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An IOT Based Solution for Determining the CO_2 Emission Level in a Particular Area

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Abstract: ***Internet of things (IOT) is a vision of future internet where "things" are needed in intelligence. These things are interconnected to so many devices, such as sensors and machines. These objects exchange data between them from one device to another and one device to server, via internet without accessing by human. Implement of IOT to measure the level of carbon dioxide in atmosphere by using carbon dioxide sensor. Raspberry PI is one of the device which can use to detect early forest fire using temperature and humidity sensor. The role of carbon dioxide, is very important in environment, if increase of carbon dioxide, causes for global warming and pollution on the earth surface. We can save the earth, by controlling and monitoring and preventing the increase of CO_2 is a big challenge. The carbon dioxide produces in huge quantity in atmosphere, to control at source is primary thing to save earth. The aim of this paper, to collect big amount of data for detecting and preventing the emission of carbon dioxide and store data in server for future analysis. All the data parameters processed with in an interval of time which are recorded in server, selecting these data by the user which are recorded in online. These data are very important for future analysis and review of atmospheric condition of a particular geographical area.***

Keywords: IOT, Co_2, Raspberry PI, Sensors, GPS , Data

I. INTRODUCTION

The increase in the carbon dioxide makes climate change. In last century the earth's surface temperature has continued to increase. National oceanic and atmospheric administration (NOAA) has studied and confirming the raise in temperature on earth surface. Emissions from fossil fuel burning combine with moisture in air, precipitation form that has high acid contents. This will severe form of air pollution that damages trees and other plants life and it also pollutes water and soil. Emission can travel far, acid rain can impact environments worldwide. This effect on global warming to avoid such problems, in nature the pollution monitoring system is very essential. Recent data collecting and analysis of such data are used for pollution control system development. Pollution control developing system focuses as minimize the carbon dioxide emission from various sources such as fossil fuel burring, vehicle exhaust and forest fires. More carbon dioxide in atmosphere makes long period negative effects on ecosystem, human health, water resources, agriculture and forestry. The huge amount of CO2 in atmosphere causes for imbalance of nature. For control of pollution, a system develops with simple flexible and network system is very essential for controlling pollution. This type of system is very essential for maintaining the quality of air in urban population area and fast growth of industrialization area, more increase of automobile vehicles on road and other human activities. [1] Monitoring of atmosphere in continuous mode will help us to know the emission level of carbon dioxide

II. SENSORS AND DEVICES CONNECTED OVER INTERNET

IOT is a paradigm, it is a collection of networks connected to each other through internet. Many devices and sensors are connected over the internet. Devices can be connected with identifying, sensing, networking and processing capabilities that will them to communicate between devices and servers over the internet to achieve some goal. A large number of devices are communicated to wi-fi or Ethernet gate way which is designed in Zigbee hybrid network. All sensors and devices are integrate with cloud computing and IOT [2]. Our paper states that wireless network is opted for to communicating with physically connected sensors and storage systems. This technique used for to implement the pollution control with interaction of users with IOT. [3]

A. Measurement of Carbon Dioxide in Atmosphere in industrial area :

Carbon dioxide sensor help us in real time management of carbon dioxide emissions. This sensor displays large change in carbon dioxide density while industrial revolution take place in a particular area. The rate of carbon dioxide is finding out by placing a sensor at physical environment. That will help to show the carbon dioxide emitted in environment in terms of PPM. The change in carbon dioxide level is known by sensor and sensor is connected with a registered mobile. This data is very much useful semantic to take necessary action to minimize the level of carbon dioxide in atmosphere.

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B. Emission of Carbon Dioxide by Automobiles

The emission of CO_2 from automobile vehicles are green house gases which can cause to climate change [7]. The green house gases are CO_2. The rate of CO_2 produces is directly connected to the amount of fuel consumption and which type of fuel used. The road transport department depends on petroleum products. The increase in the level of CO_2 emission on green vehicle guide (GVG) means vehicle produces more CO_2 .This leads to high warming up of earth surface

C. Carbon Dioxide Emission from Forest Fire

Fire has act as a key player in global CO_2 cycle. Some of the studies show that CO_2 emission from fires can be as high as half of the total emission from human fossil fuel use. In 1997 the emission of CO_2 from fires across Indonesia emitted between 13 to 40% of the size of global human fossil fuel emission. The sensor nodes are placed at forest in different area. These nodes are networked each other. These sensors has placed to detect CO_2 gas generated by forest fire will be measured by sensors. Discovery of early fire is very useful to take necessary action, fire brigades will fight against the fire in the affected area. Controlling of forest fire helps us to minimize the emission of CO_2 . This information is very useful to fire brigades to know the fire cover area and how it spreads in forest and how to curb the fire in forest area..

