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INTERNET OF THINGS FOR INDUSTRIAL MONITORING AND CONTROL APPLICATIONS

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Abstract: Industrial Monitoring and Control is essential to collect all the relevant information, statistics and data related to the various industrial processes, motors, machines and devices employed in industry premises. This aims at controlled access, better productivity and high quality results of industrial products being manufactured. In this new era of technological developments remote control and monitoring via communication techniques such as ZigBee, RF, Infrared, techniques has been widely used in Industries. However, these wireless communication techniques are generally restricted to simple applications because of their slow communication speeds, distances and data security. In addition, they are easily affected by noise and bad weather conditions such as snow, fog and rain. In the Present project, a new solution is adopted for the traditional monitoring and controls of Industrial applications through the implementation of Internet of things (IOT) using GPRS enabled high quality communication, low cost and high security without the need for much hardware infrastructure in all the coverage areas of the GSM operator.

Keywords: Internet of Things (IoT), GPRS, TCP/IP Protocol, GSM, Sensor module, Industrial applications

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INTRODUCTION

Technological developments have enabled to be taken classic systems place by Automatic and advanced systems. In addition, the availability of fast-processing, stable and sensitive products provided particular benefits in industrial automation. As a result of the developments in Communication technologies, systems are no longer monitored and controlled by personnel using classic methods, but automatically by computer-controlled or remote-controlled devices. Industrial environmental conditions have been upgrading day by day with this newly introduced automatic techniques as a result of getting rid of the conventional procedures of manufacturing increasing huge workloads.

The next generation industries will be definitely more advanced and automatic as compared with existing ones. This brings on a new terminology of **"Smart Industries"** in this new era of Monitoring as well as controlling of various Industrial applications. . As an emerging technology brought about rapid advances in modern wireless telecommunication, **Internet of Things (IoT)** has attracted a lot of attention and is expected to bring benefits to numerous applications. The newly introduced concept of"Internet of Things" (*IOT)*is providing a helping hand toachieve the Industrial automation through remote access. In IOT each device or devices constituting a system will be able to communicate with the other devices or system in the same premises over a common platform. Hence this leads to exchange of relevant data, statistics, logs and various other parameters information among various devices to improve their performance, which will help industries to have better productivity, management and increased throughput.

II. LITRETURE REVIEW

Different control technologies are used for monitoring and control of the systems, whereas the communication between a system and a user is generally realized online via wireless communication techniques such as RF, ZigBee and Bluetooth.Also, SCADA programs are utilized for developing user interfaces. However, SCADA programs do not provide adaptability for users because of their expensive libraries. RF, ZigBee and Bluetooth technologies are widely preferred in easy-to-use applications due to the short range between the sender and the receiver, and the small volumes of data transferred.The ZigBee, RF and Bluetooth wireless communication techniques are generally restricted to simple applications because of their slow communication speeds, distances and data security.

Nowadays, timer controlled systems have been easily replaced with remote controlled systems after the internet became widespread. In these systems, it is known as an important issue to get information about not only the control, but also the conditions of the machines or devices

through internet.In accordance with this need, there are some works about implementation of condition monitoring of system through internet and development of internet-based remote controlling or monitoring practices.It is observed that many systems were used for controlling and monitoring processes. There are some successful examples such as PLC SCADA based fault detection and protection system is implemented which provides the web based user interface for remote control and monitoring was developed and presented online to users.Monitoring of various industrial parameters based on ZigBee protocol has been implemented to monitor the temperature, water level and various current and voltages ratings.

III. PROPOSED SYSTEM

Industrial monitoring and control is a combination of architectures, mechanisms, and algorithms used in the industrial factory for monitoring and control the activities of industrial processes, motors, machines and devices employed in industry premises to achieve the goal. Though it sounds good enough to have a smart industrial environment in the near future but it will also have to face hurdles of handling big data as all the devices will communicate with each other and exchange their information over a common-platform.The present project is focused on Industrial applications that will be continuously monitored through a set of sensors that constitutes a sensor module. The sensor module collects the relevant data to determine whether the applications to be monitored are working well under certain threshold values.

