Smoke Away

BY: Samuel Desse, Ethan Mullane, and Bruce DeBiasse

Problems

- Drug use has become a major problem inside of bathrooms all over the world. Specifically in high schools. *1
- e-cigarette use among high schoolers reached more than 20 percent in 2018.*2
- This is damaging not just to student health but to the reputation of schools as well.
- The main problem is that in schools such as Samo, the use of Juuls and other recreational substances often will trigger smoke detectors causing a massive waste in taxpayer money as it alerts the SMFD.
- Nicotine is unquestionably harmful to developing brains: younger users are more likely to become addicted, have more difficulty quitting and may be at higher risk for addiction to other substances in the future.*2
- E-cigarettes, like JUUL, can leak heavy metals and residual nicotine into the environment. Because of heavy metals and residual nicotine, e-cigarettes may qualify as both e-waste and biohazard waste.*3
- The amount of nicotine in one standard JUUL cartridge is roughly equal to the amount of nicotine in a pack of cigarettes*4

Our Project

- Our goal is to engineer a new type of smoke detector to help schools detect drug use and negate the false alarms for fire departments.
- We will be making a highly sensitive smoke alarm that will be calibrated to detect the smoke/ vapour from juuls, vape, and other smoked drugs.

.

Current Solutions

The current solution is having a normal fire alarm. While it works, it gets activated too late, interrupts the entire school, and summons the fire department.

In San Diego the police rolled forth a new type of mouth swab that can detect up to 7 kinds of drugs. While useful, the machine is large and can't be used for prevention.

mouth swab drug test

A mouth swab drug test is a kind of drug test which uses saliva as its test sample. It uses a swab to acquire the needed sample for the test.

