INTERNET OF THINGS AND APPLICATION

YAVen-Alat(Smart City)

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WHAT IS INTERNET OF THINGS?

- The Internet of Things (IoT) describes the network of physical objects—“things”—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.
- These devices range from ordinary household objects to sophisticated industrial tools. With more than 7 billion connected IoT devices today, experts are expecting this number to grow to 10 billion by 2020 and 22 billion by 2025.

WHAT IS THIS INNOVATION?

- This invention mainly aims at controlling the disturbances created by young generations. As per the government norms, it is not allowed to make the noise of more than some specified decibels after a specified time to help decrease the level of noise pollution of the country. So whenever this device detects any such disturbances in the locality, it will automatically alert authorities along with the location to handle the situation immediately.
- The device also has a speed tracking sensor to continuously monitor the speed of passing by vehicles through the street light. The device will alert the authorities of any over speeding vehicle along with its location. The authorities then can trace the vehicle with the help of an image captured by an embedded camera inside the device.
- This device also aims at the concept of controlling air quality and smart street light concept and will run on renewable energy resources. Apart from using renewable energy resources, the device will further save energy as it will dim the light unless it detects any warm body with help of its PIR sensor. Further, the LDR module of the invention will turn off the light in the presence of daylight.

PREVIOUS INVENTION

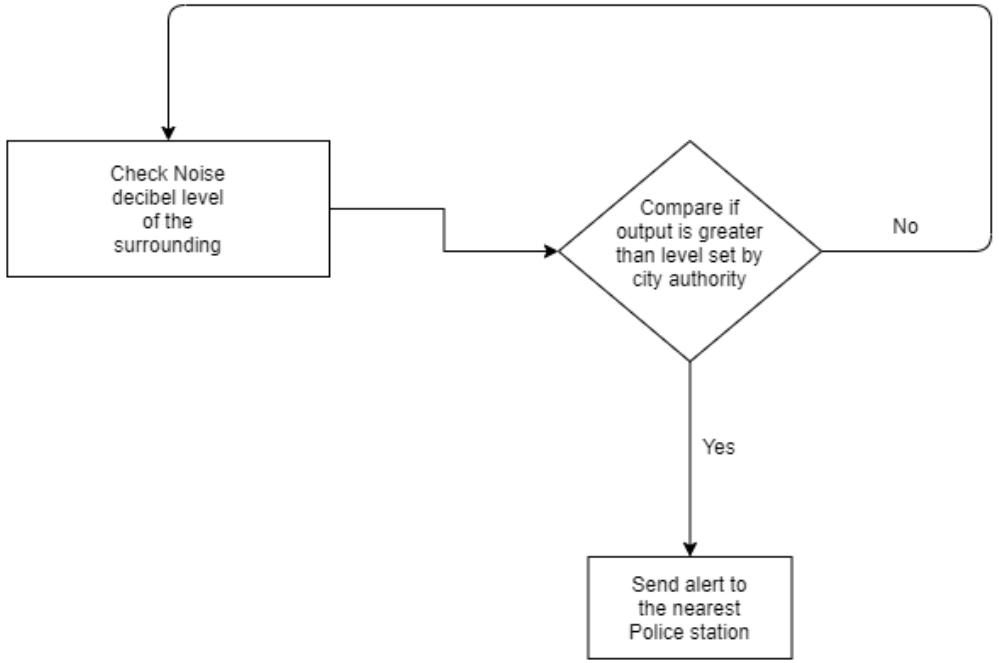
- All the ideas which are already implemented are part of the invention of smart city and all the devices are implemented individually. Till now there is no such device in which all the given modules i.e smart street lights, air quality detection, detecting and controlling of noise pollution are embedded into a single device.
- There is no such invention that can directly report to the government authorities where there is any case of unnecessary noise pollution that may cause disturbance inside any locality.
- The invention will be embedded inside a street light so that it could track every illegal activity of the locality for a safe and secure environment in the society.

