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Surveillance of Environment using Node Mcu Based on IoT

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Abstract: ***This paper proposes a way to build a cost-effective environmental monitoring system using Node MCU. The surroundings in which human beings, animals or plants live is called Environment. Detection of environment parameters like temperature, humidity, carbon dioxide and others, these factors play a significant role, as it is directly linked to health conditions of people in the environment. For the design of this hardware we use an ESP8266 Wi-Fi chip enabled microcontroller Node MCU, which is the hardware used to measure the temperature, humidity, pulse rate of the human beings and air pollutants like co_2. These parameters are monitored continuously around the user's environment and transfers the Data to Things Board Server, which is one of the best platforms to display and maintain the data by ESP8266 WIFI module from Node MCU.***

Index Terms: ***Environment, Pollutants, Monitor, ESP8266, Node MCU.***

I. INTRODUCTION

The day-to-day environment has been changing and has become more degradable, it has various effects on people and biological life. There are many gases effecting the atmosphere in different ways by causing Global Warming. such harmful gases are dangerous to human health, plants and animals.
The most common air pollutants are caused by Carbon Dioxide (CO_X), Nitrogen Oxides (NO_X), Sulfur Oxide (SO_X). The levels of CO_2 are increasing in the environment, it is described as the worst climatic factor. A billion of metric tons of CO_X are emitted from vehicles, not only CO_X, there are many gases effecting the environment like NOx and SO_X. The MQ135 gas sensor will help in above mentioned polluting gases, so we use this sensor in detecting the different harmful gases in the environment. The amount of water vapour which is present in the atmosphere is known as humidity. The right amount of humidity would be around 44 – 52 percent, which is half the atmospheres capacity, if the level is more than 70 percent one may feel exhausted. If the level rises, then there is a greater negative effect on Global warming. In Environment, temperature is one of the most important physical factors, to keep it simple we can say that, the hotter it gets the more severe it impacts on people and the environment. The DHT11 is used to measure humidity and temperature, which is simple yet powerful sensor to measure the surrounding air by giving out the digital signal on the data pin. The pulse reflects the speed of the heart pumping, this measurement is very useful in understanding the well begin of a person, It's a measure of health. Abnormal changes in pulse rate leads to various Cardiovascular problems. The flow of blood volume is decided by rate of heart pulse. So, the Pulse sensor can help in measuring the correct heart rate. These air pollutant parameters are measured by using Sensors with Node MCU. Node MCU is a tiny single board computer used for electronic projects, it has capability to interact with external world and widely used in major digital projects. It converts real time data into digital values through sensors. The data which is obtained from sensors through NODEMCU is transferred to the Cloud by using ESP8266 module, which hosts an application in the cloud by offloading all WFI networking functions from another application processor.

1.1 DESCRIPTION OF NODE MCU

Node MCU is an open source LUA based firmware created for ESP8266 WIFI chip. By exploring convenience with ESP8266 chip, Node MCU firmware goes with ESP8266 Development board/unit for example Node MCU Development board. Since Node MCU is open source organize, their hardware setup is open for fabrication. Node MCU board contains ESP8266 WIFI enabled chip. Node MCU board has features of Arduino like Analog (for example A0) and Digital (D0-D8) sticks on its board. It supports successive correspondence traditions for example UART, SPI, I2C, etc. Using such consecutive traditions. interface it with sequential gadgets like I2C empowered LCD show, Magnetometer HMC5883, MPU-6050 Gyro meter, Accelerometer, RTC chips, GPS modules, contact screen shows, SD cards and so forth.

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Node MCU Development board is incorporated with WIFI capacity, basic stick, automated pins and consecutive correspondence traditions. We can make more similarly applications on Node MCU.

II. SYSTEM MODEL

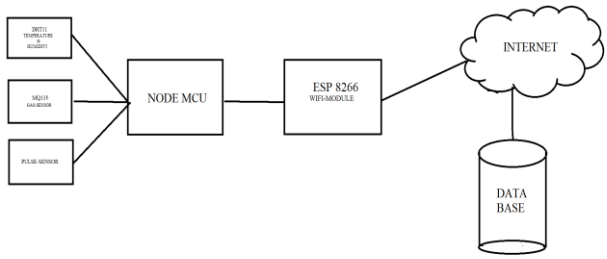


Figure 1. Block diagram about Surveillance of environment using Node MCU

The Figure 1, explains the Architecture of the System, there are mainly three Sensors; (i) The DHT11 sensor, which is responsible for detecting the Temperature and Humidity from the Physical Environment. (ii) The MQ135, detects the CO_2 levels from the Environment around the User surroundings and then (iii) the Pulse Sensor, calculates the Pulse Rate of the User. Now, the Data which is detected and calculated will be sent to the Node MCU for further Processing of the Data obtained. The WIFI Module [ESP8266], which is present in the Node MCU, will transfer the Data directly to the Things Board Server, which is an open-source platform for Data Management/Collection/Processing. The processed Data can be easily accessed by the User from the Things Board server and take the Preventive Measures in improving the General Health Conditions of a person.

