert the driver with a friendly noise. The mobile app will analyze the data collected by the hardware and present visualizations to the user.



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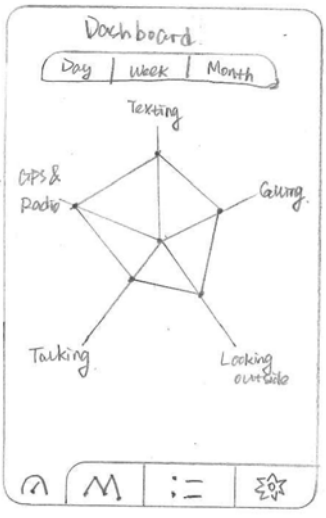

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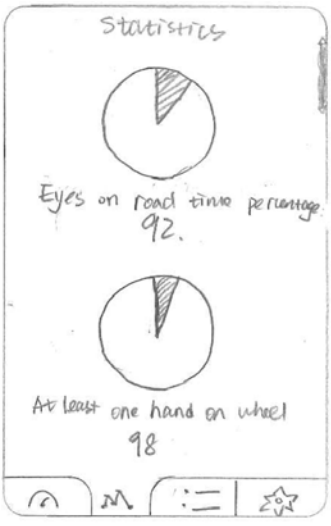

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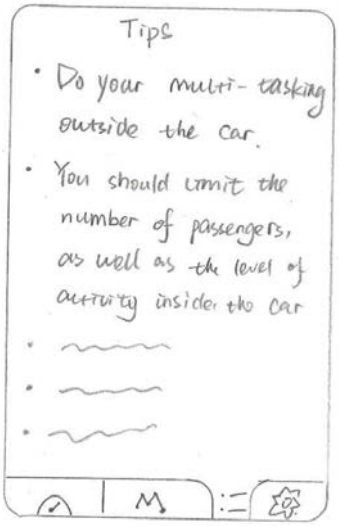

Figure 12

Figure 13

Design 3 (*cont.*)

Task 1: Tracking Driver's Distracting Behaviors in Real-Time ***(Figure 9)***

- Tracks body and eye movements with friendly "companion" device
- Phone tracks mobile usage. Phone is paired with hardware device wirelessly.
- Data from both devices gets transmitted to the phone for further analysis

Task 2: Education on Consequences of Distracted Driving ***(Figure 12)***

- App provides tips for practicing safe driving
- App provides information specific to area driver is located
    - State laws, road conditions, and weather

Task 3: Getting Alerted of Distracting Behavior While Driving ***(Figure 9)***

- Hardware device has built-in speaker that will alert driver with a friendly sound if it detects that driver is getting distracted

Task 5: Processing and Visualizing Information About Driving Behavior ***(Figures 10, 11)***

- Mobile app provides detailed analysis on the data collected by the hardware device and phone. Ranks activities done while driving.
- Users can view their data collected over a day, week, month, or year
    - Percentage of driving time with eyes ON/OFF road,
    - Percentage time spent interacting with phone