The Solution

- The solution is to invent a new type of smoke detector that will recognize the vapor and smoke from drugs before the normal fire alarm does.
- It will then send a silent alarm to an app which will alert security who can come and handle the perpetrators with appropriate punishment.
- The detector will be using improved smoke detectors to detect the smoke and send out an alarm before the conventional fire alarms.
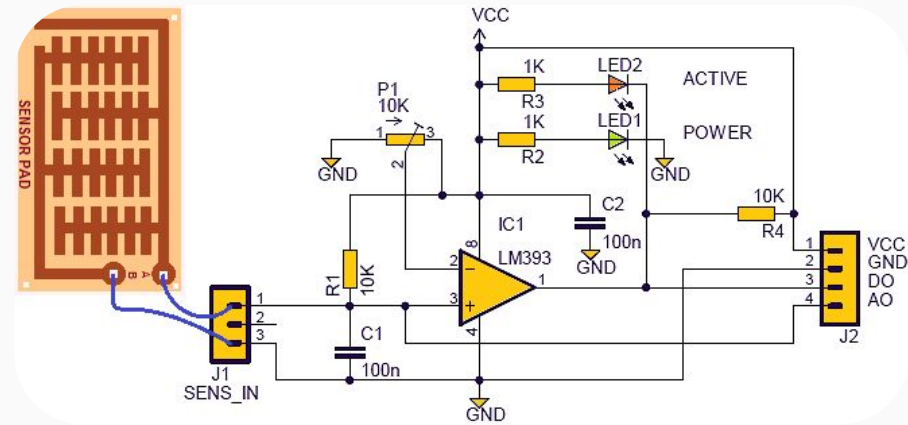
Additional Sketches/ Concept Art
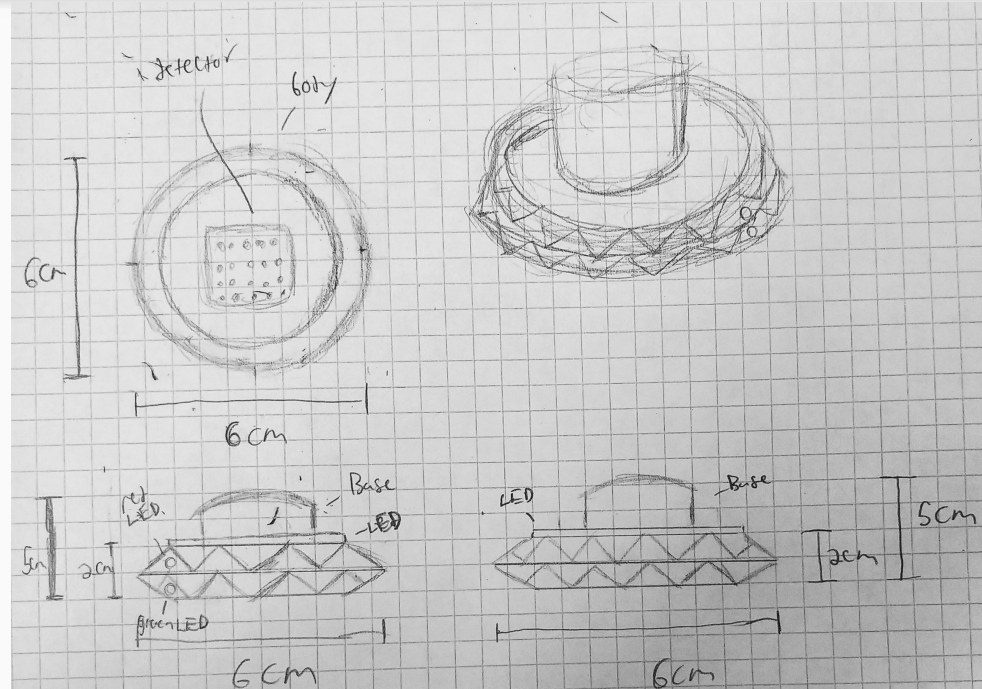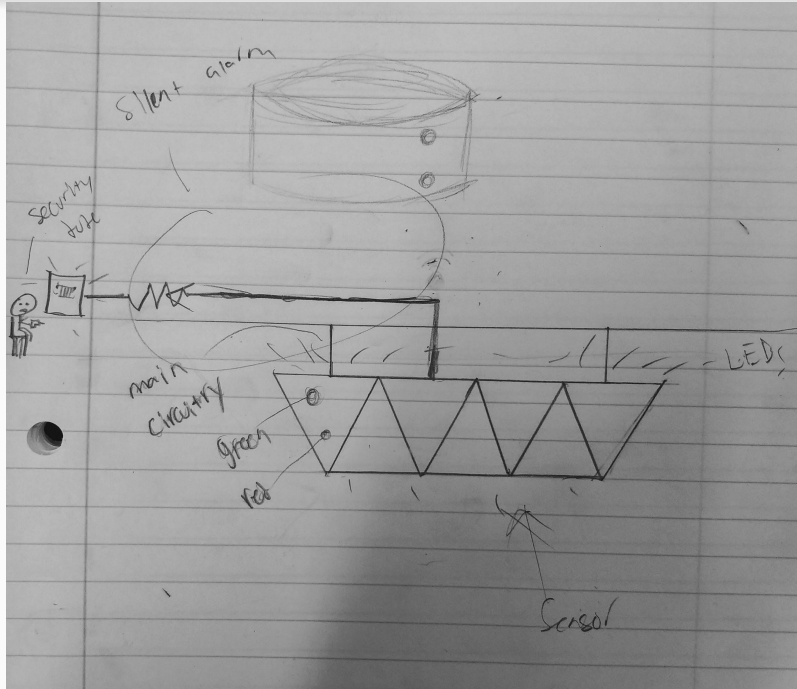
Final CAD File
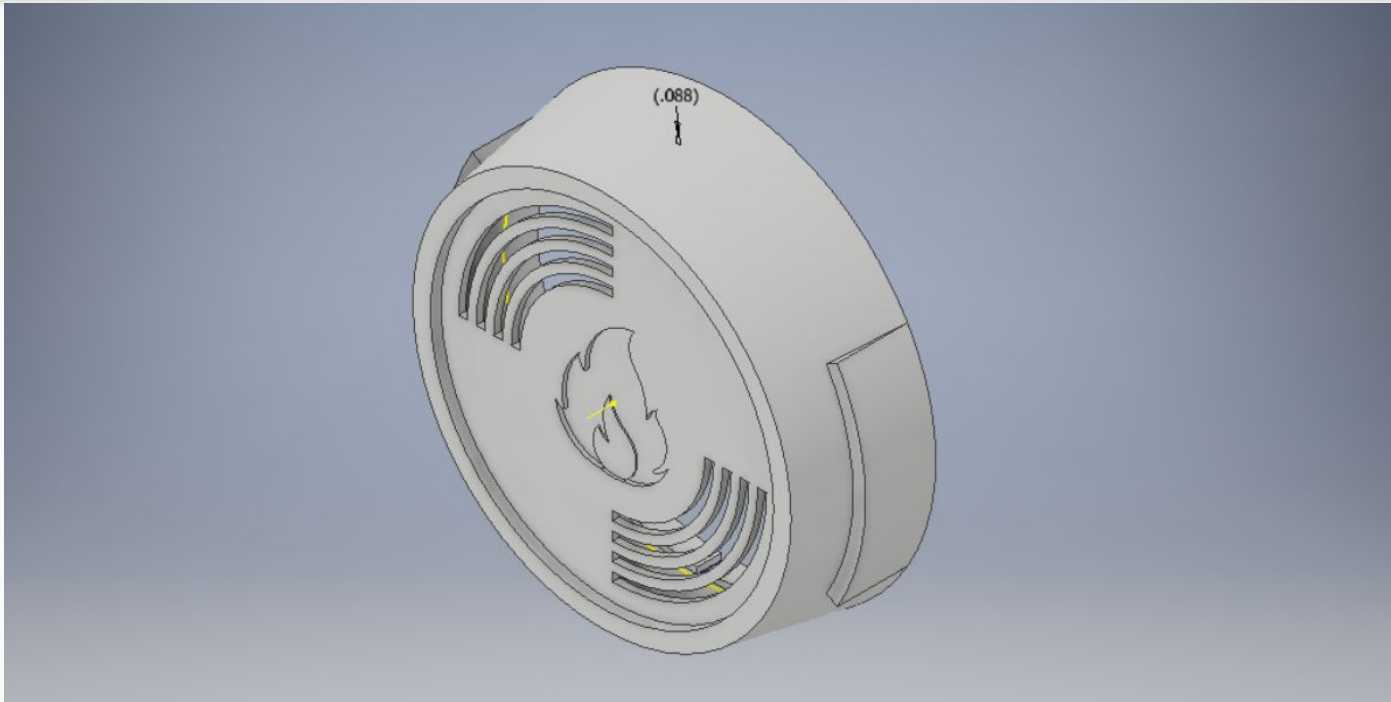
Materials

