REMOTE MONITORING OF SENSOR DATA FOR MACHINES

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ABSTRACT

In this paper, the system proposed is used for the remotely monitoring of machine health/status by observing the sensors specified. It is a soft-real-time system which will detects a minor fluctuations in the machine parameter values and predicts the problem accordingly. Previously, an operator or manual surveillance is required to detects the problem in machines.

The proposed system uses IoT concept i.e., Internet of Things, which will monitor and store data automatically, which results in easier for analysis. Internet of Things (IoT) is a latest technology which works on the principle of control system such as computer to control the physical devices over the internet. Here various machines parameters are monitored at real-time using IoT i.e., Internet of Things. This is a smart and better way for industry automation that allows user to efficiently control industry appliances/machines over the internet.

Keywords: *MQ6, DHT11, ESP8266-01.*

1. INTRODUCTION

A wireless fault detection system for industrial machines that combines various parameter analysis, thus improving the detection of mechanical faults. It is also required to consider the time of detection and further possible actions, which are also important for the early detection of possible problem, to prevent the critical damage for machine. A use of wireless sensor network (WSN), for early detection and monitoring of industrial system failures is a way to get good efficient system response. Also, The microcontroller is used by system to process the user commands/instructions. The Microcontroller then takes necessary actions as per user commands. The various real-time parameters of the system will be displayed on the console screen.

2. RELATED WORK

2.1 - Ahmad Faizal Zainal Abidin et al., Proposes and designed the system [1]Real- Time Remote Monitoring With Data Acquisition System. This system allows the user to monitor the device status from anywhere as the information will be associated to the website. The system helps user to get the devices condition and ambient changes with easiest way. The system will enables unmanned monitoring remotely. The system is designed to monitor any electrical device voltage and current magnitude, the system self-voltage, self-current, surrounding temperature and humidity magnitude. Furthermore, the device could assist user in planning for future upgrade or maintenance of the equipment. Overall, the system has been received positive remarks from industrial panel from electronic engineering solution company.

2.2 - Jonathan Medina–Garcia,Trinidad Sanchez-Rodriguez et al., described a system [2]*A Wireless Sensor System For Real-Time Monitoring & Fault Detection of Motor Arrays.* This wireless fault detection system is used for industrial motors which includes vibration, motor current and temperature analysis, to improve the detection of mechanical faults. For early detection of system machine failures, a wireless sensor network is used. To improve the detection of faults, the system designed which combine various parameter measurements in real-time way. The monitoring of the motor system involves the measurement of several quantities, such as vibrations, temperature and current consumption. The data is graphically presented in real-time by means of a virtual instrument or on any kind of GUI window. This proposed system can be easily scaled up to include other sensors on the sensing node for the measurement of other parameters of interest, or to add new sensor nodes to the wireless network. The system has a high autonomy, easy installation and reduced maintenance costs.

3. PROPOSED SYSTEM

In this system, some circuit is operated at 5v DC and ESP8266-01 Module (IoT) is operated at 3.3v DC supply, for 5v DC supply, voltage regulator 7805 IC is used and to get 3.3v DC supply, LD33v IC is used. To get started with Remote Monitoring system, the most important prerequisite is internet connectivity. System starts as it get connected to internet using Wi-Fi.

As IoT module get connected successfully to the internet through Wi-Fi, the controller will check all the machine status using various sensors used for machines. The controller sense the values from sensors, and then all the values are uploaded on web page using IoT. Also the controller checks for full system status and indicate accordingly. In the given system, there are 5 different parameters of machines are getting monitored. Temperature, Humidity, Voltage, Current and LPG, are the parameters which can be monitored by the proposed system.

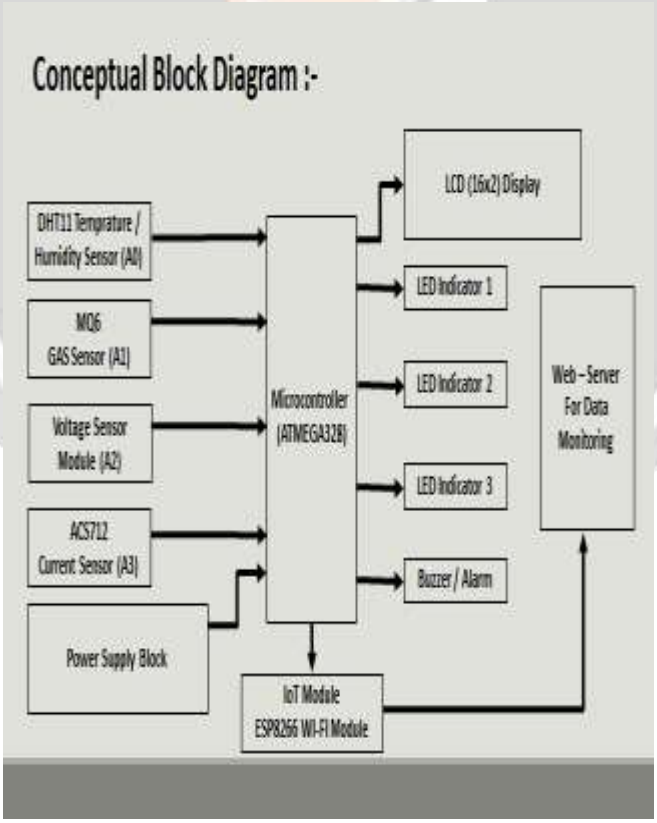

Figure 1: Block diagram of Proposed system

According to threshold values of sensors, controller will decides the system status and health level of machine. The system has buzzer and 3 LED indication panel used to make emergency alert and indicate status of system respectively.