III. CONTROLLING AND MONITORING OF CO_2 EMISSIONS IN REALTIME

Carbon Dioxide shares huge quantity in green house gases [4]. The main intension of this system is to minimize the global warming, by maintaining and preventing the CO2 emission from vehicles and industries in real time system using IOT[5]. IOT extends to too many sensors and devices are communicated with internet. These devices are every day communicate and interact with eternal atmosphere by using embedded technology. In this system we can recognize the Carbon Dioxide value in many places in atmosphere. These values are stored in the system. This system provides the information about vehicles which existing in that place and industries that exists in a particular area for calculating for CO_2 emission. [6]. This system is very high expansive. With the use of CO_2 sensor,we can find the variations in CO_2 in vehicle emission and in industry area. The sensors are communicated with internet by using Raspberry PI. The readings of CO_2 level in many places are saved in database of cloud server. The web portal and corresponding application accessed by user interface side. GSM modem transfer an intimation message to different phones those are communicated with device This web portal broadcasts present atmospheric condition. Suppose if the application uses did not recognize the message or user not attend the call, an alert system, Buzzer will rings.

IV. SYSTEM DESIGN AND IMPLEMENTATION

A. Design of Architecture

The following figure that the architecture of carbon dioxide management and discovery of fire in forest area, by using strong alert message, provided by smart IOT based system. The carbon dioxide discharges from industries, Automobile vehicles and forest fires are sensed by using Raspberry PI. This Raspberry PI, which is fabricated on bread board, is connected to cloud server mode. Raspberry PI board is remotely connected to cloud server. Raspberry PI is programmable by using python code. Raspberry PI having secured and strong connection with other devices over the internet. The sending data was verified with certain range of fixed value. If the receiving data is higher than the fixed range of value, it will send an alert message through SMS.

The major equipments are required for IOT based carbon dioxide maintaining by using strong alert technique.

1) Carbon dioxide sensor
2) Raspberry PI
3) GMS module
4) Cloud server

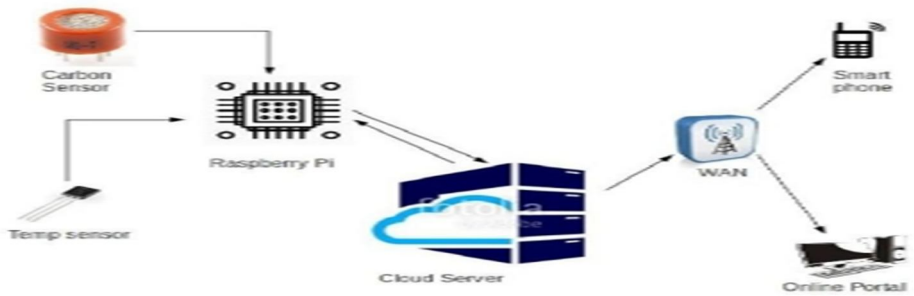

Fig. 1 Details of IOT based carbon dioxide maintaining by using alert sound

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a) *MG811 Carbon Dioxide Sensor and Raspberry PI :* MG811 is suitable for sensing concentration in air with its highly sensitiveness nature. MG811 can detect carbon dioxide gas concentration at any place from 10 to 2000 PPM. MG811 sensor fabricated with circuit board and which is able to functioning. Circuitry enable to work out of box. MG811 sensor is a small special sensor. Since only 6V DC is sufficient to function properly.

Fig. 2 Model of Raspberry PI

Raspberry PI is a low cost device. It Designs with single board computer and available in small size. It has 64-bit quad-core CPU, ARM Cortex A53 1.4 GHz and 1GB memory, an additional memory supplies by using a micro SD card. It has used in many applications and the next generation of Raspberry PI model B+, it has 4 USB ports, HDM1 ports used to connect to a display. It runs with python program language. Ethernet card provided to this device, to store the sensed data.

b) *GSM Modem and Cloud Server*

Fig. 3 GSM

GSM modem uses to transmitting and receiving the message. GSM modem could be interfaced with PC or microcontroller. GSM modem receives the signals from all the sensors, which are integrated with an RPI, if any drastic increase in value of sensor, it will passes an alert intimation to forest department

Cloud servers run on a cloud computing platform over the internet [5]. It is a virtual server. A web hosting service is allowed to users to access their web site via internet. Cloud servers landed and access and delivered same functionalities of a typical server. But cloud servers are accessed in remote region

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V. CONCLUSIONS

IOT equipped with CO_2 monitoring system through sensors and Raspberry PI, it allows determining the carbon dioxide emission level in a particular area. It will manage and controlled the pollution produced of carbon dioxide from vehicles, industries and forest fire using Raspberry PI which is embedded into cloud server. A continues monitor of carbon dioxide emission rate in so many places in the city or forest area and identify the heavy polluted place. Present data is useful to take control measures to reduce the emission rate.

