Hazardous Gas Sensing System using IoT

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Abstract- Toxic gases are the gases that are harmful to living things.An air pollutant is a material uncertain that can have to go against effects on humans and the general living conditions. Earth's atmosphere consists of an energetic system of natural gases necessary to sustain life. While the planet has protective processes to soak up small amounts of air pollutants, high levels of gases can cause ozone using everything up in the atmosphere and problems for the living. The main sources of air pollutant are fuel burning in factories , coal mining, emissions from automobiles, dump yards etc. While these gases are not only adding to air pollution but also represents the most sources of the worldwide problem.It also causes major risk to health. Here we used gas sensors with Linkit Smart 7688 Duo board. It connects with a cayenne app. If it goes above the level of the permissible limit of the gases it triggers alert messages to the people. so that people can get awareness of toxic gases present in that area.

Keywords- TOXIC GASES, LINKIT SMART 7688 DUO, GAS SENSORS, MQTT, IOT.

I. INTRODUCTION

Air pollution is a gas released in a big enough amount to cause damage to   the health of people or other animals, kill plants etc. Pollution can be classified into primary and secondary.
Forest fires, erupting volcanoes, gases released by radioactive decay of rocks inside Earth are called natural air pollution or primary pollution.
Carbon monoxide gas from automobiles, smoke released from factories etc comes under secondary pollution.
The transportation is the major sector of emitting polluting compounds in the world. And it also leads to the greenhouse effect. Through burning fuel motor vehicles, trucks give off a range of health-damaging pollutants, such as nitrogen dioxide, carbon monoxide and Volatile Organic Compounds (VOCs).
Industries which produce aluminium, steel, refine petroleum, cement etc releases more harmful pollutants into the atmosphere.
The WHO confirms that more Indian cities are endangered to air pollution.Because of the high level of particulate matter less than 2.5 micron size. Out of the 20 most polluted cities in the world, the top 14 are in India.
In India, nearly 1.3 million death occur every year out of which 68 people die due to air pollution which is the second highest after the Western Pacific region. According to WHO, air pollution is also responsible for non-communicable diseases, causing one- quarter of adult death to heart disease,25 % for the heart stroke, 43% for pulmonary diseases and 29% for lung cancer. Exposure of higher concentration carbon monoxide leads the old age people to heart disease.

This has serious effects for India where disease burden is increasing.
This project is created to get knowledge about the toxic gases present in the atmosphere easily such that they can be cautious about it.

II. HARDWARE

A. LINKIT SMART 7688 DUO

Linkit Smart 7688 Duo is a co-design product of Seeed Studio and MediaTek.

It is an open development board compatible with Arduino Yun sketches, based on the OpenWrt Linux distribution, MT7688, and ATmega32u4.The board is designed to make working with IOT applications, The board offers you the memory and we can record the video processing. It also supports Python, Node.js and   C programming. It combines the knowledge in open hardware and industry- leading reference designs for IoT devices to create this powerful development board.

Features

- Supports Wi-Fi, USB host and SD cards
- Pin-out for MT7688AN: Ethernet, USB Host, and UART
- Pin-out for on-board MCU: ADC, PWM, I2C, SPI, and UART

B. MQ 2

It is used for detecting gas leakage, CH4, Alcohol, Smoke and Propane. The sensitivity of the sensor can be adjusted by the potentiometer.

Features

● Wide detecting scope
● Fast response and High sensitivity
● Stable and long life
● Simple drive circuit

Applications

● Household
● Industries

C. MQ 3

It is used for detecting the alcohol concentration on your breath. The Sensor provides an analog resistive output based on alcohol concentration.

Features

● High sensitivity to alcohol and small sensitivity to Benzine.
● Fast response and High sensitivity
● Stable and long life
● Simple drive circuit

Applications
● They are suitable for alcohol checker,
● Breathalyser.

D. MQ 7

It is used for detecting carbon monoxide concentrations in the air. It can detect from 20 ppm to 2000 ppm.

