International Journal on Recent Researches in Science, Engineering & Technology (IJRRSET)
A Journal Established in early 2000 as National journal and upgraded to International journal in 2013 and is in existence for the last 10 years. It is run by Retired Professors from NIT, Trichy. Journal Indexed in JIR, DIIF and SJIF.
Research Paper
Available online at: www.jrrset.com
UGC Approved Journal No: 45483
Received on: 08.11.2017 Published on: 30.11.2017 Pages : 7-13

ISSN (Print) : 2347-6729
ISSN (Online) : 2348-3105
Volume 5, Issue 11
Novmber 2017.
JIR IF : 2.54
DIIF IF : 1.46
SJIF IF : 1.329

A PROPOSED REMOTE MONITORING SYSTEM BY GLOBAL SYSTEM FOR MOBILE COMMUNICATION AND INTERNET TECHNOLOGY

D. Sobya[1a*], S. Nallusamy[2b], Partha Sarathi Chakraborty[3c]
[1]Research Scholar, [3]Associate Professor, Department of Adult and Continuing Education and Extension, Jadavpur University, Kolkata-700032, India
[2]Professor, Department of Mechanical Engineering, Dr. M G R Educational and Research Institute, Chennai-600095, Tamilnadu, India
[a]e-mail: sobyadevaraj@gmail.com, [b]e-mail: ksnallu@gmail.com
[c]e-mail: p_s_c2001@yahoo.com

Abstract

In global market, all manufacturers exports their finished products to end users located in different places. Delivered product needs manufacturer's assistance if any fault occurs in it. Remote monitoring of a product is getting the status of the product continuously from a remote location. This can be made by obtaining the status of the products, checking for any abnormalities and suggesting solutions based on the problems identified. In this research article, a remote monitoring system for machine controllers used in industries is proposed using global system for mobile communication (GSM) and internet technology. monitoring logic controllers exported from the manufacturing unit is done using 8051 microcontroller and the status of the controller can be obtained by sending messages from the controller, connecting the controller to the cloud and accessing data from the cloud. This method is cost effective, since the hardware is done using simple components. From the results it was found that, producers can send solutions to control the device and based on the solutions, the controller can be programmed to take necessary decisions to rectify the deviations.

Keywords: Manufacturer, Remote Monitoring, GSM, Micro Controller, Internet Technology

1. Introduction

In general, manufacturing units are generally located at different places based on the availability of resources for their production and the raw material supplier. They export the products manufactured to their sub units located at different places and also to their customers. Any problems found in a product should be given attention immediately by the service engineers to avoid material loss and production backlogs [1-5]. It is difficult to have the presence of service engineers in all the places to monitor the products and solve any abnormalities occurred in those products. Transportation is difficult to a remote location and in adverse climatic conditions. Even a small problem consumes more time and human efforts. To address these issues, it is essential to have remote monitoring facilities in the products exported from the manufacturing unit [6-8]. The remote monitoring system should be simple, reliable and cost effective to avoid installation and maintenance overheads. This project looks at reporting the abnormalities as messages to the manufacturer. Also the status of the controller is

continuously updated to the cloud through a server and problems in it are identified by accessing the data from the server.

2. Need for the Proposed System

Remote monitoring plays a major role in most of the applications. If a problem occurs in the product exported, manufacturer has to visit the particular industry to provide solution. This consumes time and human efforts. So there is an increase in need for monitoring products delivered to a remote location. The main aim of the project is to develop a system to detect the problem immediately so that the manufacturer can provide solution to fix the problem [9]. The status of the machine should be continuously monitored and any change identified should be sent as an alert to the manufacturer so that it is given attention in product maintenance. An overview of the remote monitoring system is shown in Figure 1. The overall system comprises of several key components. The implementation of remote monitoring system for machine controllers is discussed. The two methodologies used for implementation are global system for mobile communication and internet technology. GSM module SIM900A is interfaced with the 8051 microcontroller using UART serial communication. Alert messages to the customer are sent from the modem using AT commands. Wi-Fi module ESP 8266 is interfaced with microcontroller. Status of the device is continuously updated to the cloud using thing speak platform.