III. PROPOSED METHODOLOGY

3.1 Dht11:

DHT11 is a digital temperature and humidity sensor. It contains humidity and temperature sensor that are calibrate on digital signal output. The product is designed to meet high reliability and long-term stability. We can use this sensor where ever temperature and humidity measurements are required. Example; Air conditioners, whether stations, medical fields etc. The DHT11 is user friendly as it consumes low power and for long distance transmission. It creates adjusted advanced yield and it interfaces with any microcontroller like Arduino, Raspberry Pi, Node MCU and so on and get immediate outcomes. The DHT11 is a moisture holding substrate with the cathodes connected to the surface and it records relative moistness by estimating the electrical obstruction between two anodes. It is coordinated with a high performance 8-bit microcontroller. DHT11 Sensor can measure a humidity value in the range of 20 – 90% of Relative Humidity (RH) and a temperature in the range of 0 – 50^0C.

Figure 2. Dht11 Sensor

3.2 Heart Pulse Sensor:

Heart Beat can be estimated dependent on optical power variety as light is absorbed or scattered during its path through the blood as the heart pulse changes. The essential heartbeat sensor comprises of a light radiating diode and a finder like a light identifying resistor or a photodiode. The heart beat pulses makes a variety in the stream of blood diverse areas of the body. At the point when a tissue is lit up with the light source, it mirrors a finger tissue and it transmits the pulse record. The measure of light consumed relies upon the blood volume in that tissue and the reflected light is gotten by the light locator.The locator yield is in type of electrical flag and is relative to the heart beat rate. The module utilizes an infrared drove (IR) and a photo transistor to identify the beat of the finger and at whatever point a heartbeat is recognized, red drove flashes. There will be driven on the light side of the finger and a photo transistor on the opposite side of the finger. The obstruction of the phot resistor will change when the beats will change.

Figure 3. Pulse Sensor

3.3 Mq135:

Air quality sensor for detecting a hazardous gas that is present in our surroundings. The air quality sensor detects the NH3, NOx, Alcohol, Benzene, Smoke, CO2 and other harmful gases. MQ135 gas sensor has high reactivity to Ammonia, Sulphide and Benzene steam. it is suitable for monitoring Air quality applications with low cost. The gas sensor layer of the sensor unit is made up of Tin dioxide (SnO2); it has lower conductivity compare to clean air and due to air pollution, the conductivity is increased. The air quality sensor has a small potentiometer that permits the adjustment of the load resistance and the resistance values of MQ-135 is varied along with the gases and their concentration. So, when using this MQ-135 the sensitivity should be adjusted along which is very important. The collected data through this sensor is send and further processed by the Node MCU.

Figure 4. MQ135 Sensor

3.4 Things Board:

Things Board is an open-source IoT arrange that enables quick improvement, organization and scaling of IoT adventures. We will probably give the out-of-the-crate IoT cloud or on-premises course of action that will engage server-side establishment for your IoT applications With Things Board. We can arrange gadgets, assets, clients and describe relations between them by assembling the picture data from devices and resources. Separate moving toward telemetry and trigger alarms with complex event taking care of Control your devices using remote procedure calls (RPC). Manufacture work procedures rely upon gadgets life-cycle event, REST API occasion, RPC requests the Structure dynamic and the responsive dashboards are present in device or resource telemetry and bits of understanding the data to the clients which Empowers the usage case features using flexible rule chains, also it passes the Drive gadget data to various systems.

Things board is intended to be on a level plane versatile stage, It is built by open-source technology. Fault tolerant no single-purpose of-failure, each node in the cluster is indistinguishable. Robust and Efficient, single server node can deal with millions of devices gadgets relying upon usage. It's quite adaptable, addition of new functionalities is simple with adjustable gadgets and engine nodes, it never loses your information.

3.5 MQTT Protocol:

In Things board, the platform supports multiple protocols like HTTP, MQTT, CoAP etc. But, with respect to our project, we need to send the data continuously from device to things board. So, we use MQTT over HTTP in order to use bandwidth efficiently and low power consumption.
At the core of utilizing MQTT as a correspondence road is the topic. It's a strikingly straightforward thought not one of a kind to MQTT nonetheless, the MQTT convention use the intensity of this pleasantly. A theme certainly achieves a few assignments, above all guaranteeing that a message is conveyed to the right. audience members. MQTT regards a subject as a document way. When thinking about a topic as a straight forward correspondence channel, the way application can turn out to be amazing.

