Industrial Environmental Parameters Monitoring and Controlling Using IoT

Deshpande P. L.[1] and Deshpande L.M.[2]

[1](M E Student, Department of Electronics and Telecommunication Engineering, TPCT's College of Engineering, Osmanabad, Maharashtra, India)

[2](Professor, Department of Electronics and Telecommunication Engineering, TPCT's College of Engineering, Osmanabad, Maharashtra, India)

Abstract: *In the industry, there 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. For this purpose, industrial environmental parameters monitoring and controlling is required. Internet of Things (IoT) is rapidly increasing technology. IoT is the network of physical objects or things embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data. In this paper, we are developing a system which will monitor and control the industrial parameters using concept of IoT with wireless devices, Android, and sensors. It is the most effective and most beneficial. So it has very good social prospects.*

Keywords: *controlled access, industrial environmental parameters, IoT, wireless devices, Android.*

I. INTRODUCTION

With fierce business competition, the demand of automation, information and intelligence in industrial production makes industrial enterprises has to pay more attention on the development of new technologies. [1]

In conventional factories, it is common to apply wired systems to implement industrial monitored and controlled systems (e.g., field bus systems and wired HART systems). However, it is costly and difficult to install wired systems in harsh factory environments (e.g., nuclear power plants and refineries) or to rewire in flexible manufacturing operations, in which a great of variety of complex production operations and processes require frequent adjustments, and maintain flexibility in future Industry 4.0 factories[2]

Now- a- days, the industrial monitoring field requires more manual power to monitor and control the industrial parameters such as temperature, humidity, smoke etc…This is one of the most upcoming issues in the industrial sectors. If the parameters are not monitored and controlled properly, it leads to a harmful situation. Most of the industries are facing these kinds of situation because of some manual mistakes [8]. In that kind of harmful situations, again the manual power is required to control the parameters. Sometimes, if this control process may not be handled properly, it results in an occurrence of major accidents [10].

With the upcoming technologies, it is very easy to overcome the greater issues in the industrial automation.[10] 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 application areas.[9].

The term Internet of Things was introduced by K. Ashton in the context of supply chain management and it describes a system where the digital world is connected to the physical world forming a global network in 1999. IoT becomes a reality and its goal is to make "things" more aware, interactive and efficient for a better and safer world.[10]. It allows 'people and things to be connected Any- time, Anyplace, with Anything and Anyone, ideally using Any path/network and Any service'. Such technology will help to create `a better world for human beings', where objects around us know what we like, what we want, and what we need and act accordingly without explicit instructions [3].

In a report from 2005, the International Telecommunication Union (ITU) suggested the following: "*Internet of Things will connect objects from the world, both in a sensory and intelligent way*". By unifying various techno-logical development methods, ITU identified four dimensions in IoT: identifying elements ("labelling things"), sensor networks and wireless sensor networks ("things that feel"), embedded systems ("things that think") and nanotechnology ("contraction things"). [4]

Industrial automation is a domain in which Internet of- things can bring with many benefits. For instance, remote location of plants would benefit from technologies that support remote operation and maintenance; autonomous collaboration between devices so that devices are aware of each other for information exchange, in this way to reduce engineering costs in terms of manual configurations of all involved devices; the real-time data collected from a large number of these interconnected physical hardware units can be used for developing new intelligent applications, etc.[5]

The objective of this industrial IoT system is to design the monitoring and control system for industrial parameters using IoT. This system mainly reduces the high manpower requirement in the industrial monitoring field by monitoring the overall industrial parameters through a android phone with the help of IoT application[10].

Need of the Study

Existing system requires manual intervention as well as CCTV cameras for monitoring industrial area. This study of industrial internet of things is useful for overcome the Manual intervention as well as better productivity.

II. LITERATURE SURVEY

The term "Internet of Things" (IoT) was first used in 1999 by British technology pioneer Kevin Ashton to describe a system in which objects in the physical world could be connected to the Internet by sensors. Ashton coined the term to illustrate the power of connecting Radio-Frequency Identification (RFID) tags used in corporate supply chains to the Internet in order to count and track goods without the need for human intervention. [12]

A report of McKinsey Global Institute regarding the disruptive technologies defines Internet of Things as to the "use of sensors, actuators, and data communication technology built into physical objects – from roadways to pacemakers – that enable those object to be tracked, coordinated, or controlled across a data network or internet" with the goal of creating value.[10]

Over the last years IoT is foreseen as the solution for the ever-increasing demand for connectivity between peoples, organizations, companies, gadgets and devices and it was born from the desire to achieve software real-time control and access to information. [10]