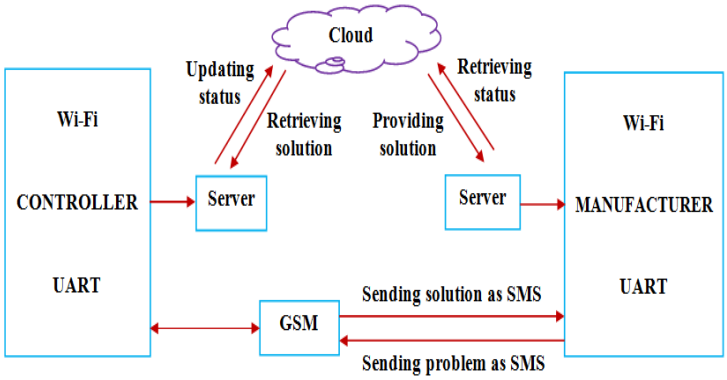

Figure 1 Block Diagram of the Proposed Prototype

The status of the product is continuously updated to cloud through server. The manufacturer will continuously monitor and retrieve the product status via cloud [10, 11]. If there are any abnormalities found the manufacturer will provide solution through the cloud and the user can retrieve the solution via cloud. Similarly the status of the device is sent as an alert message to the manufacturer with the help of GSM module through UART serial communication [12-14]. The complete flow chart of the proposed system is shown in figure 2.

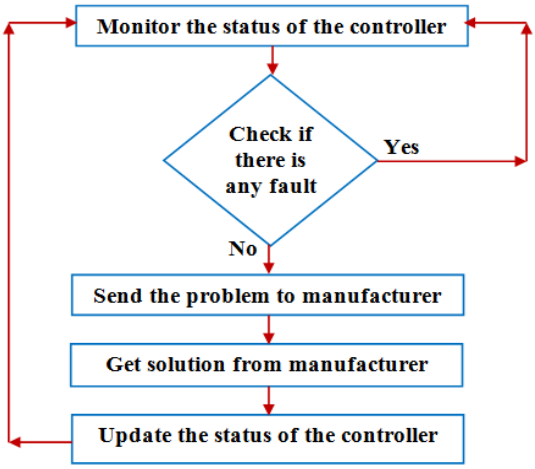

Figure 2 Flow Chart of the Proposed System

The above systems monitor the status of the 8051 microcontroller. Here two types of monitoring are done with help of GSM module and 8051 microcontroller such as ON status monitoring and periodic monitoring. The ON status of the device is monitored using the microcontroller 8051 and GSM module. Whenever the device is turned ON it will be indicated through a message with the help of GSM module SIM900A. The status of the device (both ON and OFF) is continuously monitored using microcontroller 8051 and GSM. For every 30 seconds the status of the device is indicated through a message with the help of GSM module SIM900A.

3. Interfacing GSM with 8051 Microcontroller

The SIM900A is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer application. It can be operated in four different frequencies as 850/ 900/ 1800/ 1900MHz. The circuit is made simple by the adoption of a mobile phone module of Simcom SIM900. This modem is ideal to perform data links without access to the GPRS network or to the Internet. Some of the features of the module are the baud rate can be configurable from 9600-115200 through AT command, operation temperature: -30 °C to +80 °C, low power consumption, supply voltage range 3.4 to 4.5 V, SPI interface, serial interface and antenna pad and I2C. AT commands are used to interface GSM module with the microcontroller and some of the AT commands are listed in Table 1.

Table 1 AT Commands

AT Commands	Description
AT+CMGS	Sending SMS
AT+CMGR	Read the SMS
AT+CMGD	Delete the SMS
AT+CMGF	Set to text mode

The different steps for interfacing GSM with 8051 are four switches of the microcontroller are considered as four devices to be monitored and connected to Port 0, the transmit pin of controller (P3.1) is connected to receive pin (RXD) of GSM modem and the receive pin of controller (P3.0) is connected to transmit pin (TXD) of GSM modem and using AT commands the message will be sent to a particular number whenever the devices are in ON state. Through periodic monitoring the Port P0 pins are considered to be the monitoring devices and when the pins are connected to Vcc-On state and Gnd-Off state alerts should be monitored for every 30 seconds.

4. Updating Status to Cloud

Cloud storage is storing the data on hardware in a remote physical location, which can be accessed from any device via the internet. Clients send files to a data server maintained by a cloud provider instead of storing it on their own hard drives.

