Automatic Air Quality Filter

Naser Haroon & Daniel Chen

Team

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Motivation

- Poor air quality may lead to numerous health issues
- Short-Term Effects: coughing, tightness in chest, irregular heart beat, nonfatal heart attack
- Long-Term Effects: reduced lung function, children may develop respiratory diseases, aggravation or premature death for people with lung or heart disease
- Sensitive Groups: children, senior citizens, people with preexisting heart or lung disease and active citizens are most at risk
- 50,000-120,000 premature death due to poor air quality

A "Pyramid of Effects" from Air Pollution
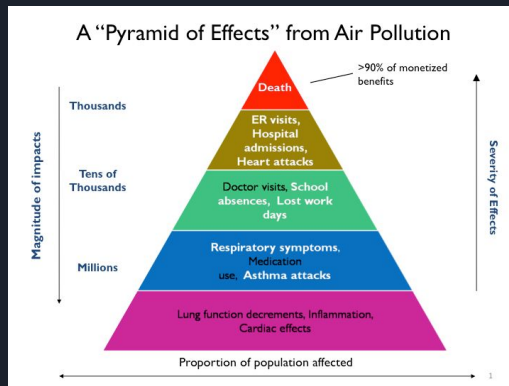
Air Quality

Good air quality consists of little to no ozone, particulate matter, carbon monoxide and sulfur dioxide. The air quality index and websites like https://airnow.gov/ are helpful for finding out the air quality. As air quality decreases, activity outside should be limited, especially for sensitive groups.

Recommendations for Schools and Others on Poor Air Quality Days*
Air Quality Index (AQI) Chart for Ozone (8-hr standard)

ACTIVITY	0 to 50 GOOD	51 to 100 MODERATE	101 to 150 UNHEALTHY FOR SENSITIVE GROUPS	151 to 200 UNHEALTHY	201 to 300 VERY UNHEALTHY
Recess (15 min)	No Restrictions	No Restrictions	Make indoor space available for children with asthma or other respiratory problems.	Any child who complains of difficulty breathing, or who has asthma or other respiratory problems, should be allowed to play indoors.	Restrict outdoor activities to light to moderate exercise.
P.E. (1 hr)	No Restrictions	No Restrictions	Make indoor space available for children with asthma or other respiratory problems.	Any child who complains of difficulty breathing, or who has asthma or other respiratory problems, should be allowed to play indoors.	Restrict outdoor activities to light to moderate exercise not to exceed one hour.
Scheduled Sporting Events	No Restrictions	Exceptionally sensitive individuals should limit intense activities.	Individuals with asthma or other respiratory/ cardiovascular illness should be medically managing their condition. Increase rest periods and substitutions to lower breathing rates.	Consideration should be given to rescheduling or relocating event.	Event should be rescheduled or relocated.
Athletic Practice and Training (2 to 4 hrs)	No Restrictions	Exceptionally sensitive individuals should limit intense activities.	Individuals with asthma or other respiratory/ cardiovascular illness should be medically managing their condition. Increase rest periods and substitutions to lower breathing rates.	Activities over 2 hours should decrease intensity and duration. Add rest breaks or substitutions to lower breathing rates.	Sustained rigorous exercise for more than one hour must be rescheduled, moved indoors or discontinued.

Note: All guidelines are cumulative (left to right and top to bottom) as duration and intensity of activities increase.