Features
● High sensitivity to carbon monoxide
● Stable and long

Applications
● Industries
● Cars

III.   SOFTWARE

A. MQTT

MQTT was first developed for the low bandwidth, high latency data links. Used in the oil and gas industry. Now it is being used many applications like Facebook Messenger application, Amazon web services etc overall MQTT is being the best protocol suited for the control system used by industrial organizations.
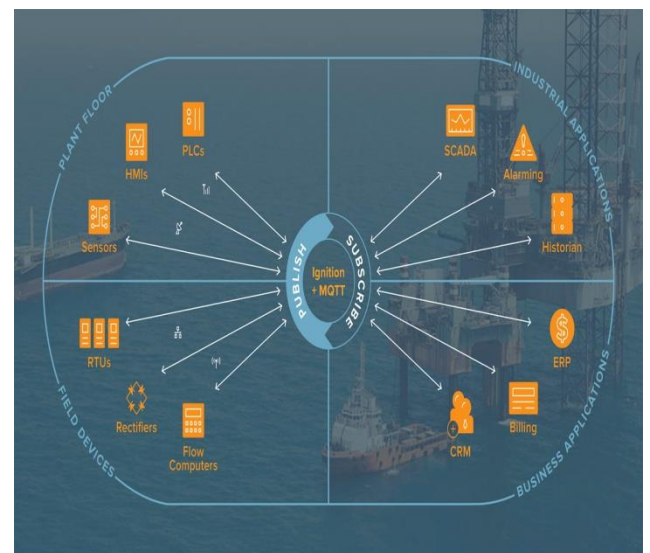
Working
MQTT is a publish/subscribe approved design that allows edge-of-network devices to publish to a broker. Clients connect to this broker, which then mediates exchange between the two devices. Each device can subscribe, or register to the particular topic. When another client publishes a message on a subscribed topic, the broker forwards the message to the client whom that has been subscribed.

MQTT works in both directions and maintains stateful sessions. The lightweightness and doing work well of mqtt makes it possible to importantly increase the amount of data being monitored or controlled.

Advantages

- Distribute information more efficiently
- Increases scalability
- It reduces network bandwidth consumption
- It is suited for remote sensing and control
- It uses the maximum available bandwidth

B. INTERNET OF THINGS(IOT)

IOT is defined as the connection of physical devices around the world to the internet that collects or shares the data.

Working

Devices and objects made with sensors are connected to the IOT platform, which integrates the data from the different devices and applies to share the information with applications built to address specific needs.

This IOT platform can clearly identify exactly what information is useful. This information can be used to detect patterns, make recommendations, and detect possible problems before they happen.

IV.   EXPERIMENTAL SETUP

The Linkit Smart 7688 Duo integrated with MT7688   and ATmega32u4 provides two operation modes IOT Gateway and IOT device mode which the gas sensors are connected to the module.

A.   Toxic gas detection

In the modern society industries, vehicles, coal mining etc releases more number toxic gases into the environment.The exposure to toxic gases results to the ill health to the human beings.

| Parts per million	Effect
50	Recommended Exposure Limit (8 hours time-weighted average concentration)
200	Headache after about 7 hours if resting or after 2 hours' exertion
400	Headache with discomfort with a possibility of collapse after 2 hours at rest or 45 minutes of exertion
1200	Palpitation after 30 minutes at rest or 10 minutes exertion
2000	Unconscious after 30 minutes at rest or 10 minutes exertion

Consequences of exposure and its effects

B.   EXPERIMENTAL RESULTS

If the toxic gases reach above ppm limit, the gas sensors connected to the modules report it to the Cayenne IOT cloud and generates the SMS and EMAIL alerts of toxic gases.
EMAIL

