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IOT Based Industrial Safety And Automation

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Abstract*:* With the rapid elevation in the internet users count over the past decade has made Internet a part of life. Internet of things is the advanced & emerging internet technology. With the rapid growth of supervising technology in industries, life is getting simpler and easier in all conditions. In this modern world these Automatic systems are being adopted over manual systems because of their Self-Regulating behavior. This reduces the cost and power. Internet of things is a burgeoning network from industry machine to consumer demands by sharing data and accomplishing tasks while we are hustling with various other activities. IoT based Industry Safety and Automation System (ISAs) aims the computers or mobile devices to monitor Industry features, functions and conditions automatically from anywhere around the world by using Internet.
Keywords: Internet of Things, Industrial Automation, Remote operating.

1. 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.

Internet of things is connecting the physical devices or things to internet and operates remotely. This is getting more popular in present technology because of it wide range of applications in every field of engineering and non engineering. Before going to the details of these applications lets briefly look into what is internet of things and how it works. Internet of things term is new to information technology but concept is used since from long back with internet as back bone. The following diagram will give you an idea about the IoT.

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 to achieve 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.

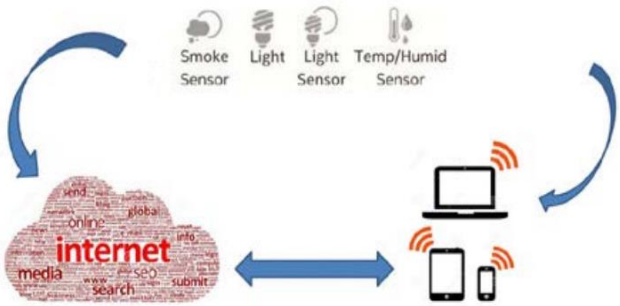

Fig. 1: IoT

2. INDUSTRIAL IOT

Industrial IoT has received a lot of research attention from the networking and embedded systems communities, which has produced some of the compelling solutions that underlie today's deployments. However, as indicated previously, broadening its adoption requires further research contributions, involving the experience of the distributed systems community. Adopting a distributed systems perspective is rather natural considering what industrial IoT is about. More specifically, an industrial IoT system is a collection of largely independent interconnected computing elements that monitor or control some physical resources in a way that appears to the users of the system as an operation of a single facility realizing a certain business process. In other words, industrial IoT systems fit perfectly the classic definitions of distributed systems. Among others, this definition emphasizes two aspects. First, it involves components that are interconnected, albeit largely autonomous. Second, it requires these components to appear to the outside world as a single coherent system. This combination implies that the autonomous components have to collaborate one way or the other. The principles and paradigms according to which such a collaboration can be established lie at the core of distributed systems. What is more, such an approach to industrial IoT emphasizing inter-component collaboration—complements the approaches taken by the networking and embedded system communities. The networking community typically focuses on methods of interconnecting the components so as to enable efficient and reliable communication. The embedded systems community, in turn, is concerned with the components themselves and their interfaces with the physical objects and the surrounding environment. Although these interests frequently overlap with those of the distributed systems community, they do differ, and hence considering industrial IoT solutions as distributed systems with all their classic challenges has the potential to add value.

3. SYSTEM ARCHITECTURE

NodeMCU: The NodeMCU is a widely used open-source microcontroller board based on the ESP8266. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board features 13 Digital pins and 1 Analog pins. It is programmable with the Arduino IDE (Integrated Development Environment) via micro USB cable.