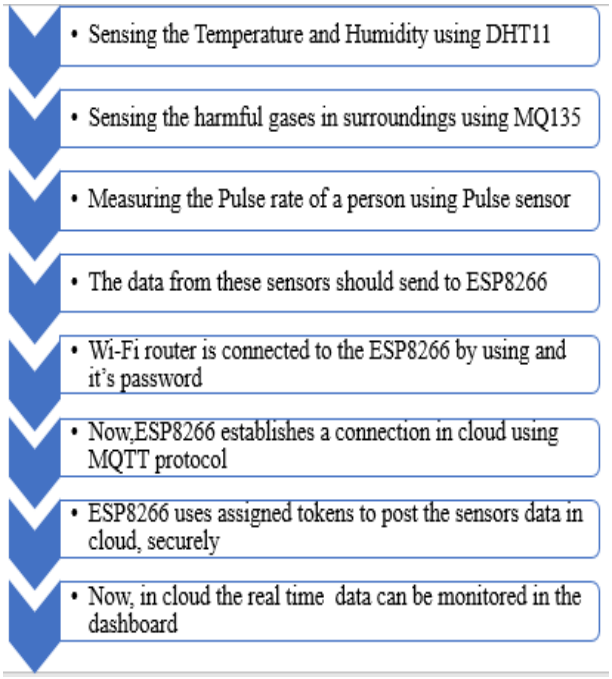
3.6 Software implementation:

Arduino IDE, The Integrated Development Environment, where its software is coded in C language including from header files to sensors and it also utilized in programming ESP8266. The IDE supports in writing and compiling the firmware[code] and then upload to the ESP8266 flash memory, it interacts with the cloud platform by the program which contains header file. In Arduino IDE, the prototypes run by library files which are extracted from the library folder.

3.7 Cloud Platform:

Primarily, both the sensors and the ESP8266 are unified with the cloud platform, then the Things Board Server assigns a token for each devices or sensor variable which provides a convenient way to access the real time data.

IV. FLOW STEPS:



V. SIMULATION/EXPERIMENTAL RESULTS:

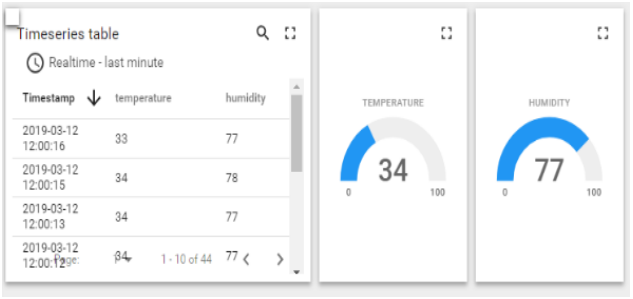


Figure 5. Output of DHT11 Sensor

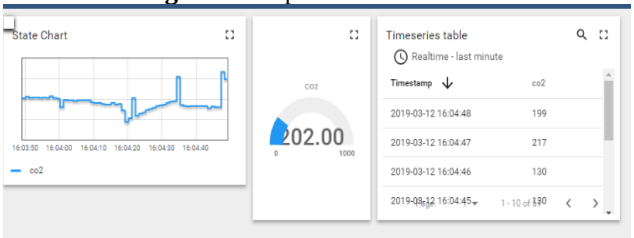


Figure 6. Output of MQ135 Sensor

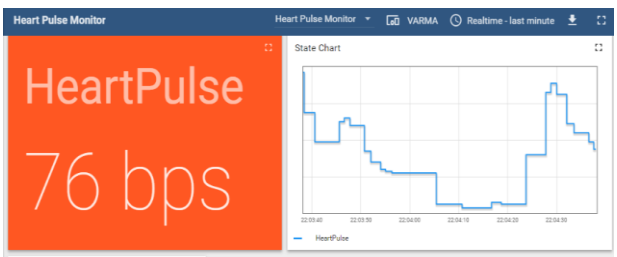


Figure 7. Output of Pulse Sensor

The surveillance of environmental prototype is developed by ESP8266.A continuous monitoring of the system shows the performance of ESP8266. Since the equipment and programming have been properly set up and the code has been uploaded into the Node MCU. Now we can see the results in serial monitor through Arduino IDE. Later The sensors data should send to the Things board platform through MQTT protocol by ESP8266 module. On the dash board we can see the monitored sensor data values.

VI. VI. CONCLUSION

The prototype of wireless sensor network for Environmental conditions surveillance is developed by using Node MCU; DHT11 sensor for temperature and humidity, MQ135 sensor for sensing CO_2 levels and Pulse sensor for monitoring heart rate. The real time data is directly accessed by the people from the Cloud platform, so that people will be more cautioned and required precautionary measures can be taken effectively.

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