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Wireless SCADA for industrial automation using Raspberry Pi

Poonam S. Mate
poonammate7@gmail.com
Gokhale Education Society's R. H. Sapat College of Engineering, Management Studies and Research, Nashik, Maharashtra

Santosh P. Agnihotri
spagnihotri@rediffmail.com
Gokhale Education Society's R. H. Sapat College of Engineering, Management Studies and Research, Nashik, Maharashtra

ABSTRACT

The World Wide Web (WWW) is the easy and convenient way to access the information on the internet in a click. This feature is suited for SCADA (Supervisory Control and Data Acquisition) to accessing the information of the system. This paper describes the wireless SCADA application for industrial automation purpose which is implemented based on client and server architecture. The user can access the real-time data in the picture/text and graphical format by using the HTTP (Hypertext Transfer Protocol) on computer/laptop screen. In this proposed system we used the Raspberry Pi as a controller. In Addition, a user can monitor and control the remote location system at the server site. Here the choice of Python language is the unique and powerful features such as on-demand access and platform independence to the design of SCADA display system.

Keywords: *SCADA, IoT, Raspberry Pi, ThingSpeak*

1. INTRODUCTION

The Manufacturing and big industries require a lot of people to complete industry work. Hence manpower playing very important role in day to day life. Again in industries, there is a need for safe and fast process also. Large industries which have better financial growth, they can make use of SCADA system for automation purpose. The main objective of the proposed system is to fetch the real-time information from a remote terminal unit (RTU) by using the wireless SCADA system. In large enterprises, many procedures are running simultaneously so there is a requirement to observe that procedures and represent them by using a system like SCADA (Supervisory Control and Data Acquisition). Proposed system monitor and control the enterprise's procedures using the internet (WWW) with the implementation of IoT (Internet of Things).

Here, industries sensors like Temperature sensor, humidity sensor, IR sensor, vibration sensor and PT100 sensors are remotely controlled through internet/website. In this system, IoT is using for communication between RTU (Remote Terminal Unit) and MTU (Master Terminal Unit). The communication with server allows the client to choose the selected process for controlling and monitoring purpose. All the sensors are interfaced to Raspberry Pi controller. Data collected from the RTU (sensors) is continuously sent over trans-receiver to Raspberry Pi which is then received at the corresponding connection to a PC/Laptop or Mobile by using IoT. We can set parameters like set point, lower limit and the higher limit on the SCADA screen.

2. PROPOSED SYSTEM RELATED TERMS

A. Internet of Things

Internet of Things is a network of physical devices and other atoms which are interfaced with electronic sensors and actuators etc. which allow these objects to collect and exchange data. IoT is an advanced automation and analytics which exploits networking. It brings a modern type of communication between things and people and also between things. Maintaining the Integrity of the Specifications.

B. ThingSpeak

ThingSpeak is the website for an Internet of Things which is utilized in our proposed system. In 2010 ThingSpeak was launched by ioBridge. It is an Open source application for IoT and it using an HTTP (Hypertext Transfer Protocol) over the Internet or by a Local Area Network. ThingSpeak clients to analyze and visualize transferred information utilizing Matlab without requiring the purchase of a Matlab license from Mathworks. On ThingSpeak website user has a special login account for security point of view.

C. Hypertext Transfer Protocol(HTTP)

Hypertext Transfer Protocol designed for World Wide Web (WWW). HTTP is Hypertext Transfer Protocol (HTTP) is use convention for SCADA, distributed network, and hypermedia data information. It is the protocol used to transfer the hypertext. HTTP session is a sequence of the network which based on the request-response transaction. HTTP client demands by sending a Transmission Control Protocol with a specific port on a server. A Hypertext Transfer Protocol server receiving a message on that appropriate port and waits until a client's request message. After accepting the request, the server acknowledges back a status line, like, "HTTP/1.3 276 OK".

3. PROPOSED SYSTEM

The proposed system used the Raspberry Pi as a controller in the wireless SCADA system. All sensors are connected to Raspberry Pi and different communication protocols amongst clients and server. The block diagram of a proposed system is shown in Figure 1.

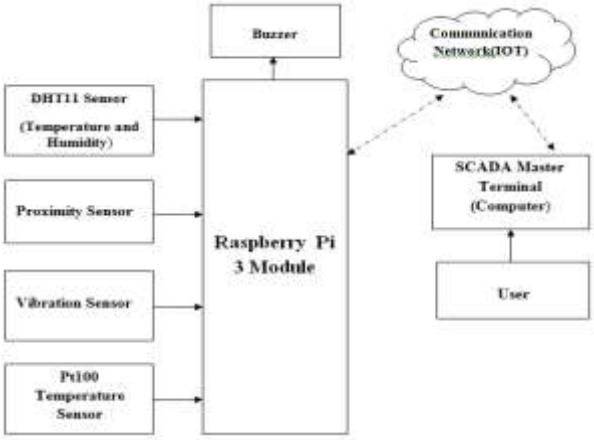

Fig. 1: Block diagram of wireless SCADA for industrial automation using Raspberry Pi.