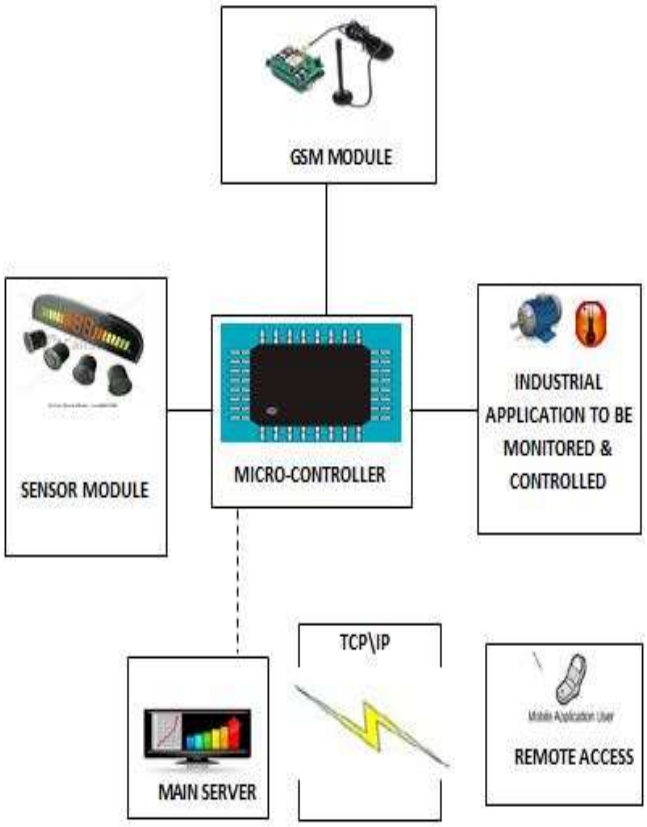

FIG 1. PROPOSED SYSTEM ARCHITECTURE

The data from various sensors in the sensor module is fed to the controlling device basically a microcontroller. This controlling device is interfaced with a GPRS enabled GSM module to get accessed remotely by users. The controlling device simultaneously forwards data to the main server. The main server located at the industry premises displays the corresponding data received from the controlling device. An arrangement of accessing the main server remotely by mobile users can be achieved through TCP/IP protocol, thus monitoring of the applications can be done through remote access.

If the industrial applications seem not to be working properly after being monitored then they can be controlled remotely by mobile users through accessing the controller by means of GPRS enabled GSM module. GPRS communication offers a non-stop, secure and cheap communication to individuals where there is no access to Internet. Thus, industrial applications will be precisely monitored and controlled by means of GPRS communication technique

without any restrictions to distance or infrastructures. Following comparison of these communication techniques will be helpful to us.

TABLE 1.COMPARISON OFWIRELESS COMMUNICATIONTECHNIQUES

Characteristics	ZigBee	GPRS/GSM	Wi-Fi	Bluetooth	RF
Focusing Area	Monitoring and Control	Wide Range of Sound and Data Transmission Monitoring and Control	Web, e-mail, image	Instead of cable	Wireless services
System Resource	4–32Kb	16Mb+	1Mb+	250Kb+	32kb
Network Data Width (kb/s)	20–250	64–128+	11000+	720	32
Coverage Area (meter)	1–100	1000+	1–100	1–10+	1–100+
Performance Areas	Endurance Cost Power Consumption	Accessibility Quality	Speed Resiliency	Cost Comfort	Accessibility

IV. SYSTEM HARDWARE

To accomplish the monitoring and control of industrial applications, consideration of following factors is important in system design.

1) Microcontroller

The microcontroller proposed for our system is ATmega32A which is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega32A achieves throughputs approaching 1 MIPS per MHz allowing optimization of power consumption versus processing speed. To handle numerous tasks in the system the microcontroller Needs to be capable of executing more instructions at a time, thus ATmega32A is efficient for computation with an enough programmable flash memory of 32K Bytes.

