

## **The Community**

### **Project Ideas:**

#### **Idea 1: Automated Breaking Emergency Device (ABED)**

##### Sensor(s):

- Grayscale sensor
- Ultrasonic distance sensor HC-SR04
- Photo-interrupter sensor

##### Actuator(s):

- LEDs, relay switch or transistor
- 7-segment led -

##### Controller:

- Raspberry Pi 4
- Atmel ATmega328 8-bit microcontroller.

##### Project Summary:

My team believes that this automated breaking emergency device is the best-fit for this term's project requirements as well as having the appropriate level of complexity for the study environment. This Minimum Viable Product (MVP) has an ultrasonic sensor attached to a RaspberryPi driven car. The sensor measures the distance by using ultrasonic waves. It emits an ultrasonic wave and receives the wave reflected back from a target. Measuring the time it takes for the wave to return it can calculate the object's relative distance from the sensor. This MVP will also afford some "should" and "may" features that could increase its market viability. It might include a simple display, a 7-segment led showing the measured distance and a photo-interrupter sensor for more complex purposes such as cliff detection and velocity measurement. Also, we may add Green and Red LEDs. The green LED is for no obstacles ahead and red is for braking. The device will be able to be integrated into a variety of systems – simple or complex – but we will use a Raspberry Pi 4 which communicates with our 8-bit microcontroller to control this device.

#### **Idea 2: Air Purifier**

##### Sensor(s):

- Air particulate size, humidity, temperature, altitude, etc. sensors
- DEVMO Digital Particle Concentration Laser Sensor PMS5003 PM2.5 PM10+Cable for Arduino

##### Actuator(s):

- LCD screen for measurement display, fans for purification, & relays

The Community: Natalie Nguyen, Adam Provost, Navid Karamichamgorda, and Joshua Blazek

- SunFounder Relay Module for Arduino and Raspberry Pi 5V DC Trigger by HIGHLO (HIGH Trigger)
- OLED Module 12864 128x64 Yellow Blue SSD1306 Driver I2C Serial
- Self-Luminous Display Board for Arduino Raspberry PI

Controller:

- Microcontroller with UART input
- ESP32 Feather Board

**Project Summary:**

Our overall goal of this project is to create an inexpensive, lightweight and portable air quality control system for anyone that works, or lives in polluted areas, or just wants assurance in the air they are breathing. This system works by detecting the particulate matter in the air and, when a certain level of particulate matter is reached, the system will engage the filtering mechanisms which begins to filter the air. The system will continue filtering, until the particle counts are below the set limits. One side of this unit will display the Particulate Mass value(s) along with many other sensors, and the overall air quality, so the user will be well informed of the exact air quality at that time.

**Idea 3: Self Spilling Coffee Cup**

Sensor(s):

- MEMSIC MMC5883MA 3-axis Magnetic Sensor & pressure sensor

Actuator(s):

- Center of gravity controller to distribute weight

Controller:

- ARM Cortex-M0

**Project Summary:**

The self-spilling coffee cup would function as a normal coffee mug, most of the time. This mug would look regular and would hold coffee as any normal mug would, that is, until it randomly relocates it's centered weight thus making the mug unbalanced. This would cause the mug to capsize and empty its contents. This mug would be programmed to spill itself at times of no correlation, completely randomly and in an unpredictable fashion. We could add an additional element of unpredictability by making sure the direction of the spill is also randomized so users can't plan ahead and try to save their precious caffeinated beverage. The input of said device would be a pressure sensor at the internal bottom of the mug to insure it was only active when it contained contents, and the actuator would be an internal balancing weight that would control its orientation. Orientation could be kept track of using a magnetometry and positioning sensor.