European Union research cluster on Internet of Things, defines 'Things' as active participants in any kind of "business, information and social processes where they are enabled to interact and communicate among themselves and with the environment, by exchanging data and information 'sensed' about the environment, while reacting autonomously to the 'real/physical world' events and influencing it by running processes that trigger actions and create services with or without direct human intervention".[7]

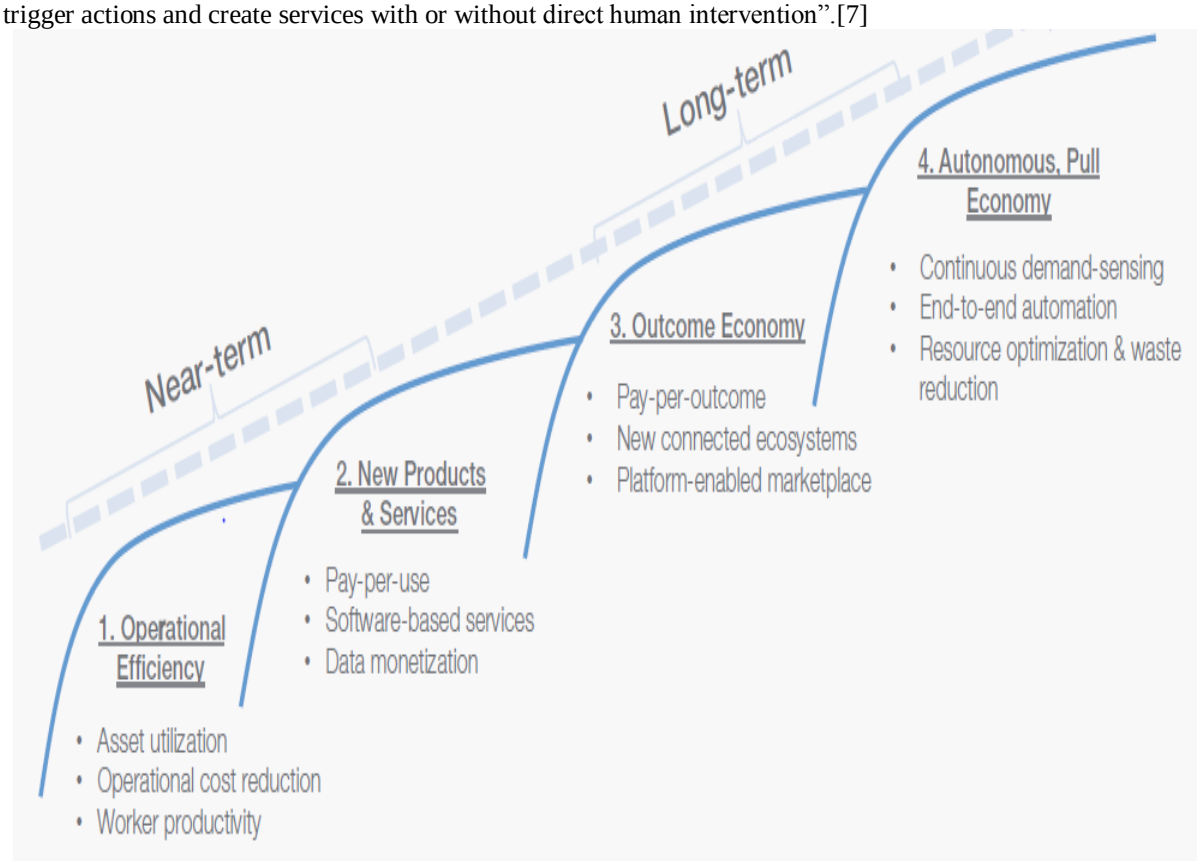

Fig1: The adoption and impact path of the industrial internet.

As depicted in Figure 1, in 2014 research on Industrial Internet shows that the future evolution of the Industrial Internet will likely follow four distinct phases. Phases 1 and 2 represent immediate opportunities that drive the near-term adoption, starting with operational efficiency. These activities are happening now, and will likely accelerate in the next two years. Phases 3 and 4 include long-term structural changes that are roughly three years away from mainstream adoption. [11]

In 2014,Li Da Xu,Wu He,shancangli propose " Internet of Things in Industries: A Survey" This paper gives us the current research of IoT, key enabling technology, various IOT applications in industries and identifies research trends and challenges. A basic purpose of this paper is to summarize the current state of-the-art of IoT in industries systematically. [6]

In recent years a wide range of industrial IoT applications have been developed and deployed. Evolution of this starts from RFID technology, which allows microchips to transmit the identification information to a reader through wireless communication. By using RFID readers, people can identify, track, and monitor any objects attached with RFID tags automatically. Another technology is the wireless sensor networks (WSNs), which mainly use interconnected intelligent sensors to sense and monitoring. Its applications include environmental monitoring, industrial monitoring, traffic monitoring. Both RFID and WSN are used to develop IoT. Then upcoming technology is IoT with Artificial Intelligent. [8]

Gaps Identified

The lack of study material and information about automated industry. There is not sufficient awareness about web based controlling.