MODULES AND FUNCTIONALITIES

- Raspberry-PI to integrate all the components on a single platform.
- Sound detection sensor module for Detection of the intensity of sound.
- Speed sensor for tracking the Overspeed.
- MQ135 for measuring the air quality index in that area.
- Camera module for capturing all the activities.
- LDR(Light Dependent Resistance) for street lights.
- PIR(Passive Infrared Sensor) to detect the movement of warm bodies on the street.
- GPS module for alerting the authorities along with the location.

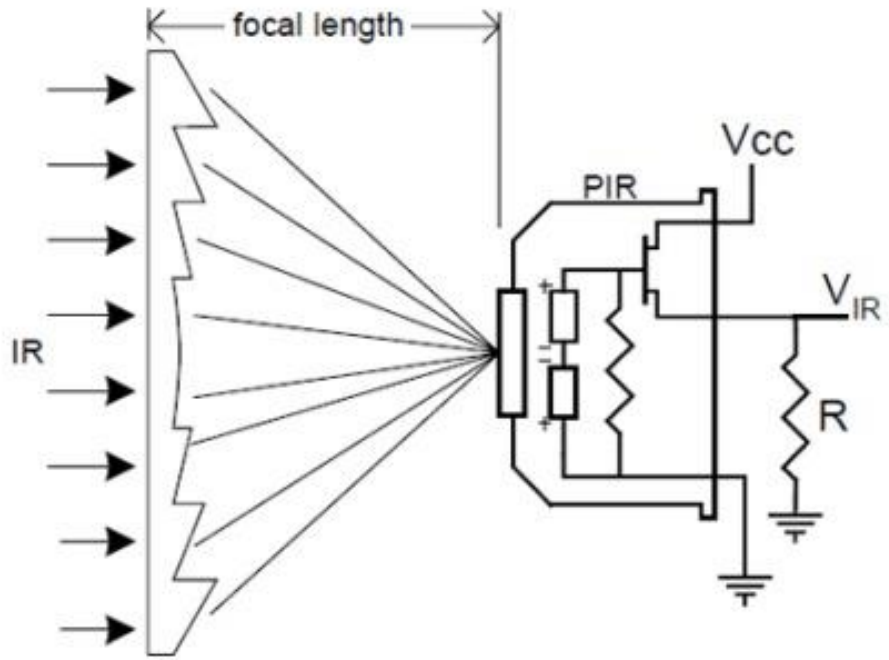
SOUND SENSOR(LM386)

- The **LM386** is a low power **audio** frequency **amplifier** which is very commonly used in small **audio amplifiers**.
- The IC consumes very less power and hence can be operated using a 9V battery easily. It can easily drive an 8-ohm speaker with a variable gain of 20 to200. Volume control and gain control is also possible in this.