In proposed system DHT11 sensor is used for measurement of Temperature and humidity of industry whereas the PT100 sensor used to measure the high range temperature up to 1000ºC. The Infrared sensor (IR) is a low-cost infrared object detection unit that we can be applied for industry using IR LED's. It gets triggered when a light is detected. When the sensor sensed any obstacle in the process it sends a signal to the raspberry pi. From raspberry pi, by means of WiFi configuration and IoT concept, we can turn ON/OFF the process which will control by IR sensor. If industry's work depends on motor then the Vibration sensor will give the information about the set limit of the motor vibration and vibration sensor will display the result on the computer.

4. RESULTS OF PROPOSED SYSTEM

In the proposed system, we interfaced DHT11 sensor, Proximity sensor, Vibration Sensor and PT100 sensor to Raspberry Pi: Proximity sensor is used for the purpose of sensing the motion or obstacle in the industry while making any production. Vibration sensor sensed vibrations of industry's machine /motor and give the output on a computer screen through Raspberry Pi. The DHT11 sensor used to sense the normal temperature and humidity of industry and PT100 sensor used to sense and controlled the very high temperature where production temperature is above 400^0 C. Real-time result of a sensed process shown in Figure 2.

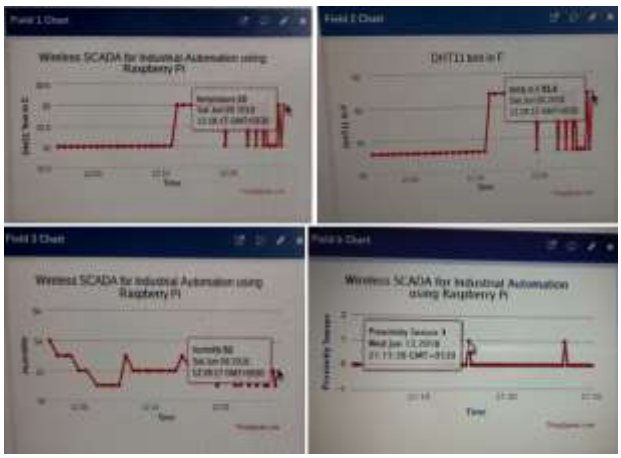

Fig. 2: Graphical representation of results on ThingSpeak

After Interfaced sensors to Raspberry Pi, the results are in graphical format by using a ThingSpeak website. Communication between raspberry pi and a user is an Internet of Things (IoT). By getting this results user can monitor their processes of industry and can control processes if anything is wrong in that process.

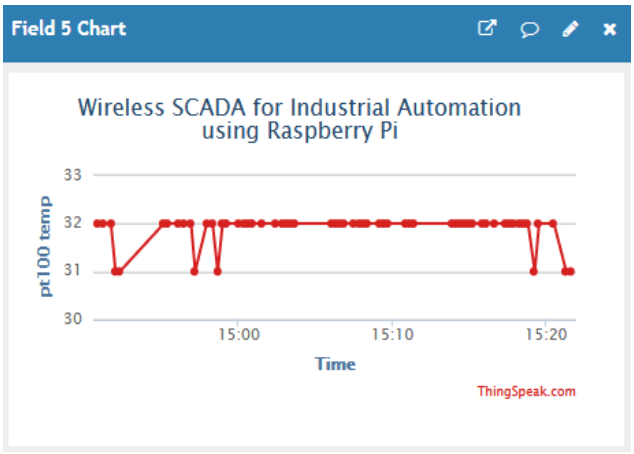

Fig. 3: PT100 sensor result of Temperature in graphical Form on ThingSpeak

In figure 4 we designed a complete SCADA system in picture form which gave real-time values of industry's system. Whereas zone1, zone2, and zone3 in figure 4 show result of DHT11 Temperature in degree Celsius, DHT11 Temperature in Fahrenheit and Humidity respectively. Temp block shows Temperature of PT100 sensor.

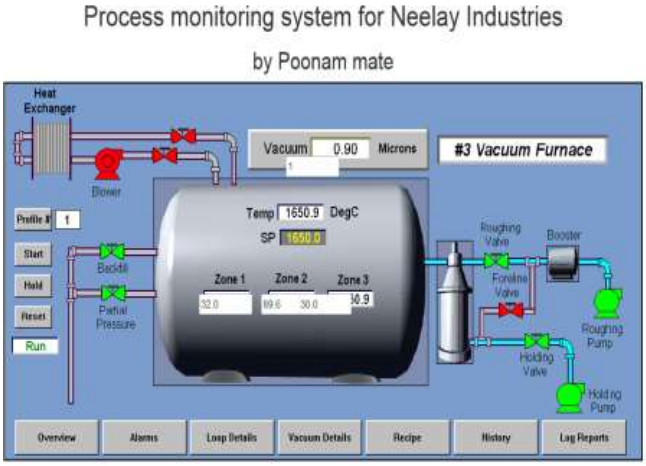

Fig. 4: Proposed SCADA System

5. CONCLUSION

The Proposed system supports online supervision and controlling the industry processes through a computer/laptop screen. It used the Internet of Thing (IoT) for communication between client and server and IoT is very secured than other communication media. User saw process information by using their credential login on thing speak. Designed SCADA system gave an entire view of the industry and it made easy to control and monitors the industry parameters as compared to graphical format. The entire information has great portability, great receptiveness and low cost also it is likewise simple for maintenance and up gradation. It is possible to interface different sorts of sensors with these modules and make distinctive applications.

6. REFERENCES

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