International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 01 | Jan -2017 www.irjet.net p-ISSN: 2395-0072

Industrial Data Acquisition, Management and Controlling using IoT

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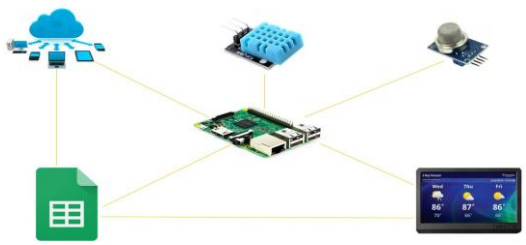
Abstract - *Modern Industries are adopting software driven automation system. The data generated by various resources can be used for monitoring industrial plants. Decisions are taken based on parameters provided by the system. The actions can be controlled by the user or by an automated system. Conventionally most of the parameters are available to the users within the premise in a standalone computer. Solution is to have a monitoring system which can be migrated to mobile system or a desktop pc so that the plant can be monitored remotely with the help of smart mobile phones. The system comprises of a wireless mode of communication and a raspberry pi system that can operate on windows or Linux platform. The parameters like emission of gases, temperature, relay circuit, are monitored.*

Key Words: *Raspberry Pi, wireless network, IoT, Sensors.*

1. Introduction:

Design and implementing a system using Raspberry Pi as an IoT device, is intended to monitor, control, retrieve data for controlling and analyzing the usage and performance of different industrial resources and allowing them to control through a standalone system or remotely through a mobile devices. Based on the concept of IoT, the resources need to configure and give connectivity through an embedded system. The system can also make use of phones as a remote device to view the usage status and thus monitor the resources.

IoT is a very trending field which has made the way to connect various physical objects to connect with digital world. IoT which stand for Internet of Things has made a very great step in innovation like smart automation in various fields like home, agriculture and many other. Here small scale industries are taken into consideration. Every owner of the industry wants to have an eye on the operation going. By making use of IoT device like Raspberry pi as an intermediate for communication, has make a way to monitor industry on a standalone system and also remotely on a smartphone.



2. Need of System

The resources need to operate in particular environment. Temperature is the most important factor for the resources to deal with the operations running throughout the task. Most resources works better when they operate in a particular or specified temperature scale.
By collecting this information from various resources for a particular task, a system can be made to monitor and control this resources to work efficient and produce products hassle free. Additionally, smart automation for energy saving can be applied to the industry by the help of relay circuits. Relay circuits are used to connect various AC resources through the Mains Power supply (230V – 50 Hz), allowing the circuit to control by a master system (refer Fig -1).

3. System Architecture:

The goal is to give a waveform representation of the data received from various sensors using Raspberry pi device. For automation, additional modules can be added for other parameters with predefined or user defined controlling actions. This data can be represented graphically and making use of this data to perform automatic operation in a module at certain case.

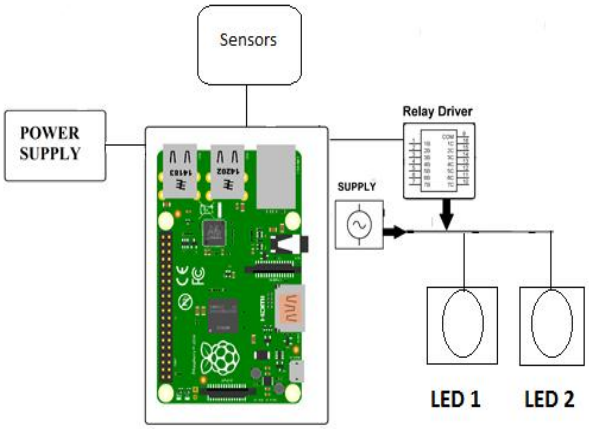


Fig -1: System Architecture

Temperature, humidity, gas are three parameters which are used in this proposed system. Digital Sensors are used to interface to get the data and save them in a spreadsheet and use them for monitoring, controlling and automation purpose.

The Fig.2, is the proposed system for monitoring resources. The system consists of sensors like DHT11 (Temperature and Humidity sensor) and MQ-2 (Gas Sensor) for monitoring environment.

The sensors are interfaced with Raspberry Pi 3B through GPIO Pins. GPIO stands for General Purpose Input Output. The pins are used to give interface for various sensors and other resources.

