DECO3200

Human-Computer Experience Design Computing Studio

Break My Fall Testing Plan Concept

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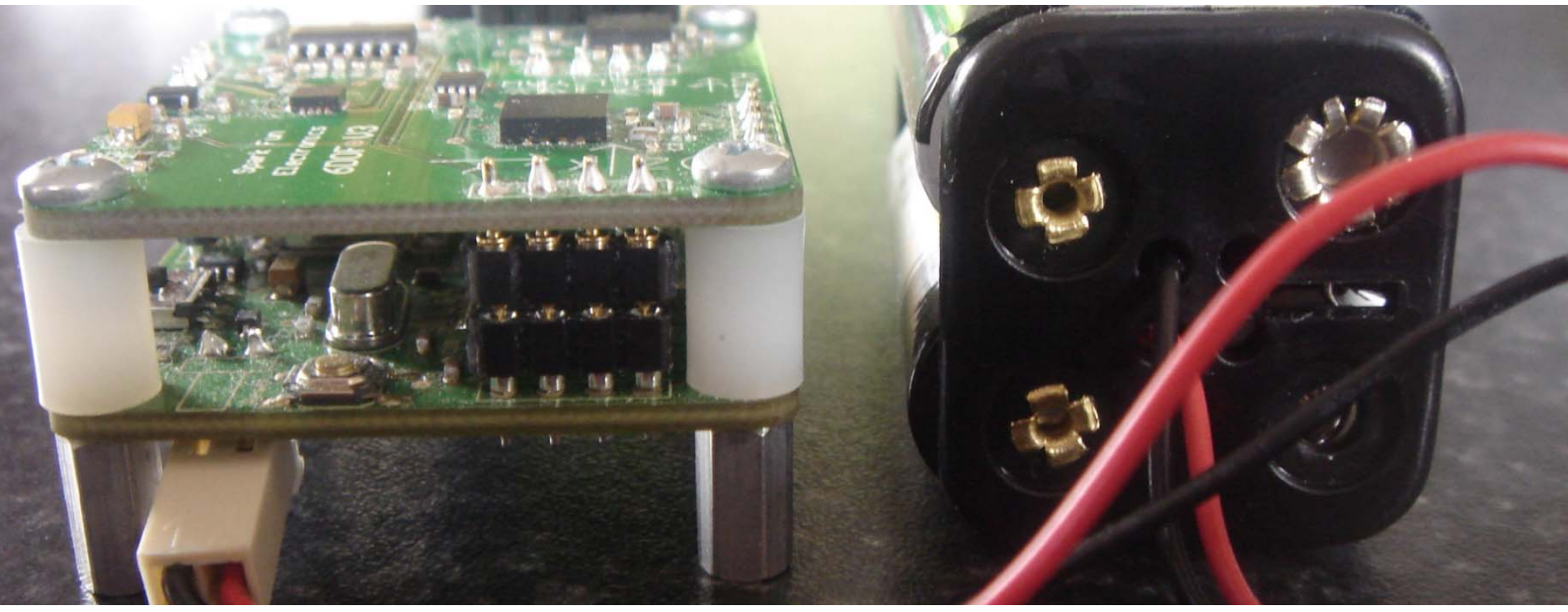

INTRODUCTION

A recorded observation will be undertaken to effectively measure the impact the fall detection device against its addition to the quality of life to a responsible adult in the care of a child under the age of 2. In order to do gauge the effectiveness of such a device, test subjects will be observed, recorded and studied to gain meaningful results and interpreted to determine the value of the alerting device.

The reason for the observation is to record participant's interactions and activities and map out different tasks within a given environment. This in turn assesses the comprehensibility of the alerting phone device during the occupation of a foreground task. The foreground task provides a distraction, so the test subject can be affected by the alerting device and not solely focusing upon it, in other words waiting for their child to fall. This will allow effective measurement of fall detection, data trasnfer and reaction times. The key goal of this device is to shorten the time taken to discover and render assistance to a fallen child.

METHODOLOGY

In order to effectively simulate the real life environment that the device will be deployed, test subjects have to be chosen with respect to their monitored child. The child in question must be at the early stages of walking and accident prone to falling down. This is typical of a child under the age of 2. There will be 8 children chosen 4 males and 4 females. Their demographic would typically be of Filipino background in order to effectively gauge the device in an environment similar to the context documented in the design brief.