2) Current sensor

The AllegroACS712 provides economical and precise solutions for AC or DC current sensing in industrial, commercial, and communications systems. The device package allows for easy implementation. Typical application of this sensor is for controlling motor, and its overcurrent fault protection. The output of the device has a positive slope (>VIOUT (Q)) when an increasing current flows through the primary copper conduction path (from pins 1 and 2, to pins 3 and 4), which is the path used for current sampling.

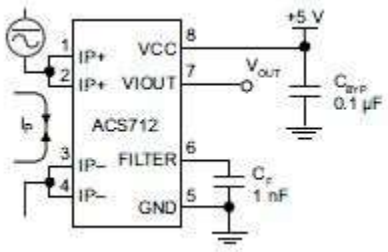

FIG 2.CURRENT SENSOR IC SCHEMATIC

The internal resistance of this conductive path is 1.2 mΩ typical, providing low power losses. The thickness of the copper conductor allows survival of the device at up to 5 times theovercurrent conditions. The terminals of the conductive path are electrically isolated from the signal leads (pins5 through 8). This allows the ACS712 to be used for monitoring the motor current and protecting motor form overcurrent conditions in industry.

3) Temperature Sensor:

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy.

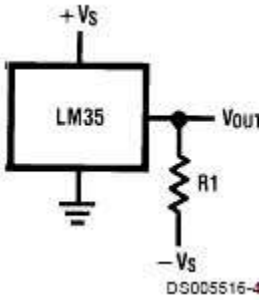

Fig 3.FULL RANGE CENTIGRADE TEMPRATURE SENSOR

The LM35 can be applied easily in the same way as other integrated-circuit temperature sensors. It can be glued or cemented to a surface and its temperature will be within about 0.01°C of the surface temperature.This presumes that the ambient air temperature is almost the same as the surface temperature. The LM35 temperature sensor for value of R1 = −VS/50 µA, respective voltages are measured for corresponding sensed temperatures- VOUT = +1,500 mV at +150°C

= +250 mV at +25°C
= −550 mV at −55°C

4) *GSM Module:*

The TC35i GSM module operating in the GSM 900 MHz and GSM 1800 MHz frequency band is an extremely compact and super slim communication module especially designed for telemetry, telematics and telephony. It offers additional features such as SIM application tool kit and extended AT commands for the industrial environment. The physical interface to the cellular application is made through a ZIF connector. It consists of 40 pins, required for controlling the unit, transferring data and audio signals and providing power supply lines.

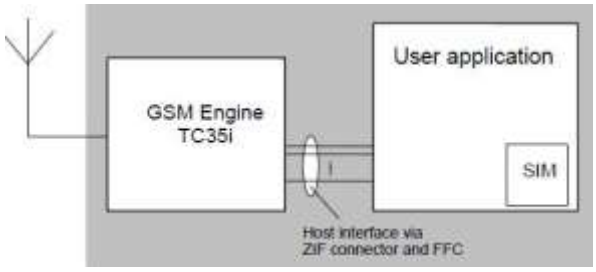

Fig 3.BLOCK DIAGRAM OF A CELLULAR APPLICATION

The cellular device application forms the Man-Machine Interface (MMI). The serial interface allows for access to the GSM module. For battery powered applications, TC35i features a charging control which can be used to charge a Li-Ion battery. This GSM module helps to track the location of the system employed in an industry for a user at a different location who wants to communicate with the system. Therefore, any industrial application, parameters exceeding its threshold value can get controlled by means of micro-controller through this TC35i GSM module. For the cellular application to operate reliably it is essential that the GSM module is securely attached to the host housing.

V. CONCLUSION

This paper has presented the design and implementation of Internet of things for monitoring and controlling of various application and parameters in industries using GPRS wireless communication technique.The key idea of the proposed work is to provideflexibleand long distance connectivity between industrial environment and user. The advantages of the developed system are to have a continuous monitoring over industrial applications and also control them if going beyond their threshold conditions. Future work will focus on

improvement of above proposed work and adding features to make a reliable smart Industrial monitoring and controlling system.

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