Air Pollution Monitoring, Forecasting and Controlling System

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Abstract

Air pollution is the presence of compounds in the atmosphere that are hazardous to human beings and the health of other living organisms, or that can impair climate and materials. Chemical compounds such as carbon monoxide, ozone, nitrogen dioxide etc, are common air pollutants and they lower the quality of air. In many industrial and urban areas today, maintaining and monitoring air quality has become a top priority. With this project we aim to successfully demonstrate the possibility of a low cost, IOT based system built using Arduino and various sensors that not only monitors the current air quality, but also has the ability to forecast the future predictions and also provide suggestions on how to control the pollution and protect human beings from the harmful pollutants.

Objectives

- Build an IoT system that measures the current AQI level
- Collect the concentrations of the various air pollutants via the IoT system
- Build a model to forecast the Air Quality for the next 5 days, using the collected data
- Build a web application and provide analytics such as current AQI and the forecasted AQI levels
- Provide controlling measures to improve air quality
- Provide precautionary measures to safeguard the health of humans

System Architecture

ML/DL model

Air → Arduino with sensors → cloud server → web application
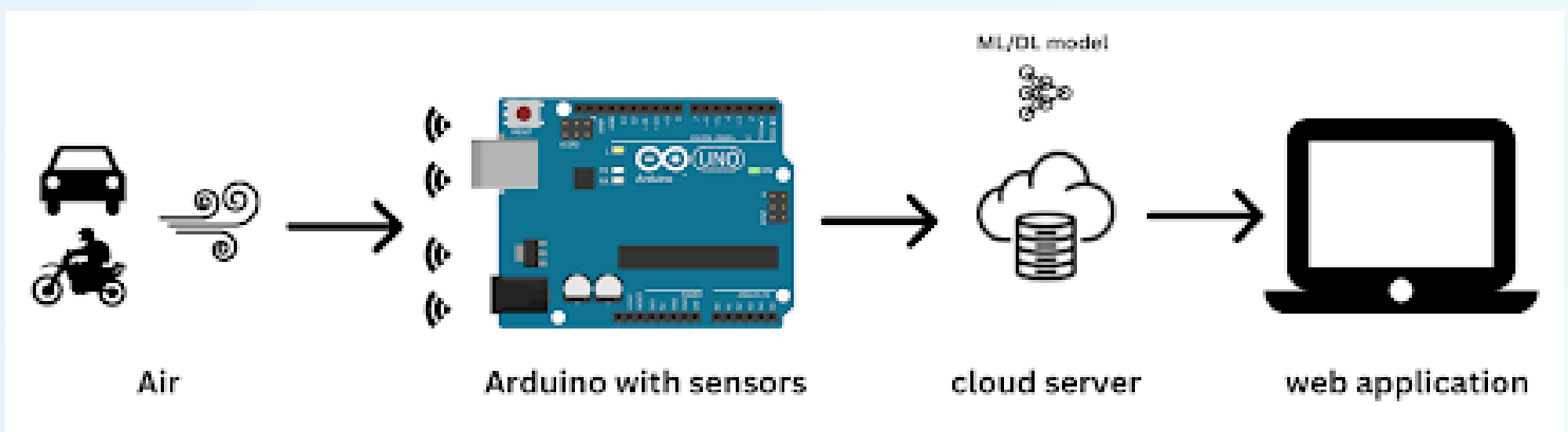
Methodology

1. Monitoring
An IoT device is built using Arduino as the microcontroller. We have used MQ135 Air Quality sensor, MQ131 Ozone sensor, MQ7 Carbon Monoxide sensor, and PM2.5 dust sensor. These sensors will measure the current concentrations of the various pollutants and will output the current AQI. The values of the concentrations of the gases is stored in a database, which is used to forecast the future levels of AQI.

2. Forecasting
Using the data collected in the previous module, an ML model is trained to predict the future levels of AQI. Based on our research and literature survey, the AutoRegression model provided the best results.

3. Controlling
AQI is categorized into 6 categories based on the value. Depending on the category of the current AQI level, suggestions are provided to improve the category to 'Good'.