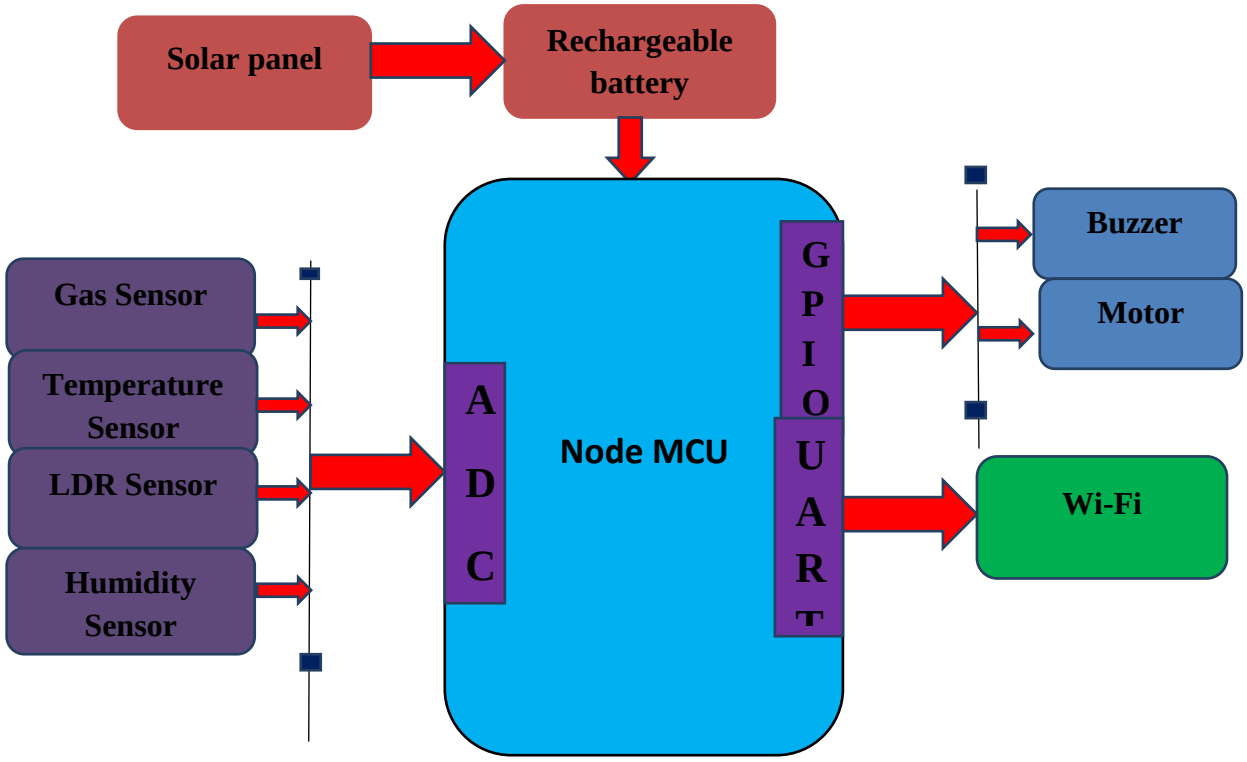

Fig. 2: Proposed Architecture

Temperature & humidity sensor, Gas Sensor and illumination intensity sensor are used to percept the environment and object conditions. Analog signals are provided to NodeMCU device produced by

sensors. The digital equivalent of these signals is transmitted to the database server using Wi-Fi module. The data stored on the database server is transferred to the website time to time and the status of the alarm is checked continuously for any uneven conditions observed by the industry person on the website. Then adequate steps can be taken to solve the problems. This can be possible through past experience and similar previous condition stored in database. The proposed architecture and server section illustration shown in Fig.2 and Fig.3.

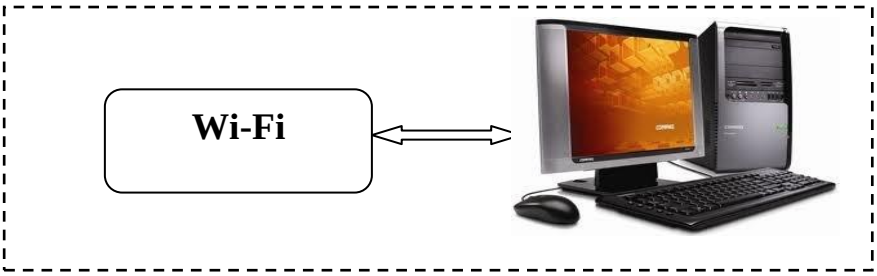

Fig. 3: Server Section

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson andspiffs.