Design
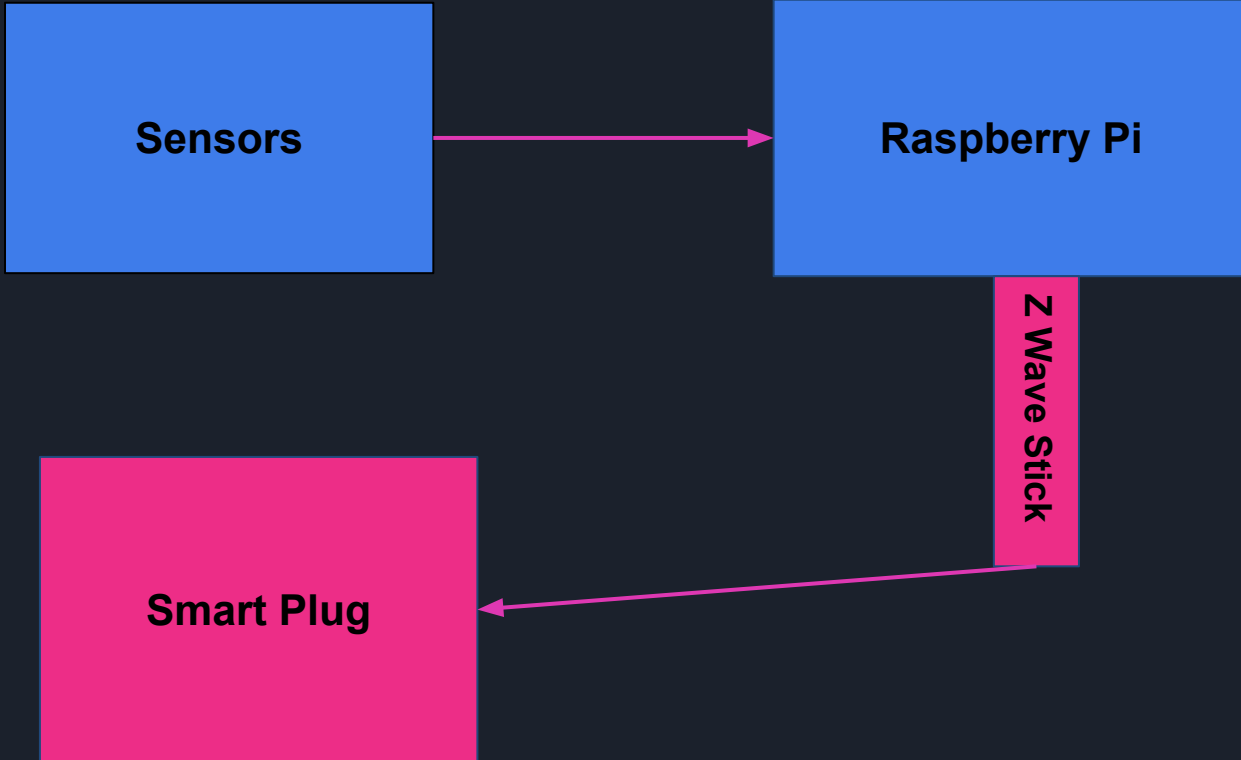
Sensors

MQ-2 Sensor
-LPG
-I-Butane
-methane
-alcohol

Waveshare Dust
Sensor
-PM 2.5
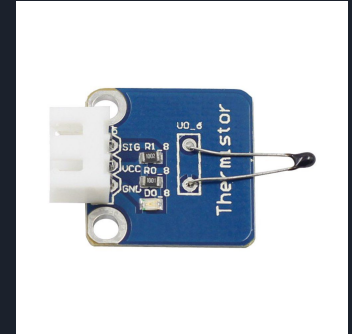
Thermistor
Sensor
-Fahrenheit
-Celsius

Programs

Arduino IDE - Gathers data using sensors

SQLite3 - Used to store data collected using Arduino

Flask - Used to create website to display data collected from Arduino

Process

-Arduino IDE gets reading inside a room

-Python script uploads data to terminal

-Data is saved into text file using python

-Access data in text file on Flask and store into SQLite3

-Create and display graphs on Flask

-If data is over the threshold, Z Wave stick starts sensor by sending a Z Wave signal to smart plug

Left window (Flask - Full Stack ... / 127.0.0.1:5000/sq...)

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Right window (File Edit Tabs Help)

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2019-07-23   15:28:37   23.47   74.25   226
2019-07-23   15:28:38   23.47   74.25   225

Fahr vs time

cent vs time

lpg vs time

co vs Time

Future Goals

- Complete display of real-time air pollution information

- Continuous calibration of sensors

Questions