Voice Controlled Industrial Parameters Monitoring and Controlling System

Saurabh Sathawane, A.D. Belsare, Vaibhav Deshpande, Snehal Warade, Tanay Thakre

Abstract: ***Internet of Things is a medium by which we can control our appliances from anywhere in the world. In Industry many times accidents happened due to negligence of workers and there are some risky areas in Industry where workers not able to go and work. Voice-controlled Industrial parameters monitoring and controlling system are used in the risky areas of Industries usually in power plants where there are high noise level and pollution to avoid accidents. Here an induction motor speed, temperature, pressure, etc are monitored and controlled to avoid damage to the motor. These all the parameters are going to monitor and controlled automatically. In this paper, Google-Assistant and Adafruit IO server are used for monitoring and controlling. By using this system the workers can monitor and control Industrial appliances and problems occur in Industries where workers not able to go and work are overcome.***

Keywords: ***DC motor, IoT, NodeMcu, Adafruit IO, Google Assistant, sensors.***

I. INTRODUCTION

Nowadays at many places peoples using the concept of IoT. Every person wants to live their life comfortably without a burden of workload. The best solution for this is to use technology in an efficient way to automate the things or appliances which can do their work automatically. There are many advantages of the IoT system than a wired system like the cost of the system is low, installation is easy, data analysis is in real-time and also gives alerts to the operators without going to remote places [1]. Low consumption of power and real-time capabilities has been considered to be a major requirement for IoT based applications [2].

It is also expected that IoT has been used for fetching data from various locations and processing such data more efficiently [3]. Induction Motor is the most popular type of motor for various applications in industries due to its simple rotor construction, ruggedness, low maintenance requirements and provision for flexible Industrial automation [4]. In various industries more than two DC motors are used for various applications like air compressors which are a vital part of many food and beverage processing plants [5].

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Nowadays in production industries, automated systems are driven by motors, so maintenance of those motors is a difficult task for the operators in the industry [6].

Continuously monitoring of the system overcomes the difficulties caused due to the previous method of maintaining the motor's condition on time. It may also cause sudden shutdowns [7]. In this paper we are proposing a system that allows humans to monitor and control Industry motor automatically. Its advantage is that if suddenly any system is not working properly in the industry and there is no worker available near the system then it will automatically perform certain actions accordingly. There are many applications of a motor. They are used in conveyors, dynamic braking and reversing applications. For opening and closing curtains dc motor is used. Dc motor is used in so many appliances.

At the hardware side, NodeMcu, l298n motor driver module, DHT11 temperature sensor, MQ2 gas sensor, dc motor, along with some sensing units are used to sense parameters like temperature, pressure, gas, etc. At the software side, the Adafruit IO platform and Google Assistant are used to monitor and control parameters like temperature, gas, etc. IFTTT a web-based server is used to connect Google Assistant and Adafruit IO. Monitoring and controlling can be done through both either by Adafruit IO manually or by Google Assistant through voice command.

II. METHODOLOGY

The proposed system is based on the concept of IoT to monitor and control industrial parameters. Here the main part is of interfacing of hardware with software. various sensors such as the DHT11 temperature sensor, MQ2 gas sensor are used to check the parameters like temperature, pressure and gas. There are various temperature sensors available in the market like DHT22 but here DHT11 is used due to its low cost. The speed of the motor is continuously measured in real-time to monitor changes in the speed of the motor. To control the speed of a motor we used the PWM concept. As per the condition certain actions have to be taken. If the temperature goes above 30 degrees then the buzzer will be turned on and a mail of alert is sent on registered mail ID similarly when gas detected then the buzzer will be turned on and fan for exhaust will also turn on. When there are certain changes in parameters i.e. temperature, speed, etc. alarm is activated.

Scheduled working is shown in the table below:

Table 1: Scheduled working

observation of sensor values and their actions concerning the threshold				
Sr. no.	***Type of component***	***Obtained value***	***Threshold value***	***Actions***
1.	Temperature sensor	29.5 *C	30.0 *C	Display temperature value on LCD.
2.	Temperature sensor	30.5 *C	30.0 *C	Buzzer turned on and email gone on registered mail ID.
3.	Gas sensor	1	0	Gas not detected.
4.	Gas sensor	0	0	Gas detected buzzer and fan for exhaust turned on.

Thus by using the DHT11 temperature sensor we can measure temperature and if it goes high above 30degree then buzzer was turned on and email on registered email ID was sent. Similarly if the MQ2 gas sensor detects any gas then buzzer and fan for the exhaust were turned on. Apart from that RPM of the motor is calculated and displayed on LCD.

