

INF 632 Research Project - Part 4

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I. METHODS

A. Controlled Experiment

The device will be assessed on one male subject age 22. In this control session, the subject will consume 0.75 ml/kg of absolute ethanol (as 100 proof vodka) in four parts cold orange juice over 20 mins. The BAC of the subject will be assessed using a Vastar AD690 Breathalyzer. Before any measurements are taken the subject will rinse his mouth out with warm water. After 7-mins an initial BAC reading will be obtained from the breathalyzer and a voltage reading will be obtained from the wearable. A light meal will be served 1hr prior to consumption. The subject will be free to sit and move around during the session.

B. Intoxication Experiment

The subject shall consume 0.75ml/kg of vodka in 20 min intervals for a 3 hr period. Every 20 mins a reading will be taken from the wearable and the breathalyzer. Prior to each reading the subject will again rinse his mouth out. All readings will be recorded in a digital journal with time-stamps to insure that the accelerometer measurements from the wearable can be synchronized. A binary classifier shall also be recorded in the digital notebook (i.e. does the subject feel signs of intoxication or not).

C. Sober Experiment

On a new day, the subject will consume no amount of alcohol. Measurements again will be taken every 20 mins for a 3 hr period with both the wearable and the breathalyzer. A sober classifier will be recorded during the entirety of this experiment.

D. Measures

The Vastar AD690 Breathalyzer will measure the percentage of alcohol in the subjects blood. The wearable device will measure the acceleration of the subject during the experiments as well as a voltage measurement every time the subject blows into the gas sensor. A real-time clock will be used as a time reference for the records in the digital notebook and the wearable.

E. Data Management

The data from the wearable (i.e. voltages, accelerations, and time-stamps) will be recorded to the onboard SD card. The BAC measurements and classifiers shall be recorded in a digital notebook.

F. Statistical Analysis

Using a t-test we shall see if the sober vs. intoxicated measurements are significantly different. This means we will compare the acceleration, voltage, and BAC measurements during the sober trials to the same measurements during the intoxicated trial.

We shall conduct a multivariate linear regression analysis on the data. We will use the BAC from the breathalyzer as the response variable and the voltage and accelerometer as the predictor variables. This analysis will be conducted using the regression functions found in the Octave programming language.

Using the k-nearest neighbor method with a $k = 7$ we shall see if the accelerometer and voltage can classify intoxication. We will use %30 of the known intoxicated and sober data as classifiers and try to predict the other %70 of data.