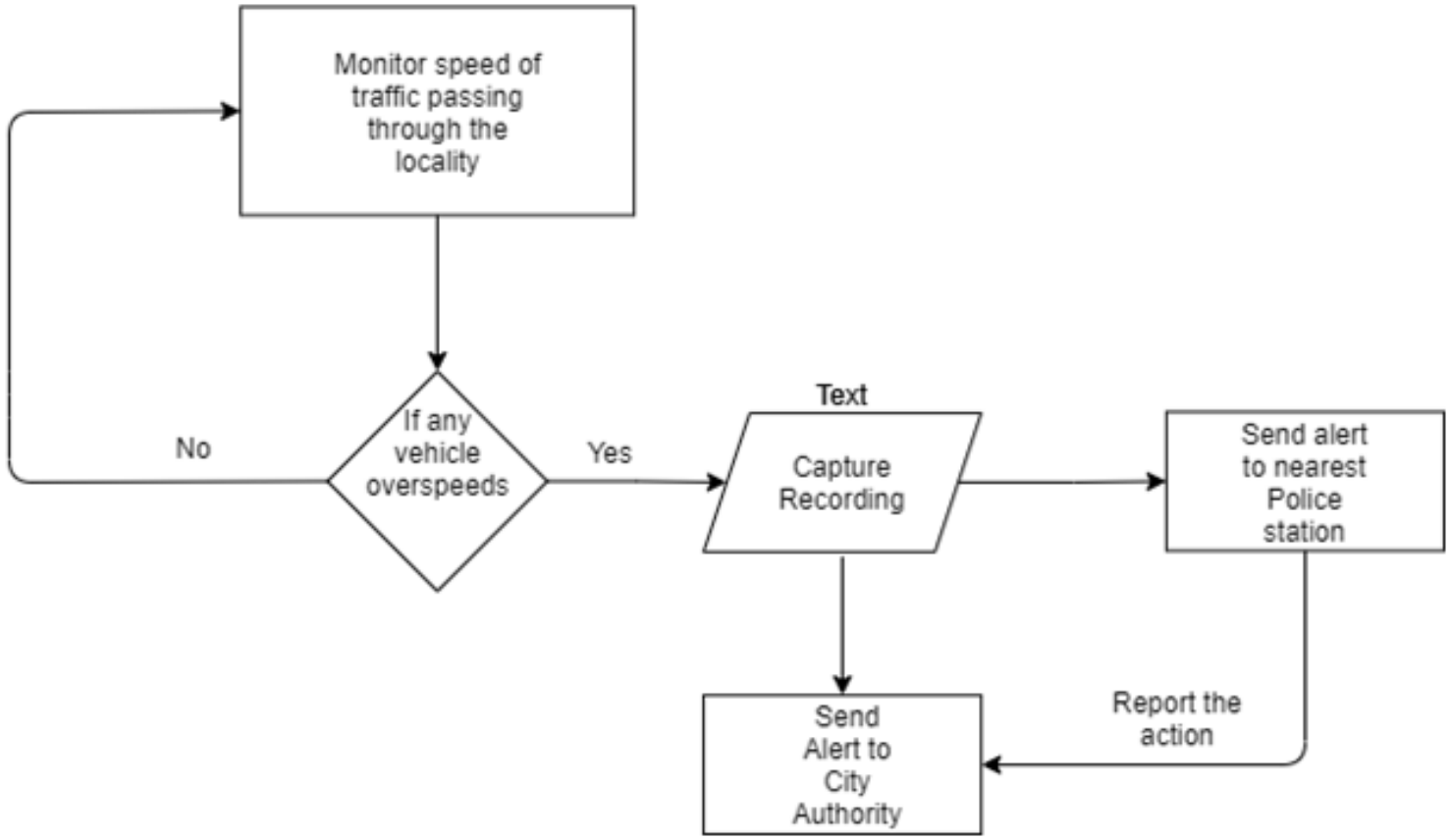


SPEED SENSOR

- IR sensors are the basic principle behind this function. The prototype used two IR sensors. Each one of them then detects the motion/presence of ant object near them.
- The sensor notifies the device whenever it detects any object and records the time stamp for the same. Then the second IR sensor wakes up and detects the body for it to come into its range.
- The sensor again records the time stamp when it detects the object after it passes through first sensor. The devices calculates the time difference between the two time stamps and uses the pre-known distance between both the sensors to accurately calculate the speed of the object passed.