SMS
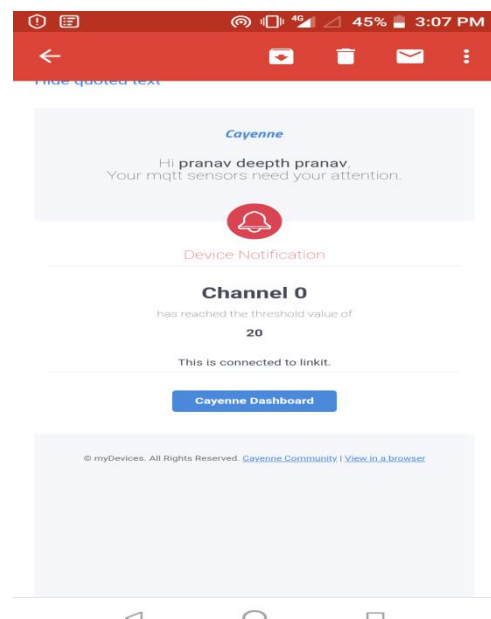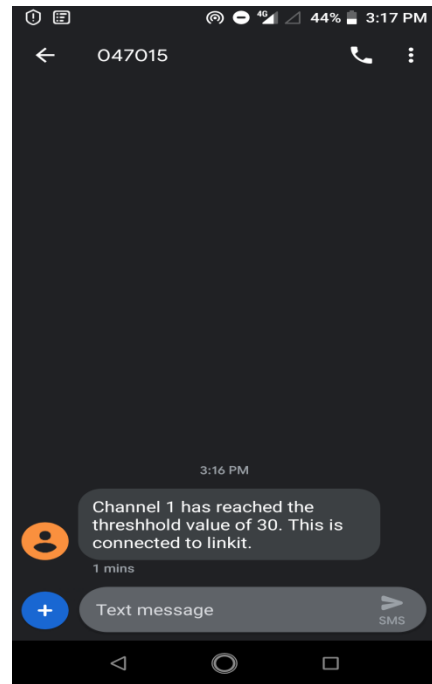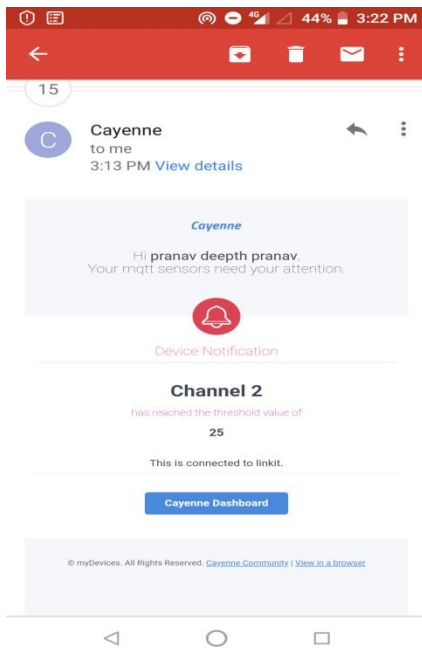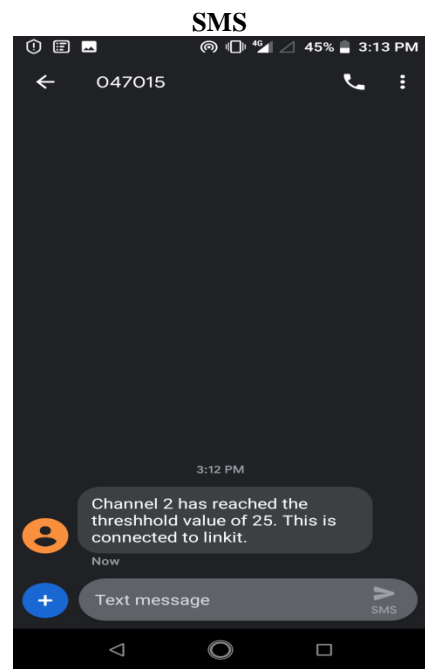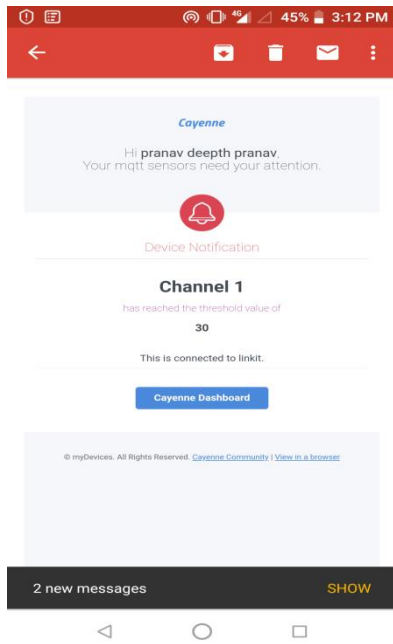
V.   CONCLUSION

The Linkit Smart 7688 Duo board with Gas sensors are placed in the polluted areas such that public can get awareness and be cautious about the toxic gases.

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