The children's education would not be important to this test, but rather their ability to walk and fall down is the simple criteria in order to measure the device and responsible adult's times. With each of the 8 children, there will be a single father or mother, totalling 8 adults for testing. Their education must be at a level where they are capable of reading a simple mobile phone screen and have experience interacting with such a device.

The study itself will primarily be of quantitative nature, meaning most data retrieved from the study will be of numerical value and free of human control or awareness. As mentioned above, in order to fully gauge the impact of shortening the time which it takes to render assistance to a fallen child, the obvious tracking of times and latencies would be crucial in developing a fully function product that has even a small impact on the quality of life for the adult responsible for the child.

The time taken for the accelerometer device to detect a fall, the time taken for device to stream the data to the mobile phone and the reaction time of the test subject will all add latency to the child receiving assistance.

Detection Time + Data Transfer Time + Reaction Time
= Delay for assistance to arrive to Child

Figure 1.1 – Latency detection

It is worthy to note that data transfer time also has direct implications from the distance measured between the accelerometer device and the mobile phone. The greater the distance between the two would mean the further the data has to transfer over a Bluetooth connection, further adding latency to the delay for assistance to arrive to the child.

Distance between the phone and test subject will also be recorded with respect to the reaction time of the adult test subject. The further the test subject is from the mobile phone, it is fair to say that it will become more difficult for the subject to be notified of a fall alert in any of the 4 forms (vibrate, alert, SMS or phone call).

Secondary to this will be the capturing of falling data from the accelerometer into a data log file, stored internally onto the mobile phone. Values for acceleration in the X, Y, Z axis, roll, yaw and pitch will be crucial in understanding what happened to the monitored child when they fell over. Patterns may emerge into data stream of the accelerometer and may help further refine the fall detection algorithm in order to reduce latency in detection time.

METHOD

For each of the 8 children and 8 adults, they will be separated into 2 video surveillance rooms whereby the first room will have a mobile phone placed inside, whereby the adult is unaware of this fact. This allows for an accurate recording of reaction time and alert notification variables of the phone which provide a fast and effective response time from the adult subject. The child will be fitted with the fall detection waistband which houses the accelerometer device communicating to the mobile phone located in the first room via Bluetooth connection. The second room will have a playground for the child to run around and interact, mimicking a child care centre environment, which holds as one of the planned deployment areas for this device.