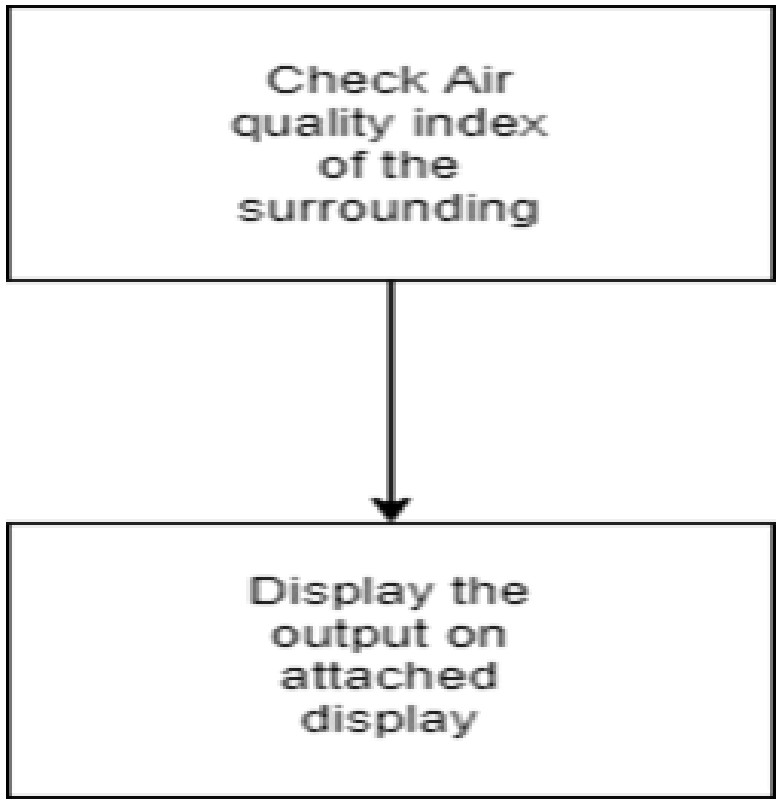


ACCIDENT CONTROL DATA FLOW DIAGRAM



MQ135(AIR QUALITY MONITORING)

- It is used to measure the air quality of an area which will be used in this invention to make people aware of their surroundings and help them understand the need to take proper care of the environment.

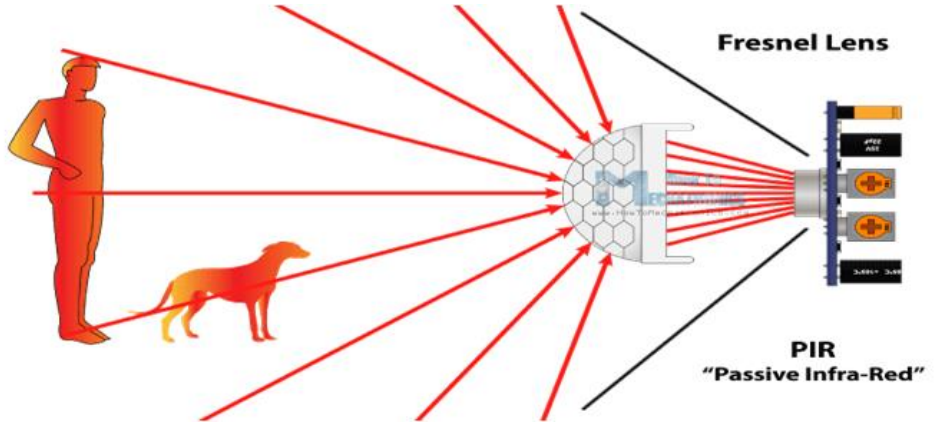


LDR(LIGHT DEPENDENT RESISTOR)

- The **working** principle of an **LDR** is photoconductivity, which is nothing but an optical phenomenon. When the light is absorbed by the material then the conductivity of the material enhances. When the light falls on the **LDR**, then the electrons in the valence band of the material are eager to the conduction band.
- It is used to detect the presence of light in the surrounding so that when the sunsets and it becomes dark, the device could give a signal to switch on the street lights and viceversa when there is sunrise so that no human dependency is required.

PASSIVE INFRARED SENSOR(PIR)

- PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range.
- They are small, inexpensive, low-power, easy to use and don't wear out.
- For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors.