The materials that we used were a fire alarm, an adafruit wifi breakout, and some solder for the breadboard as well as a computer to code the adafruit. All in all our materials cost was around 30 dollars.

Building the body

We used an old fire alarm

Soldered the breadboard to go with the alarm using a soldering iron, some wire strippers and scissors

We attached the adafruit wifi breakout

We proceeded to code it to connect to the app.

We have also constructed a breadboarded

prototype.

Making the app

We are coding an app that connects to the Adafruit Wifi Breakout.

This Wifi device will then connect to the smoke alarm, which when smoke is detected, will send a silent signal to the device.

The app will feature 3 sections. A homepage (with smoke status), a notification page, and a statistics page that shows the amount of detected alarms over a period of a month.
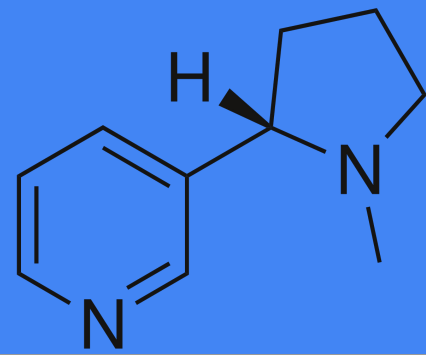
The APP

Smoke Away-

Smoke Away-

Testing Plan (Hardware)

Test: The hardware test will consist of two parts, one without smoke as an input and one with a smoke input.