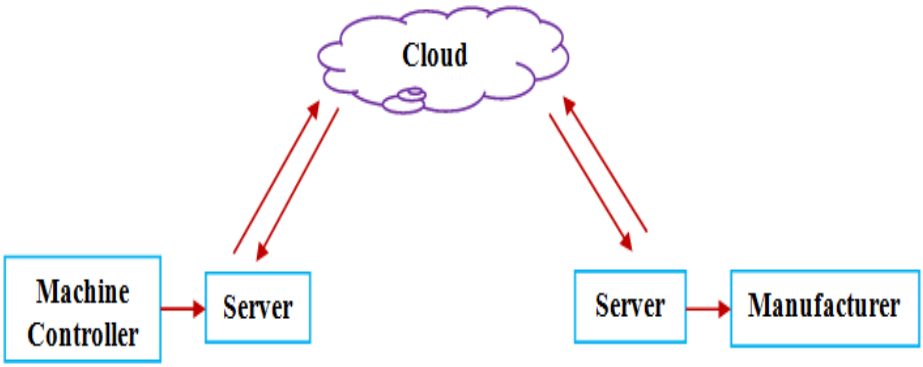

Figure 3 Updating Status to Cloud

The figure 3 shows that the status of the machine controller is sent to the server and then updated to cloud using Things peak platform. The updated status is retrieved by the manufacturer at any time by using the Things peak. To access the Things peak platform the following steps has to be followed.

- Create new account in Things peak platform and create the new channel.
- Then create the required fields to store data. Each channel consists of eight fields.
- Each channel have unique id called API keys like Write API key and Read API key.
- Write API key is used to write data to the channels and read API key is used to read data from the channels.
- With the help of write API key the data is send to the cloud and it is seen in the channels with the field name.
- After setting up the connections the data is send to the cloud from machine controller.

5. Results and Discussion

The setup was tested for four devices, and the results are shown below for one device. The experimental set up of the prototype model is shown in Figure 4. The ON status monitoring and periodic monitoring results are shown in Figure 5 and Figure 6 respectively. Figure 5 gives the observation when switch 1 is connected to the port P0^0. Normally the switch will be in high position. Whenever the switch is pressed it indicates that the device is turned ON and it will be intimated with a message “DEVICE 1 IS ON” to a particular number. Figure 6 gives the experimental setup and alert message when device 1 is in ON state and device 2 is in OFF state. The Port P0^0 is considered as device 1 and Port P0^1 is considered as device 2. Device 1 is connected to supply (5v) pin and device 2 is connected to ground pin so that the alert message is sent as “Device 1 is ON and device 2 is OFF” to a particular number.