GPS MODULE

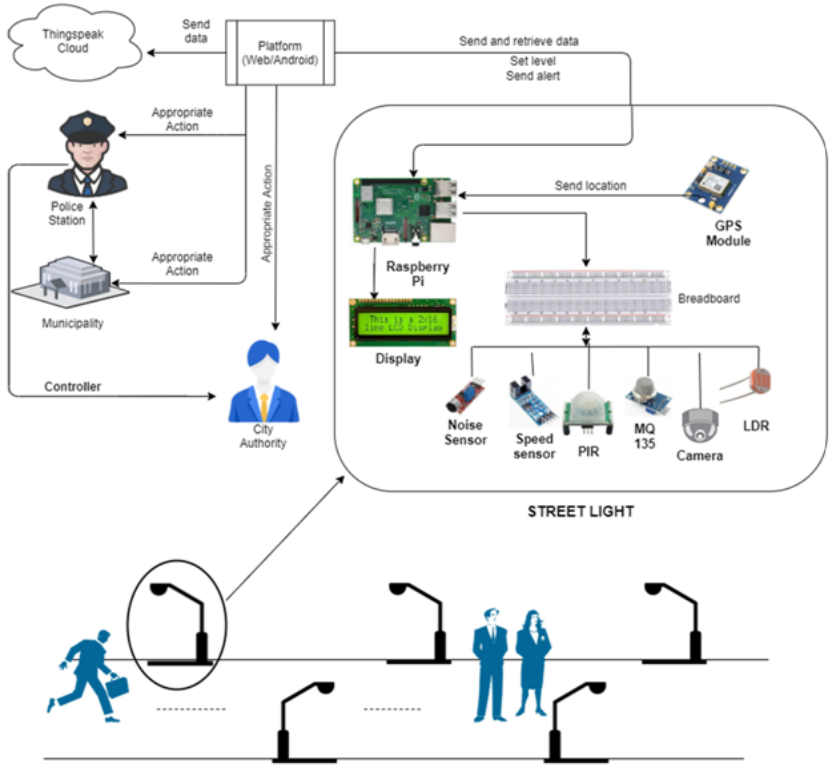
- GPS stands for Global Positioning System by which anyone can always obtain the position information anywhere in the world.
- It is used to determine the exact location of the device so that authorities can easily trace the location.

PROPOSED FRAMEWORK

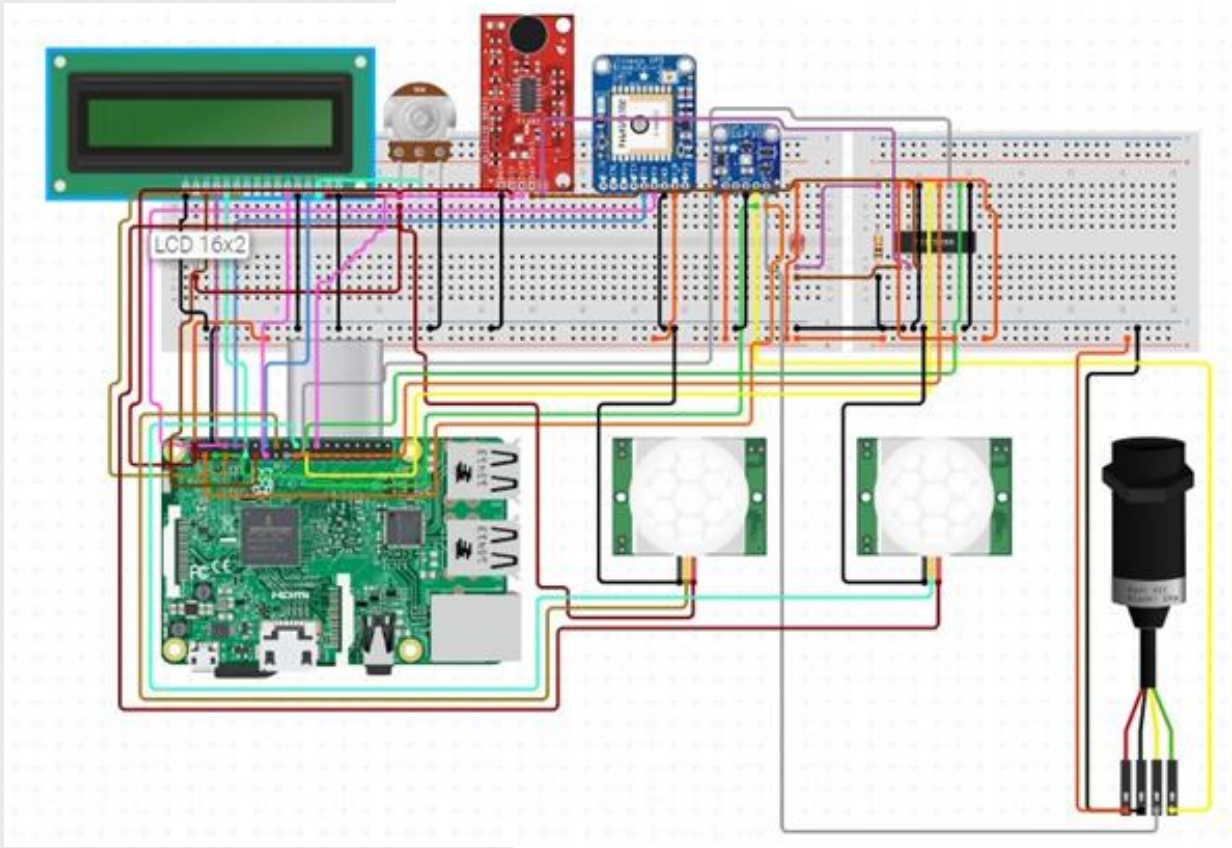
a. The above figure shows the layout of the invention. In the following section, the invention has been described in detail with help of diagrams. Our diagram consists of some original images of modules that will be implemented in the original invention. The invention is based on street lights of smart areas. It will be implanted in street lights to monitor any noise pollution and other mischievous activities and inform respective government officials and help them to take any action against it. It will also help control accidental risk by taking appropriate action.