4. MAIN COMPONENTS USED IN PROPOSED SYSTEM

a) Atmega328p µc
b) ESP8266-01 MODULE
c) DHT11 SENSOR MODULE
d) MQ6 SMOKE SENSOR MODULE
e) VOLTAGE SENSOR MODULE
f) CURRENT SENSOR MODULE

a) ATmega-328p

The microcontroller used in the system is ATmega-328p. Which is an 8-bit high performance microcontroller from the Atmel's Mega AVR family. Atmega328p is a 28 pin packaged microcontroller based on enhanced RISC (Reduced Instruction Set Computing) architecture with 131 powerful instructions. It has a 32 KB programmable flash memory, static RAM of 2 KB and EEPROM of 1KB. Most of the instructions requires one machine cycle for execution. It can work on a maximum frequency of 20 MHz.

b) ESP8266-01 MODULE

The ESP8266 is generally known by the IoT module. Which is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability produced by manufacturer Espressif Systems, located in Shanghai, China. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using simple commands. It has very low price and there were very few external components on the module board, which suggested that it could eventually be attracted many developers to explore the module, chip, and the software on it. The ESP8266-01 is the very first module with 1 MB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi.

c) DHT11 SENSOR MODULE

The sensor module DHT11 is a composite sensor that contains a calibrated digital signal output of temperature and humidity. The technology of a dedicated digital modules collection and the temperature and humidity sensing technology are applied to ensure that the product has high reliability and excellent long-term stability. The sensor includes temperature measurement device, and it has capability to get connected with a high-performance 8-bit microcontroller. This sensor can measure temperature in the range of 0 - 50 ^{0}C with 1^{0}C tolerance. For humidity, 1% of tolerance is there.

d) MQ6 SENSOR MODULE

MQ-6 gas sensor modules are used in gas leakage detecting equipment, and are suitable for detecting of LPG, iso-butane, propane, and cigarette smoke. It has features such as high sensitivity to CH4, Small sensitivity to alcohol, Fast response, Stable and long life and Simple drive circuit.

e) VOLTAGE SENSOR MODULE

This module is based on resistance points pressure principle, and it can make the input voltage of red terminal reduce 5 times of original voltage. The max avr analog input voltage is 5 V. so the input voltage of this module should be not more than 25v. Because the AVR chip have 10 bit ADC. Here, this system can measure maximum of 25v DC supply as specified sensor rating.

f) CURRENT SENSOR MODULE

A current sensor (ACS712) is a device that detects electric current in a wire, and generates a signal proportional to that current. The generated signal could be analog voltage or current or even a digital output. The generated signal can be then used to display the measured current or can be stored for further analysis in a system, or can be used for the purpose of control. Here, this system can measure maximum 20Amps of AC/DC current as specified sensor rating.