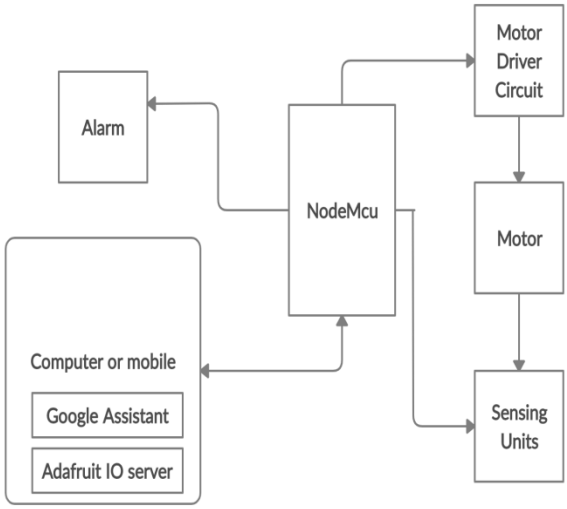

Fig 1:- Block Diagram

As shown in (1) NodeMcu is the main part to which all components are connected. l298n motor driver circuit is connected to NodeMcu which is used to drive a motor connected to it. An IR sensor is attached in front of a motor to calculate the speed of a motor in real-time. Along with that other sensors are used to check other parameters. The alarm is connected to a system for an alert when there is a change in parameters. This NodeMcu is wirelessly connected with mobile or pc through which we can monitor temperature, pressure, etc. and control the motor.

III. HARDWARE

The most important hardware component is NodeMcu to which all other components connected. The motor is connected with a motor driver circuit that drives a motor and protects NodeMcu from back emf produced by the motor. IR sensor is placed at some distance in front of the motor for measuring RPM of a motor in real-time. IR sensor is used because it does not need any contact with the motor.

The testing of hardware is shown in (2).

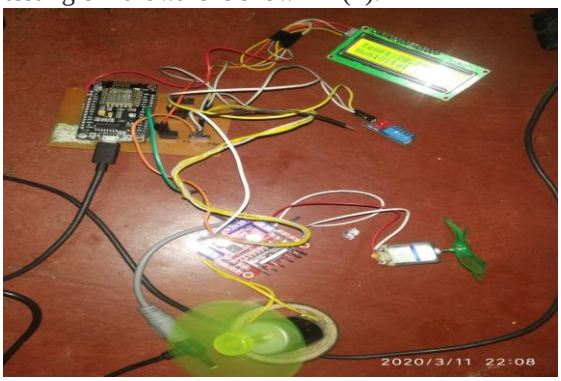

Fig 2:- Testing of Hardware

IV. SOFTWARE

In the proposed system Adafruit IO server has been used to share the data remotely. This server provides better connectivity and storage of remotely sensed data. The first step is to make an account on the Adafruit IO server and create a new dashboard in which feeds are added according to our requirement such as a slider for motor control, buttons, etc. Then take the Guage and link it with feed. The second step is to link Adafruit IO with Google Assistant via the IFTTT server.

An account on IFTTT has been made. Here in the presented system Google Assistant has been used where commands are inserted. Here Adafruit IO is used to send a response on the Adafruit IO server according to that command. Google Assistant is used to taking command if the command matches the command that was inserted in Google Assistant then that action is triggered and changes are seen in the Adafruit IO server.

A screenshot of server-side work is shown in (3(a)) and the working of Google Assistant is shown in (3(b)).

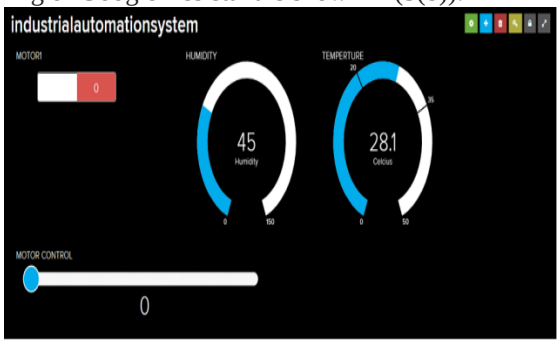

Fig 3(a):- server-side working of Adafruit IO.

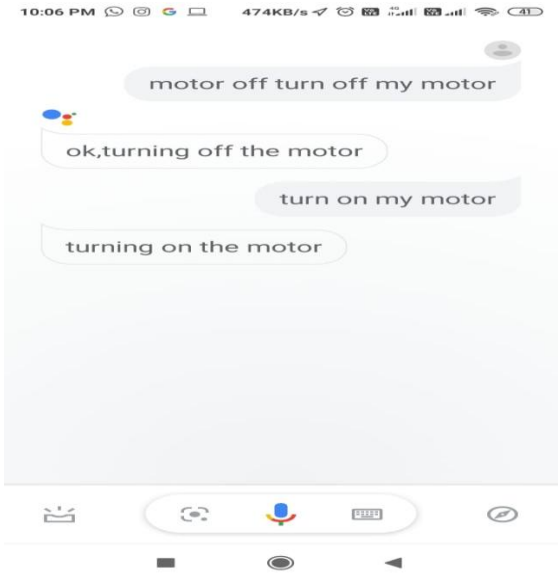

Fig 3(b):- server-side working of Google Assistant.