b. Our invention will be connected with the Thingspeak cloud facility, which can be accessed by the city authority with help of a Platform(web/Android application). The cloud data will also be accessible to Police and municipalities for taking immediate action, who further will also be controlled/managed by the city authority. Any information from the invention will be sent or retrieved to the cloud based on the level set by the city authority. An alert will be sent to all those having access to the cloud whenever the level exceeds the level set/permitted by them. The noise level permitted will be set based on the location of the installation of the invention. The voltage supplied to the lights will also change depending on the output of the “LDR” and “PIR” modules of the invention.

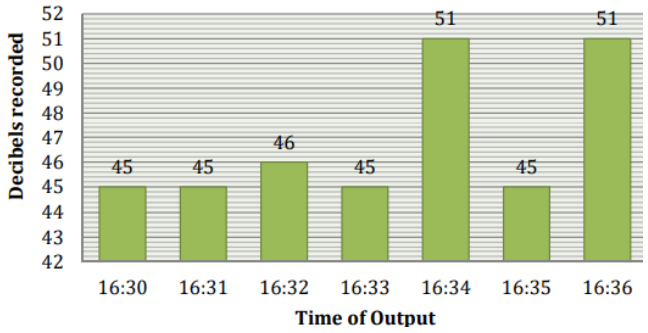
c. The speed sensing module of the invention will help in bringing down the accident ratio of the location where it will be installed by alerting the authorities by detecting any exceed in the limit of speed permitted/allowed by authorities/government.