A system also implement for detection of forest fire. Collected data by temperature and humidity sensors which are placing in various spots at forest area. Trees burning in the forest, it could lead to increase the CO_2contents in atmosphere which causes for global warming. The data collected by sensors passed to Raspberry PI, this device connected with sensors to store it in a cloud server. Raspberry PI is programmed with python, which sends messages to server. Server gathers all the messages and stores to predefined data base table for future analysis. A strong alert sound system developed, that send alert sounds to the authorities through SMS.

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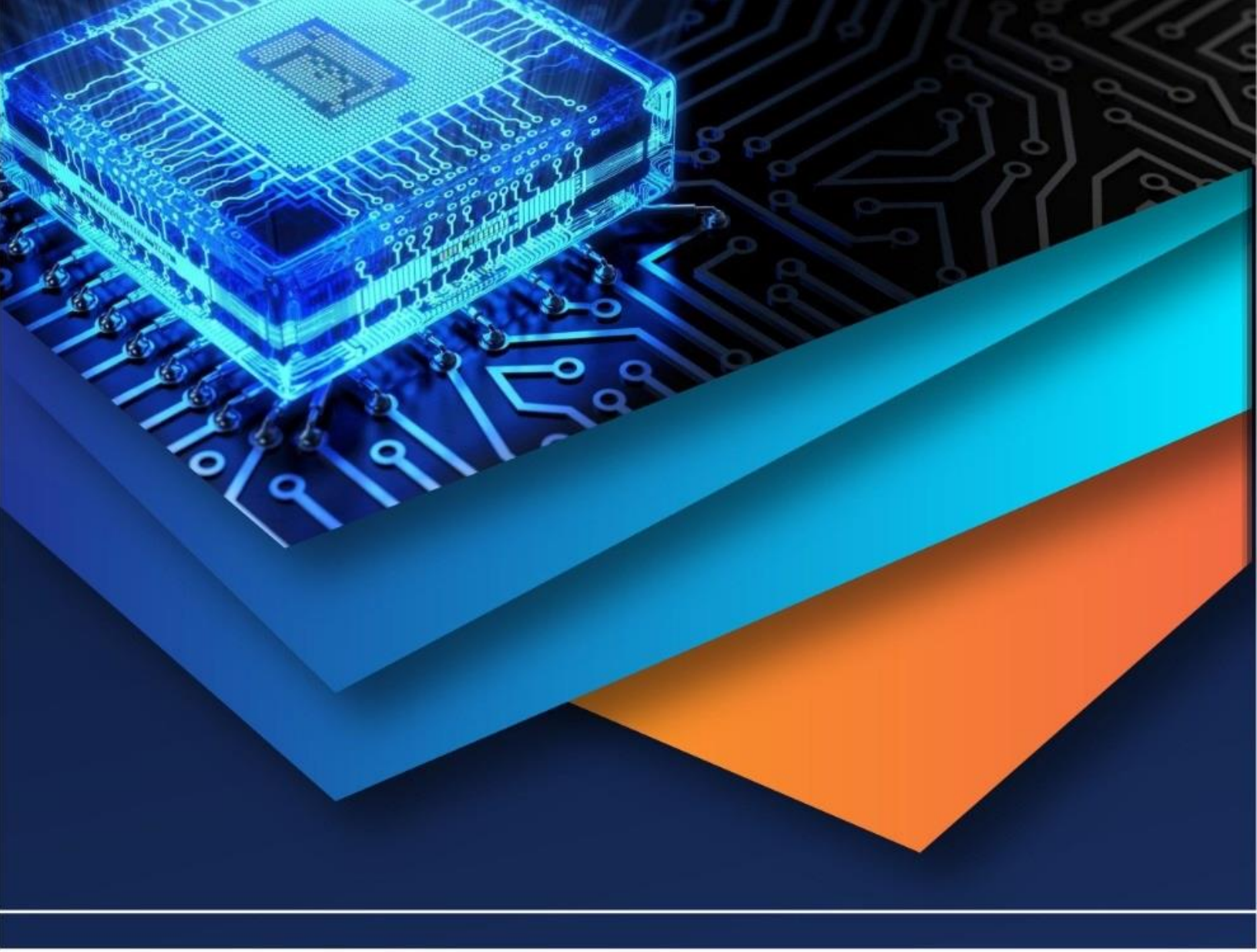

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