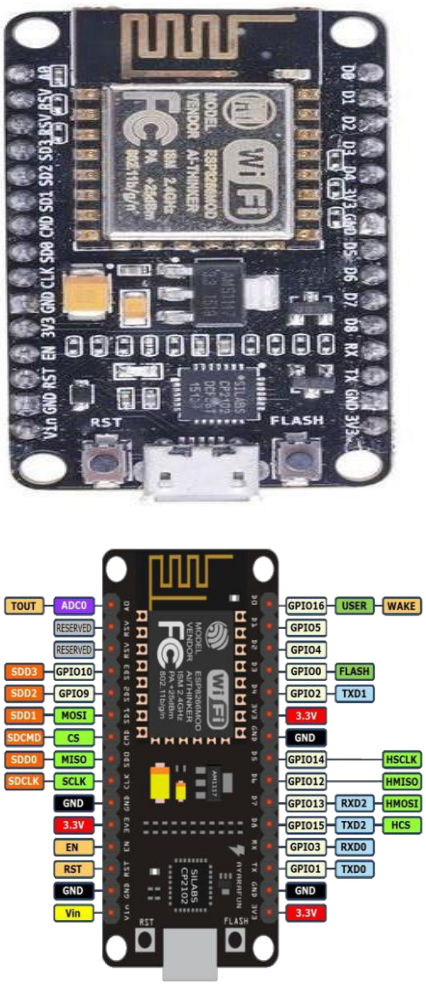

Fig.4: NodeMCU

ESP8266EX is embedded with Tensilica L106 32-bit micro controller (MCU), which features extra low power consumption and 16-bit RSIC. The CPU clock speed is 80MHz. It can also reach a maximum value of 160MHz. Real Time Operation System (RTOS) is enabled. Currently, only 20% of MIPS has been occupied by the WiFi stack, the rest can all be used for user application programming and development. The following interfaces can be used to connect to the MCU embedded inESP8266EX:

• Programmable RAM/ROM interfaces (iBus), which can be connected with memory controller, and can also be used to visit external flash;

• Data RAM interface (dBus), which can connected with memory controller;

4. SYSTEM DESIGN

Fig 5 and Fig 6 shows the hardware and software implementation design. Here NodeMCU along with Sensors like Temp sensor, gas Sensor , LDR sensor , Humidity sensor etc. to collect data. We used ESP8266 internal Wi-Fi module to connect the system to the server via internet.

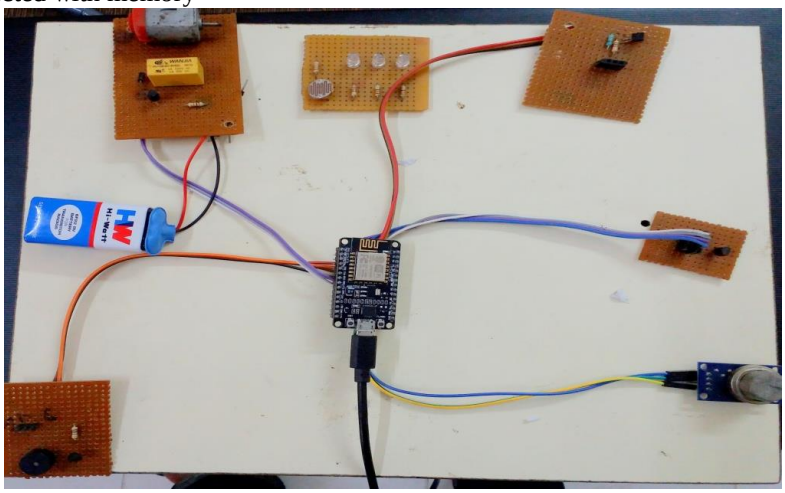

Fig. 5: Hardware Implementation

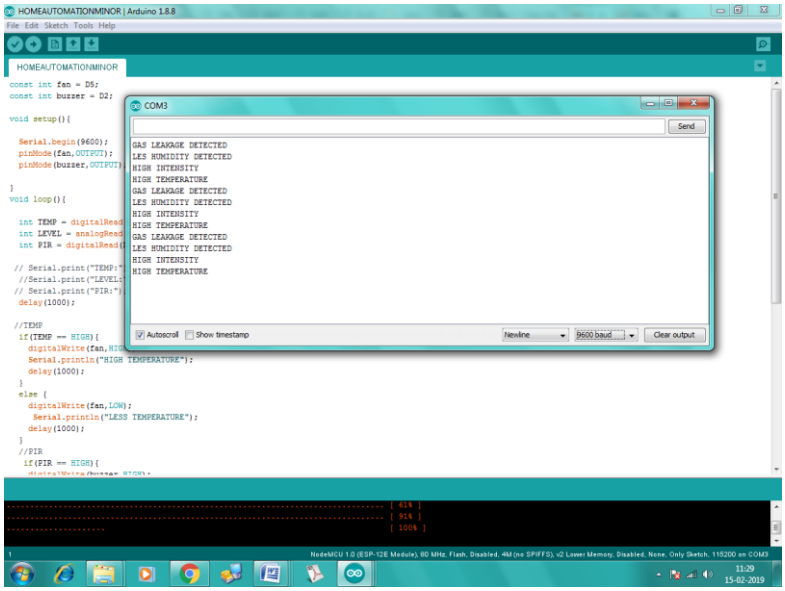

Fig. 6: Software Implementation

5. CONCLUSION

With the advancement in technology, it is expected that the availability of internet is everywhere. We are developing an industrial application using internet of things technology. In this paper we have proposed to provide an application for monitoring industrial appliances and to inform the responsible person to take appropriate measures. This paper aims to serve as an efficient backbone for achieving a network of sensors and actuators which can help for improving the performance of the day to day activities of the industry.

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