5. FLOWCHART OF PROPOSED SYSTEM

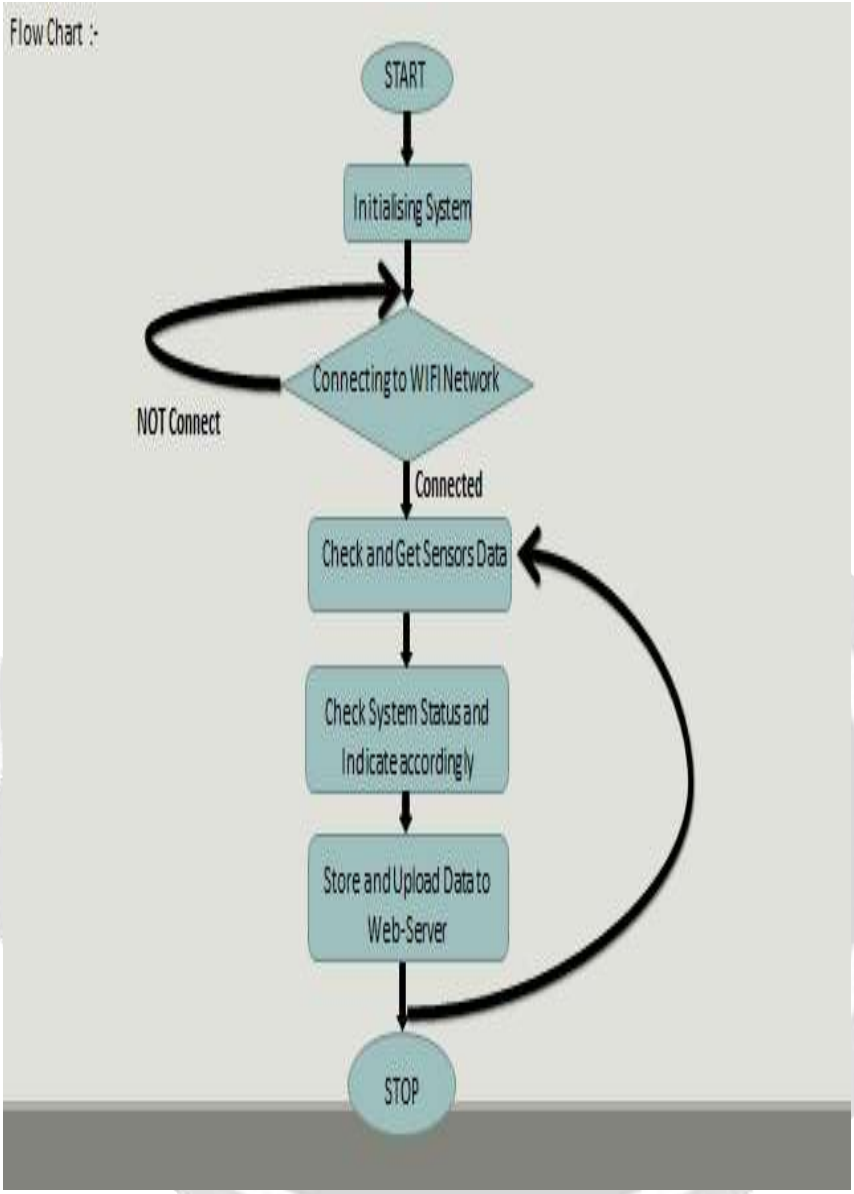

Figure 2: Flowchart of proposed system

The work-flow for system is as described in Figure 2. The system initialization starts with the establishing and connecting to the Wi-Fi network for an internet access. Further the microcontroller unit will check for sensors data and evaluate it, to detect the system status. If system found to be critical or in any emergency state, the alerting section will alert accordingly. If system is found to be normal, all the data from different sensors are stored and uploaded to web-page/server simultaneously.

6. SYSTEM EXPERIMENTATION AND PRACTICAL IMPLEMENTATION

The discussed system is implemented on small size PCB and proper mechanical modeling is under process for systematic representation of model. Basics implemented system is as shown in figure 3 below.

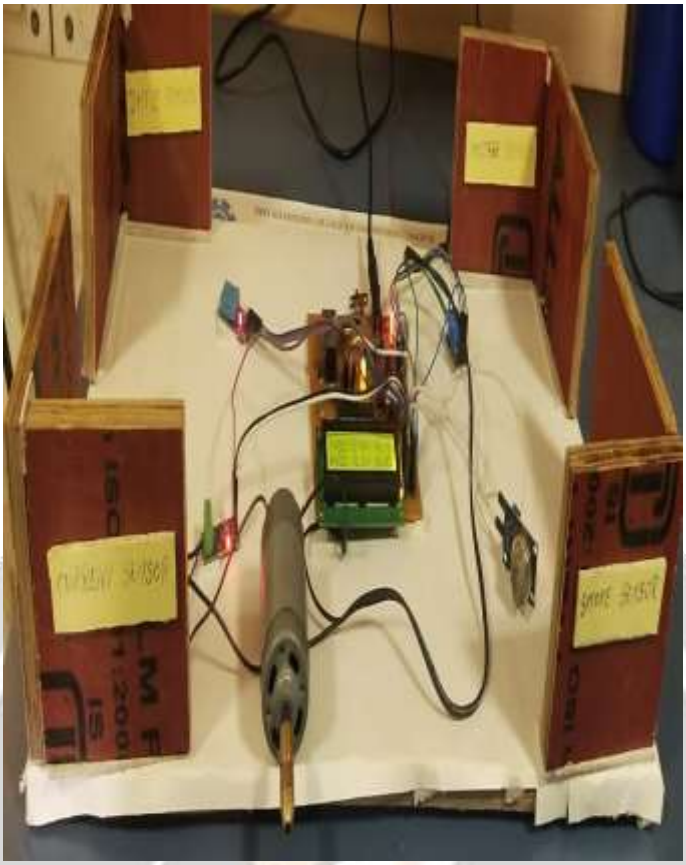

Figure 3: Experimental setup of proposed system

7. CONCLUSION

In order to demonstrate the application of the system, this paper is designed. This system gives the machine status at every time, which results in easy maintenance of the machine positively. Also it reduces the chances of whole system damaged and loss for industries. The controller unit improves the efficiency and capability of system by indicating/ alerting at any emergency and life-threatening situations. By use of IoT concept, the monitoring of system is easier on various platforms such as computer, smartphones etc. at any time.

8. REFERENCES

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