The coding part is discussed below in the form of a flowchart. Define digital pins of NodeMcu for all the components. Then Create an ESP8266 WiFiClient class to connect to the MQTT server. Then we send temperature and humidity value to the server and receive motor speed value from the server. Then set all the define pins as an output except MQ2 gas sensor pin as this is active high initially.
For MQ2 gas sensor,

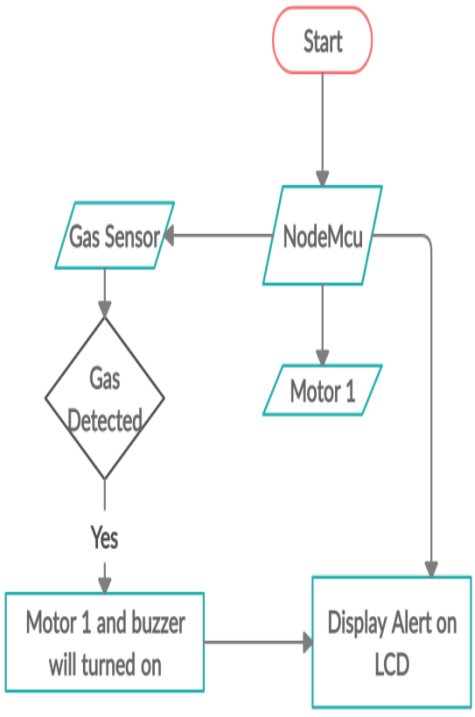

Fig 4:- Flowchart for gas control part.

Gas is detected when the state of the sensor is low and the buzzer will be turned on as shown in (4).
Similarly, the flowchart for the temperature sensor is shown in (5). The alarm is activated when the temperature goes above the threshold.

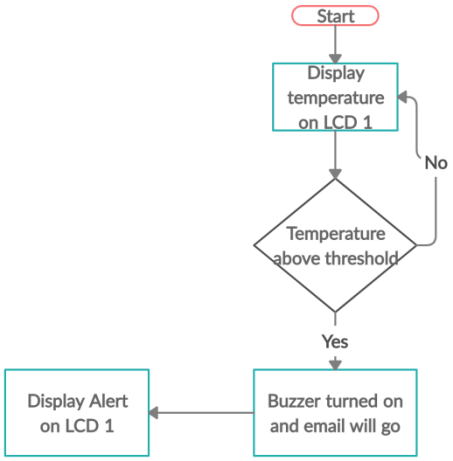

Fig 5:- Flowchart for temperature control part.

The flowchart shown in (6) is used to calculate the speed of a motor in real-time. The speed of a motor is calculated and displayed continuously in real-time.

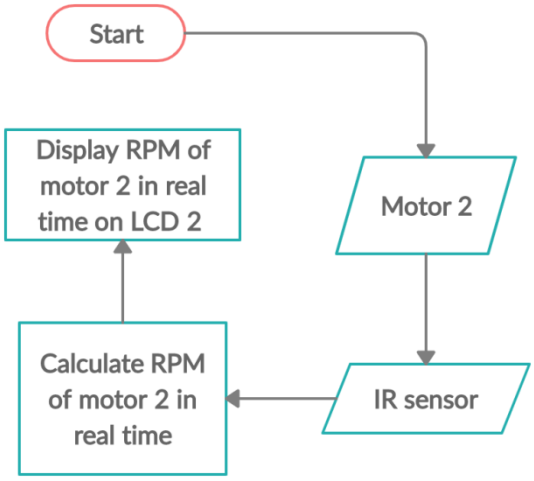

Fig 6:- Flowchart for speed monitoring part.

V. RESULT

Thus the goal of monitoring and controlling the speed of the motor and other parameters is successfully achieved by using sensors that monitor temperature, pressure, etc. By using Adafruit IO and Google Assistant we can control the temperature, speed of the motor, etc. As the temperature increase to certain limit buzzer will turn on and a mail is sent on registered email ID. When there is some leakage of gas then the gas sensor detects it and the buzzer will turn on and fan for exhaust will turn on immediately. All the parameters such as temperature, pressure, motor status, etc. are monitored with the help of the Adafruit IO server and its importance is that if there is a sudden change in the temperature, pressure, motor status, etc. then it will directly be seen on the server. The output is shown in (7).

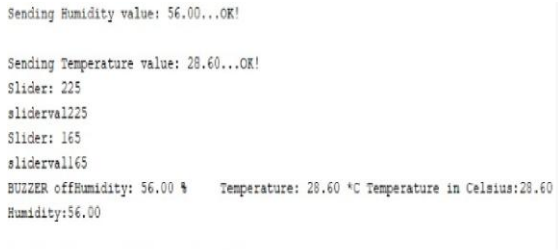

Fig 7: the output of a system

The obtained results are shown in the table below.

Table 2: Result

Final Results obtained			
Temperature value	***Pressure Value***	***Slider value***	***RPM value***
28.60*C	56 Pa	165	128
29*C	56 Pa	170	132
30.5*C	55 Pa	140	118

VI. CONCLUSION

With the help of voice-controlled industrial parameters monitoring and controlling system we can control and monitor Industrial appliances from remote places. By using this system we can monitor Industrial appliances and its parameters on the Adafruit IO server and control it by using voice commands through Google Assistant.

Because of this system workers can avoid sudden accidents happened in industries due to technical faults in industrial appliances. If ever suddenly a problem occurs in industrial appliances then the system will very helpful in that case.

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