By using the above sensors, system gets some environment parameter like temperature, humidity and emission of gases. The readings generated runtime are monitored. The data is also stored in Google Spreadsheet with Timestamp.

By the help of Google Spreadsheet, it is possible to make remote access to data generated runtime.

As per the readings generated by the system it can be controlled and monitored by the user and can also be used for automation. Making the resource data available to user remotely, it makes user or owner to keep an eye to the system and check the resource status anytime and anywhere.

4. System Description:

The proposed system consists of sensors like DHT11, MQ2, etc. and the Raspberry Pi mini-computer. The sensors are used to take the environmental information, sends it to the remote application or a web portal. The information can be viewed, accessed remotely. The information is stored on the cloud.

I. Raspberry Pi 3 Model B :

Raspberry Pi is a credit card sized system which has a quad core processor, 1 GB RAM, Bluetooth 4.1, 10/100 Base T Ethernet port, 2.4 GHz WIFI 802.11n module, 4 GB on-board storage, external Micro SD card support , 4 USB ports, HDMI audio and video output.

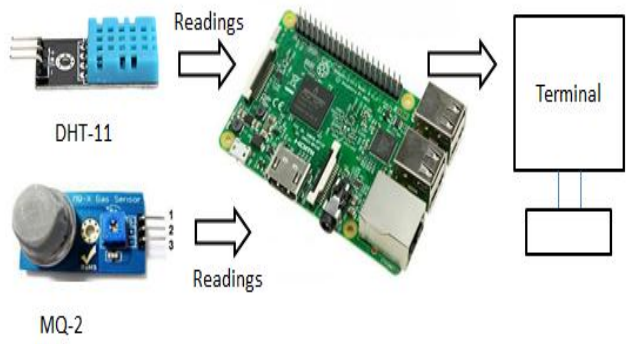


Fig -2: Proposed System Architecture

I. DHT11 Sensor :

The DHT11 Temperature and Humidity Sensor features a temperature & humidity sensor. It is a digital sensor. It has better accuracy. This sensor includes a resistive-type humidity measurement component and NTC temperature measurement component. This sensor is cheap and easy to use. There are various types of DHT sensors available in the series.

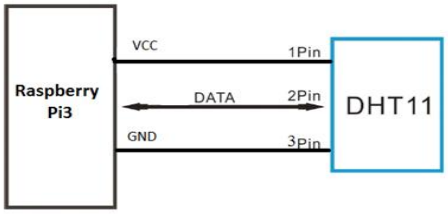


Fig -3: Interfacing of DHT11 to Raspberry Pi

Table -1: DHT11 Specification

Parameters	Conditions	Minimum	Typical	Maximum
Humidity				
Accuracy	25 °C		±4%RH	
	0-50 °C			±5%RH
Measurement Range	0°C	30%RH		90%RH
	25°C	20%RH		90%RH
	50°C	20%RH		80%RH
Temperature				
Accuracy		±1°C		±2°C
Measurement Range				50°C

II. MQ-2 Gas Sensor :

This sensor is used in gas leakage detecting equipment's in family and industry. They are suitable for detecting of CH_4, Propane, Hydrogen and Alcohols. It features to fast response with providing stable and long life. It provides high sensitivity to CH_4. It's low cost and suitable for different applications.

Symbol	Parameter Name	Technical parameter	Remarks
Rs	Sensing Resistance	3KΩ-30KΩ (1000 ppm isobutane)	Detecting conc. scope: 200ppm-5000ppm LPG and propane 300ppm-5000ppm Butane 5000ppm-20000ppm methane 300ppm-5000ppm H2 100PPM-2000PPM Alcohol
a (3000/1000)	Concentration Slope rate	≤0.6	
Standard Detecting Condition	Temp:20°C ± 2°C Humidity :65% ± 5%	Vc: 5V± 0.1 Vh: 5V ±0.1	
Preheat time	Over 24 hour		

5. CONCLUSIONS

By the help of wireless connectivity provided in Raspberry Pi 3 model-B, Data Acquisition has become more reliable and helps in displaying different parameters value in graphical form. It has make the connectivity between system very easy and allowing users to access remotely anytime.

ACKNOWLEDGEMENT

The Authors would like to thank Mr. S. R. Lahane, Assistant Professor from Computer Department at Gokhale Education Society's R. H. Sapat College of Engineering Management Studies and Research, Nasik, for his work and dedication toward our studies and activities.

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