An Integrated Alcohol Sensing Device for Cars Comprising of an HX711 Weight Sensor, Servo Motor and an MQ3 Alcohol Sensor to Prevent Drunk Driving Incidents

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Purpose/Statistics

My product tests the alcohol content in a person's breath to determine whether or not someone is driving legally. Here are some key statistics regarding the issue.

1. Every day, about 28 people in the United States die in drunk-driving crashes (USDT)
2. In 2019, the annual death toll ended up being 10,142 (USDT)
3. Young drivers (ages 16-20) are 17 times more likely to die in a crash when they have a blood alcohol concentration (BAC) of .08% than when they have not been drinking (CDC).

The painful reality is that these deaths were preventable. My product aims to address the drunk driving problem.

Background

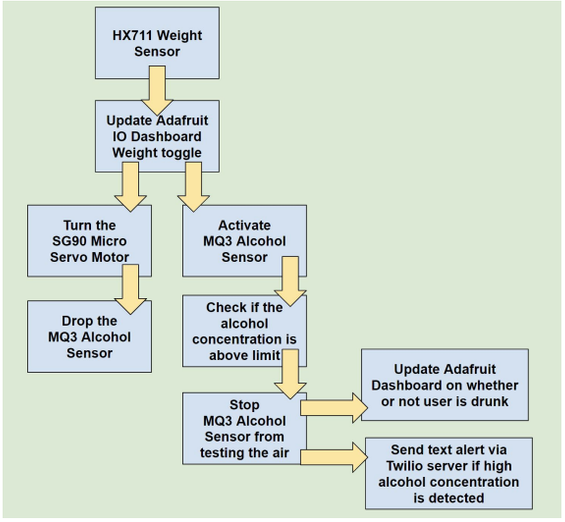
There are other alcohol detection systems integrated into cars. However, these bulky instruments are only used after the driver has already had a drunk-driving incident and is mandated to use the breathalyzer. Instead, I wanted my product to target the entire population, specifically younger drivers since prevention is better than cure. Therefore my alerting system needed to be small, quick, and effective.

Goal

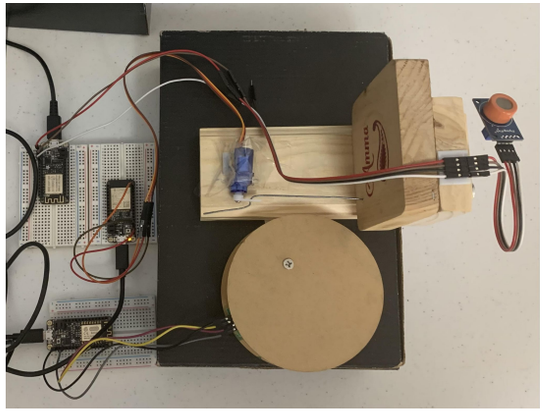
To make an affordable and effective alcohol detection device to prevent deaths due to drunk driving.

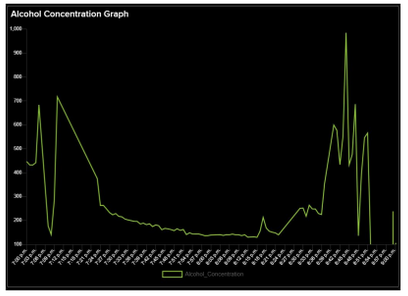
Design Analysis

After a discussion in my health class regarding drunk driving, I began brainstorming ways to prevent these incidents. First, I wanted to make a system primarily focused on the driver. This would mean that the system would only activate when the driver sits on the driver's seat. I decided to support this design with an HX711 weight sensor embedded in the car seat. Additionally, I needed to determine where I would place the alcohol sensor. Initially, I wanted to set the sensor in the steering wheel but realized that it might cover the airbag and, therefore, be unsafe. Therefore, I decided to let the alcohol sensor drop from the car's ceiling so that the driver could hold the sensor close to their mouth. The sensor can also be put back to not interfere with the driver's driving. This mechanism would require a motor acting as a holder when the sensor is not used and pull away when the sensor is in use. this led me to using the servo motor.



Project Components



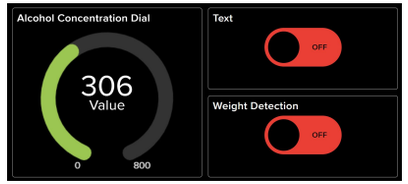


In the above line chart, the green line represents the values the MQ3 alcohol sensor outputs. Each peak in the graph at the values at 690, 710, and 990 represent spikes due to the spraying of alcohol.

Substance	Water	(43% ABV) with 50% water	43% ABV Undiluted
Trial 1	203	435	702
Trial 2	210	423	699
Trial 3	197	412	713
Trial 4	213	456	697
Trial 5	220	398	687
Trial 6	253	423	654
Trial 7	178	468	732
Trial 8	201	432	721
Trial 9	221	415	683
Trial 10	231	460	659

In all of my trials, I used a spray instead of a human subject and I could determine that the concentration of alcohol that the sensor detected for the 50% alcohol solution was averaged at 432 ppm and the concentration for undiluted alcohol was averaged at 695 ppm. Therefore, I decided to set my trigger at 600 ppm for my device.

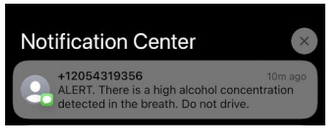
Dashboard



This is the user configuration dashboard. The client can view the latest value detected by the sensor through the alcohol concentration dial as well as whether or not someday is sitting in the driver's seat of the car through the weight detection toggle. The text toggle will also display if an alert has been sent.

Conclusions

My prototype was successful in alerting the client based on the environmental conditions as demonstrated by this alert message.



Impact

With technology advancement and more autonomous cars manufactured, this could be easily integrated in all new cars to prevent tragic deaths from happening. This sensor will also help insurance companies to avoid major claims due to damages due to accidents. They can also provide premium discounts to people who have cars equipped with my sensor system.

Works Cited

References

United States Department of Transportation. (n.d.). *Drunk Driving*. NHTSA. Retrieved March 4, 2022, from https://www.nhtsa.gov/risky-driving/drunk-driving#:~:text=Every%20day%2C%20about%2028%20people,These%20deaths%20were%20all%20preventable.

Centers for Disease Control and Prevention. (2012, October 2). *Teen drinking and driving*. Centers for Disease Control and Prevention. Retrieved March 4, 2022, from https://www.cdc.gov/vitalsigns/teendrinkinganddriving/index.html#:~:text=The%20percentage%20of%20teens%20in,more%20than%20half%20since%201991.&text=Young%20drivers%20(ages%2016%2D20,they%20have%20not%20been%20drinking.