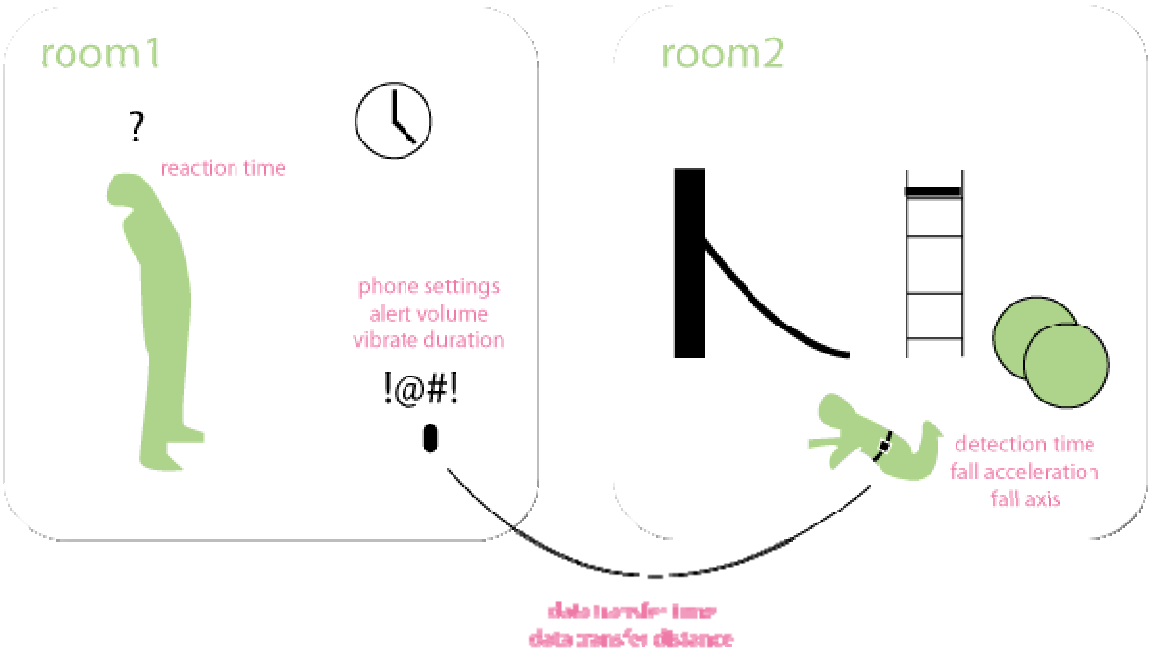

Figure 1.2 – Testing methodology / Recorded data variables in pink

In order to add realism for the adult test subject, ambient noise will played via a television set (volume locked) inside the room to simulate such noise they would normally receive in the real world, hindering their ability to perceive an alert from the mobile phone. The children's playground room will also have padded flooring built-in to prevent any injuries occurring from serious falls.

When the child falls over in the playground room, the mobile phone will alert in one of 4 specified ways (each different for the 4 adult males and 4 adult females) and the adult should react by picking up the phone, reading and finally understanding the alert message. A questionnaire will then be handed to them to ask specific questions about the application of such a device in their own context. Further testing can also stem from this initial research in whereby mobile phone variables such as alert volume and vibrate duration may play a role in shortening the reaction time of the test subject. However, at this stage it does not weigh as heavily in determining the calculated delay for the adult's perception of the mobile phone alert.

Both the child and adult will be observed and recorded for analysis in the 3 timed stages leading up to the assistance delay. No instructions will be provided to either the adult or child, but rather just lead into 2 separate rooms for relaxation. The lack of instructions will provide the advantage of removing any bias in revealing material critical to observation and influence from subjective opinion. The adult will presumably watch the television, while the child will interact with the playground. At this stage, there is a consideration that a control group should be added with the knowledge of the mobile phone and what the alert means in order to benchmark the reading and understanding stage of the fall alert from the phone. This type of control group could provide meaningful interpretation to the collected data from the first batch of test subjects.

As mentioned above, distance plays a large role in the addition of latency to any of the 3 timed stages. Thus, further testing must be carried out with the variables of distance between the waistband to phone and phone to test subject, changed (1m, 2m, 5m, 10m) and results observed to gain any meaningful insight as to how far the optimal distance is for a fast and effective reaction to render assistance to the child.

EQUIPMENT

The essential equipment for both rooms will be a video camera with time stamped footage for integrity with the fall detection data log on the mobile phone. A laptop will be used as secondary verification of the data being stored onto the mobile phone matches that stored onto the MYSQL database via the PHP script. An accelerometer waistband, tested and fitted for child safety, will be allocated to each child and paired with a Nokia N80 mobile phone running the fall detection JAVA applet. The JAVA applet will be a working prototype developed with basic functionality and low-fidelity control over phone variables such as alert volume and vibration duration.

When the results have been obtained, interpretation of the data will be in respect to a smaller timing in any of the 3 stages, in turn resulting in a faster response to the fallen child, as a successful implementation of the fall detection system. Ideally, the lowering of latency delays between the 3 stages will be a factor of the variables mentioned above, such as distance, phone volume, ambient noise and awareness. In addition to this, a questionnaire will be provided in order to gain insight as to the readability and comprehension of the system and its components. Critical to this would be questions related to the graphical user interface (GUI), font sizes and mobile phone alert variables in order to understand what constitutes an effective and understandable alert notification from an adult's perspective.

The second distinction derived from the results will be put forward by which of the 4 alert methods are the most successful in communicating a fall has occurred and it's comprehension by the adult subject. There will be obvious differences between a phone call and vibrate alert, especially with the addition of ambient noise from the television. But the times related to each method will be reflected and interpreted with sensitivity to a test subject's hearing ability and awareness.

Gender Please Circle

Male Female

Age Please Circle

<18 18-25 25-35 35+

Was the phone call loud enough? Please Circle

Didn't Hear it Very faint Perfect Too Loud No Comment

Did you understand the SMS message? Please Circle

Immediately Half Minute Later After a Minute or So Didn't Notice

What activity were you performing when the phone alerted? Please Circle

Was doing nothing Watching TV Standing Walking around the room Sitting in chair

How would you describe the screen display? Please Mark on the Line

Subtle ---------- Intrusive

Calm ---------- Violent

Would such alerts be helpful when not in a direct line of sight with your child:

Please Mark on the Line

Not Helpful ----------Very Helpful

Any further comments or keywords?