Figure 4 Circuit Set Up of the Prototype

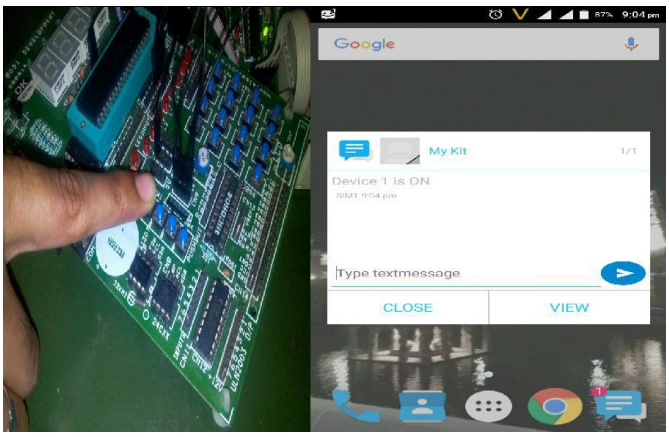

Figure 5 ON Status Monitoring of Device-I

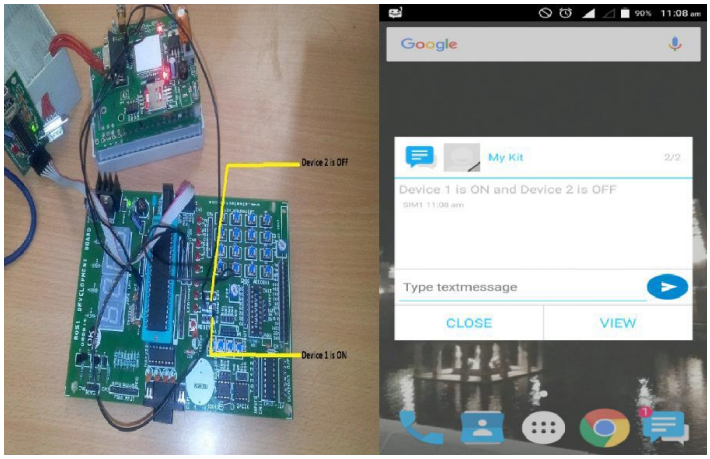

Figure 6 Periodic Monitoring

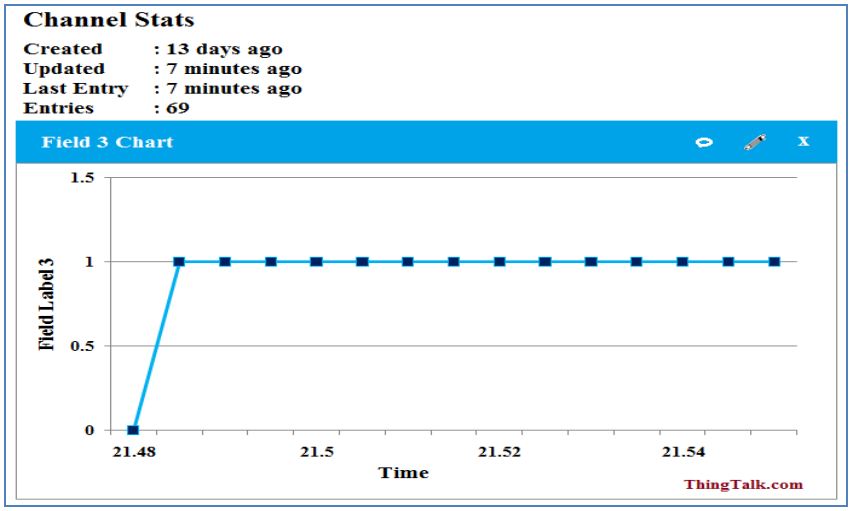

Figure 7 Monitoring the Device under Stable Condition for Long Period

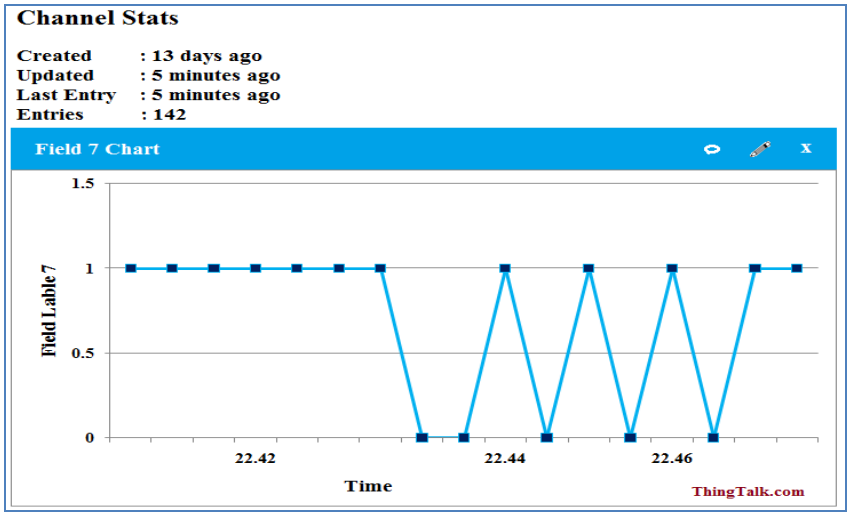

Figure 8 Monitoring the Device under Stable Condition for Shorter Period

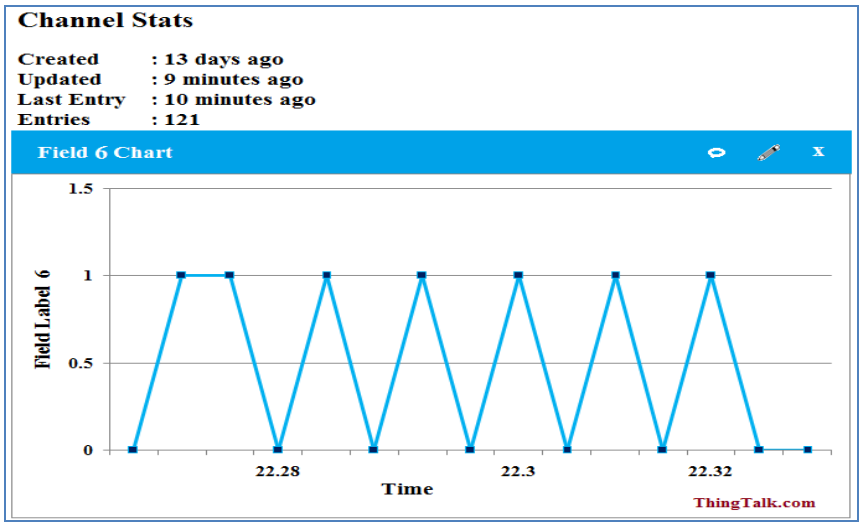

Figure 9 Monitoring the Device is under Fluctuating Condition

The Figure 7 shows that the device is in off state initially. The pin which has to be monitored is connected to the VCC, the device becomes ON state. The above graph shows that there is No voltage variations hence the device is in stable condition for a long period. Figure 8 gives the observation for monitoring a device under stable condition for a shorter period. Initially the device is in stable state. After some time the device fluctuates between ON and OFF state. Figure 9 gives the observation for monitoring the device under fluctuating condition. Initially the device is in OFF state. Then the device fluctuates between ON and OFF states. There are more voltage variations and the device is in fluctuation condition for a longer period.

