Boston University
Electrical & Computer Engineering
EC463 Capstone Senior Design Project

First Prototype Testing Plan

Halo Smart Drink Protector

by

Team #23
Halo

Team Members

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Required Materials

Hardware:

- Arduino Nano 33 BLE
- Traditional drink cover (*Nightcap*)
- Micro-USB cable
- Testing Cup

Software:

- Arduino script:
    - Checks and prints the accelerometer values of x-axis, y-axis, and z-axis
    - Stops the program and prints the warning message when the cap is potentially taken off, continues when the reset button is pressed

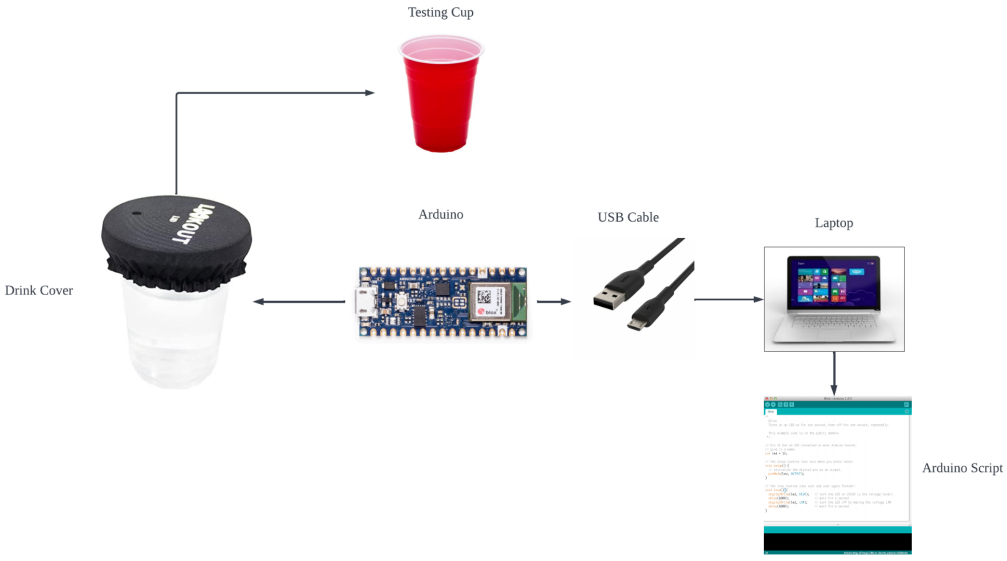

Figure 1: Illustration of the Setup

Set Up

There are two components of our prototype: The stretchable material that covers the cup, and the Arduino. For our prototype, we decided to use the product of our potential competitor, NightCap. It consists of two parts, a flexible cloth that covers and stays on a variety of potential drink glasses, and a rubber band that connects to the flexible cover. We will attach an Arduino Nano 33 BLE onto the cover by using 3M tapes, and it will be placed in the middle of the cover. Running the Arduino, constantly measures linear acceleration using its built-in accelerometer. When the Arduino detects sudden and significant changes in either the x, y, and z values of the accelerometer, the program will halt and print out the message that informs the user that the cap may have been taken off. Otherwise, if the cover remains on the cup the "Cap is on" message will be continuously printed.

Pre-test Set-Up Procedure

1. Connect the Arduino to a laptop or a power supply.
2. Upload the code from Arduino IDE onto the Arduino Nano 33 BLE.
3. Calibrate and reset the values for the x, y, and z-axis.

Testing Procedure

1. Place the Cup on a flat surface and remain stationary.
2. Take the drink cover that has the Arduino attached to the top of it and place it on the cup.
3. Start moving the cup horizontally on the X-axis to check if Alert Message shows up.
4. Start moving the cup horizontally on the Y-axis to check if Alert Message shows up.
5. Start moving the cup vertically on the Z-axis to check if Alert Message shows up.
6. Try to take off the drink cover and check if Alert Message shows up.

7. Finally check if the x, y, and z values are still showing accurately and correctly after randomly moving the cup to test the error margin.

Measurable Criteria

The criteria for successful running and the expected output is as follows:

I. The Halo device should fit securely around the cup.

II. When the cup is moved, but the cover remains in place, the program should not send out an alert, and keeps on checking if there are any sudden changes to the values of the accelerometer. The message “The cap is on” will keep on appearing in the Serial Monitor.

III. When the cover is removed from the cup, the program should halt and the “Cap might have been taken off” message appears in the Serial Monitor.

IV. The Halo device should have a success rate of at least 90%.