CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

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Project Number

J1013

Project Title

A Microcontroller and Air Pollution Sensor Based Smart Air Filter Controller

Abstract

Objectives/Goals

The objective of this project is to create a smart air filter controller that can control any standard air filter based on the level of particulate matter air pollution. The design criteria are to make sure that the controller is inexpensive and easy to use.

Methods/Materials

I designed and built a circuit using an Arduino Teensy micro-controller. I used a IRED-based particulate matter sensor to determine the pollution in the air. I programmed the Arduino Teensy using C programming language. The program reads raw data output by the sensor and translates it into the amount of particulate matter density. That amount is compared to the EPA air quality standards to control a relay switch. The circuit also contains an LCD and LED's, which provide visual representation of pollution.

Results

I tested the sensor using smoke from an incense stick, and compared it to a commercial sensor. Both sensors were placed a set distance away from the incense stick and exposed to smoke. This process was repeated for multiple trials . Both sensors proved to have similar values, showing that the controller would be accurate and effective. The algorithm was also very consistent, only turning the filter on when it was needed, and turning it off when not needed.

Conclusions/Discussion

As long as the air filter can be connected to a standard outlet and fulfills HEPA filter standards, it should perform effectively. This controller is shown to be cheaper than smart air filters currently on the market, as the controller price is about $80, while commercial smart air filters cost about $400, not including the existing air filter being thrown away. Two design criteria were achieved, making the controller inexpensive and making sure it worked with any standard air filter.

Summary Statement

The objective of this project is to create a smart air filter controller that can control any standard air filter based on the level of air pollution.

Help Received

I built an programmed the circuit myself. My mentor, Dr. Aneesh Sharma, taught me the basics of electronics in a similar project and guided me when I was stuck.