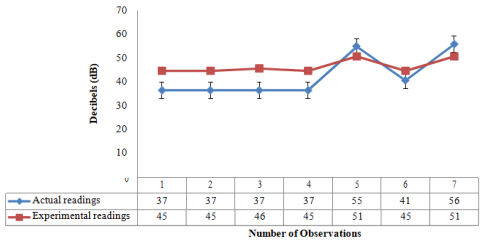


PROPOSED CIRCUIT DIAGRAM



EXPERIMENTAL RESULTS

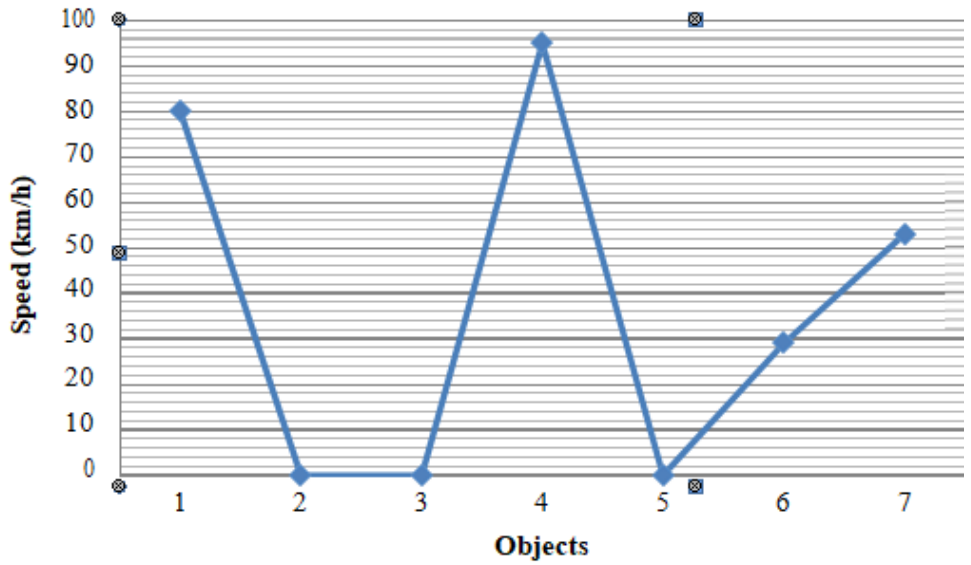




Decibels detected/measured	Serial Monitor output
45	----------
45	----------
46	----------
45	----------
51	Sound Detected
45	----------
51	Sound Detected

- The initial readings of the prototype for the noise sensor (LM386) in a quiet environment during the testing were found to be as follows:
- The above readings were obtained in a closed-door room. The prototype was able to detect the sound when the decibels reached the threshold value and correctly displayed the information on the serial monitor, i.e the cloud database in this case.
- The above graphs are for pictorial representation to understand the output of the prototype. The first graph(Fig 18) is deprived using the experimented output obtained using the prototype. The second graph (Fig 19) is a comparison graph drawn to judge and better understand the effectiveness and accuracy of the prototype. The actual readings mentioned were taken using pre-developed devices best available as per our feasibility. The second graph also tells the effectiveness of the prototype.

CONTD..



Object Detected	Speed tracked(km/h)
Yes	80
No	----------
No	----------
Yes	95
No	----------
Yes	29
Yes	53
No	----------

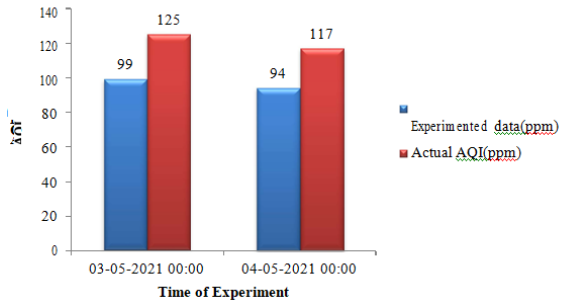
- The tracker used in the prototype gives output based on calculations performed using the data: final_time_to_cross= datetime.strptime(T2, FMT)-datetime.strptime(T1, FMT) Speed=Fixed_Distance/final_time_to_cross. The data provided by the two IR sensors are used to calculate the speed with help of the preassigned value of Fixed_Distance, which indicates the distance between both the sensors. The gap between these sensors for the invention is assumed to be 5 meters, but the prototype assumes this value as 10 cm instead of its original distance to calculate the speed of the object. Hence, the scaling of the distance needs to be mentioned correctly for accurate and precise results.

CONTD..

Time of Experiment	Experimented data(ppm)	Actual AQI(ppm)
03/05/2021 11:00:16	99	125
04/05/2021 10:54:41	94	117

Renukut air quality index (AQI) forecast

Day	Pollution level	Wind
Monday, May 3	Unhealthy for Sensitive Groups 125 US AQI	13.4 mp/h
Tuesday, May 4	Unhealthy for Sensitive Groups 117 US AQI	11.2 mp/h



- All the results drawn above were derived from the model. The experiment was conducted several times in 5 days and the best precise and accurate records were taken into consideration. The tables drawn above and charts plotted were based on the results of the best and close to the accurate records calculated among all other data. The pictorial representation will surely help to better explain the outcome and experimental results of the model/prototype. The data can vary depending on the connection and environment of the place where the experiment is to be conducted. The above data and charts only give a basic idea of the type of results the model can give.


Thank you