6. Conclusion

During this research work an attempt was made on remote monitoring system for machine controllers used in industries is proposed using GSM and internet technology. GSM module SIM900A is interfaced with the 8051 microcontroller using UART serial communication. Alert messages to the customer are sent from the modem using AT commands. Wi-Fi module ESP 8266 is interfaced with microcontroller. Status of the device is continuously updated to the cloud using Things peak platform. Device's status can be accessed at any time by logging on to Things peak platform and the methodologies proposed are easy to implement and cost effective. A further extension of the prototype can be controlling the device based on the problems identified in the controller and the status obtained from the server. Solutions can to control the device by the producers and based on the solutions, the controller can be programmed to take necessary decisions to rectify the abnormalities.

7. References

[1]. Rahali, H. Alami, and A. Hilali, "Design and implementation of a system for monitoring and remote control of a greenhouse climate parameters". Journal of Automation and Control Engineering, 3(5), 2015, 425-427

[2]. S. Nallusamy, G.B. Dinagaraj, K. Balakannan and S. Satheesh, "Sustainable green lean manufacturing practices in small scale industries-A case study", International Journal of Applied Engineering Research, 10(62), 2015, 143- 146

[3]. S. Nallusamy, "Frequency analysis of lean manufacturing system by different critical issues in Indian automotive industries", International Journal of Engineering Research in Africa, 23, 2016, 181-187

[4]. S. Nallusamy, "A proposed model for sustaining quality assurance using TQM practices in small and medium scale industries", International Journal of Engineering Research in Africa, 22, 2016, 184-190

[5]. S. Nallusamy, S. Satheesh, P.S. Chakraborty and K. Balakannan, "A review on supplier selection problem in regular area of application", International Journal of Applied Engineering Research, 10(62), 2015, 128- 132

[6]. R. Chutia, D. Sonowal and S. Sharma, "Remote Household Appliance Control System Using GSM" Proc. of the International Conference on Advanced Computing and Communication Technologies, 2011, 540-542

[7]. O. Touhami, R. Sadoun, A. Belouchrani, S. Hamdani, A. Boukoucha and S. Ouaged, "Remote monitoring system of Electrical machines via Internet," IEEE International Symposium on Diagnostics for Electric Machines, Power Electronics and Drives, 2013, 93-99

[8]. D. Sobya , Partha Sarathi Chakraborty and Dulal Krishna Mandal, "Design and development of IoT based residential automation security system with bluetooth technology," International Journal of Application or Innovation in Engineering & Management, 6(6), 2017, 62-72

[9]. Faheem Ijaz, Adeel A. Siddiqui, Byung Kwan Im and Chankil Lee, "Remote management and control system for LED based plant factory using Zigbee and Internet". IEEE transactions on Industry Applications, 2012, 118-127

[10]. D. Sobya, S. Nallusamy, Partha Sarathi Chakraborty and Muruganandham, "Design of multi functional electronic energy meter enabled with zigbee protocol intended for industrial applications," International Journal of Current Advanced Research, 6(10), 2017, 7029-7033

[11]. M. Mori and M. Fujishima, "Remote monitoring and maintenance system for CNC machine tools," International Conference on Intelligent Computation in Manufacturing Engineering, 201, 416-420

[12]. S. Nallusamy, D. Sri Lakshmana Kumar, K.Balakannan and P.S.Chakraborty, "MCDM tools application for selection of suppliers in manufacturing industries using AHP, Fuzzy Logic and ANN", International Journal of Engineering Research in Africa, 19, 2015, 130-137

[13]. Ankesh Patel and Rakesh Trivedi, "Industrial wireless monitoring and control using zigbee technology," IEEE transactions on Industry Applications, 2014, 841-875

[14]. D. Sobya, Data compression analysis of rocket engines with vector quantization based on FCM algorithm, International Journal of Engineering Research in Africa, 22, 2016, 135-140