Test One will be using the fire alarm's reset button as a trigger for the alarm, which should be setting off the signal to the WIFI adapter part. There are two contact points that will be joined by the press of the reset button, and this will send a similar signal as if the smoke alarm detects smoke, without the need of smoke.

Test Two will be using actual smoke from burning organic matter, leaves, wood, paper, etc., and will be testing whether or not smoke also triggers the fire alarms response. We are testing whether or not the smoke alarm still receives a signal from smoke, whether or not the sounded alarm goes off and whether or not the WIFI adapter sends a signal to the app.

Testing Plan (Software)

Test: The Software test will consist of one part which tests the connection between the app and the WIFI adapter.

Test One will see if the app links to the Adafruit Wifi Breakout, and make sure it sends a signal to the app that will be coded to generate an alert. We will also test to see if the detector sends a signal to the Adafruit after a substance is detected, or the detector is switched "ON". If 1=ON and 0=OFF, and the detector generates a 1, then we check to see if the Adafruit is notified.

Testing Results

As of now we have not yet completed the prototype. There are several issues in regard to coding the signal using arduino. However as soon as we have that we will be able to move on with testing.

Stakeholder feedback

https://docs.google.com/forms/d/e/1FAIpQLSeJP2hLxn6ju8_hdS-coebDovJD oFoLGEFXAfLUV1q6FEUXVQ/viewform?usp=sf_link

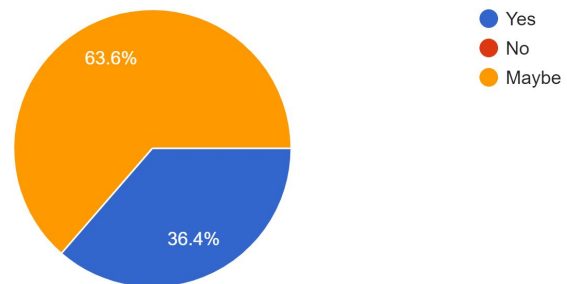## Would this cause for less interruptions to class time?
11 responses

- Yes
- No
- Maybe

36.4%

63.6%
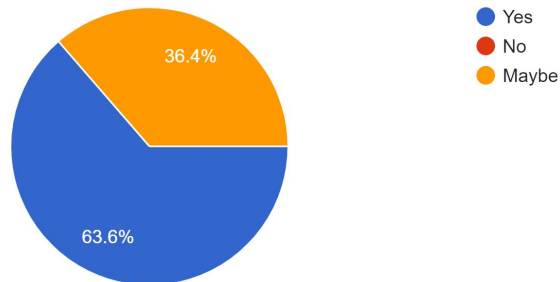
Would our device discourage drug use in restrooms?
11 responses

- Yes
- No
- Maybe

63.6%

36.4%

Modifications and Next Steps

- Our group would modify the system to be run with bluetooth instead of the Adafruit Wifi Breakout
- We would make the detector a low energy core bluetooth system
- We would expand the amount of substances the detector can identify
- Include vapor, different types of smokes/gases

Modifications and Next Steps

- For next steps and modifications we would try to make the entire system smaller
- We would also make sure the detector has better detection of questionable substances
- Widen the range of its detection so that it can detect it at a ceiling level even if the activity is closer to the ground
- Expand its capabilities in different types of detection, and how long it can last without needing battery changes/maintenance

Potential Resources

1. https://www.therecoveryvillage.com/teen-addiction/high-school-drug-use/#gref

2. https://truthinitiative.org/news/how-are-schools-responding-juul-and-youth-e-cigarette-epidemic

3. https://truthinitiative.org/news/3-ways-juul-harms-environment

4. https://truthinitiative.org/news/how-much-nicotine-juul