Poor network connectivity (mainly backward areas), cybercrime, data protection are the challenges in front of industrial IoT.

III. PROPOSED MODEL OF SYSTEM

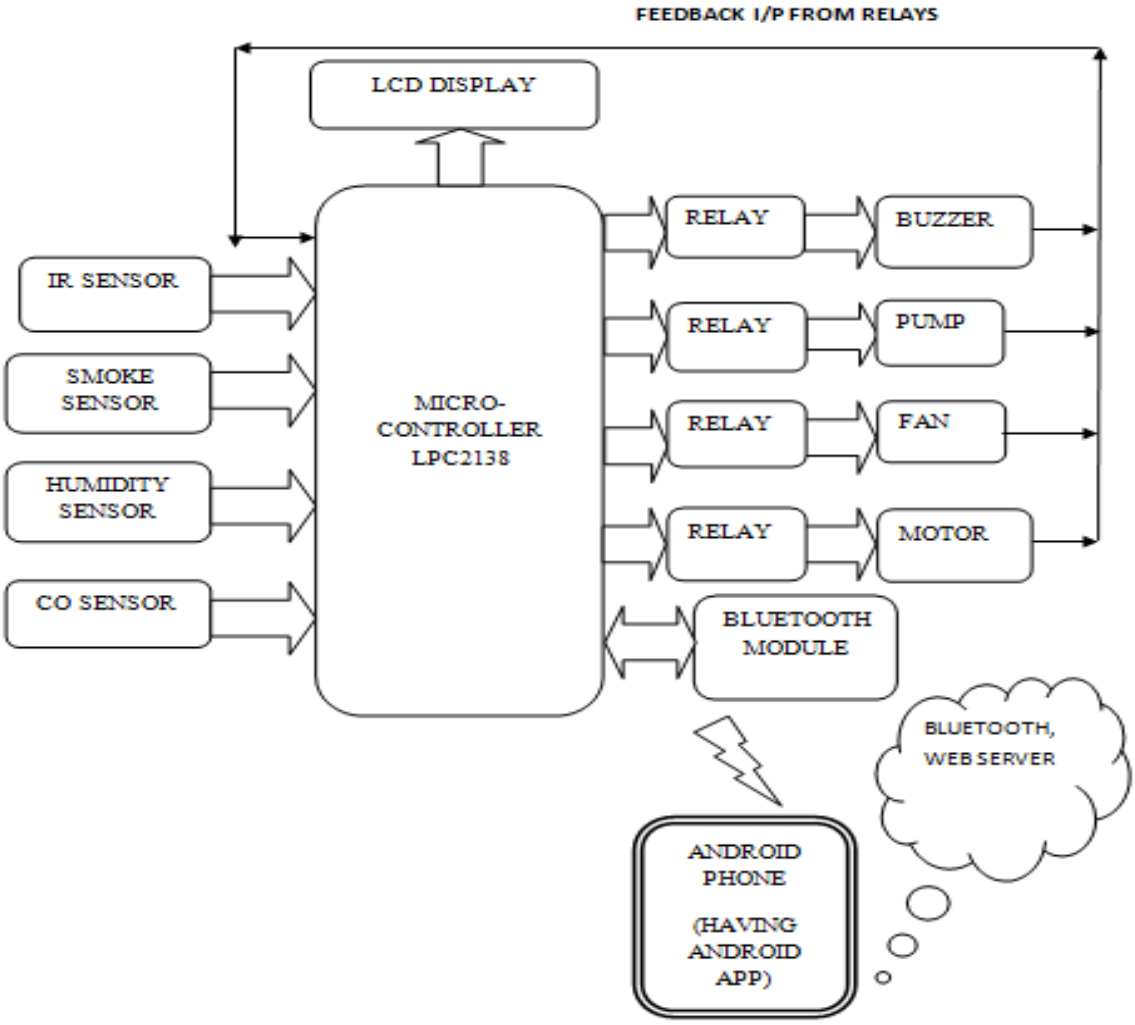

Fig 2: Block diagram of the system

The system is designed for monitoring and controlling various parameters in the industry wirelessly with the help of Android APP from Web page designed for our system.

The system consists of Microcontroller LPC2138 which will perform all controlling action , LCD (Liquid Crystal Display) is used to display the status of the process and Bluetooth Module for wireless transmission of data between Android phone and microcontroller. Android gives you a facility to configure your project directly from your Android device. It is a very fast operating system having immediate connection to other peripheral.

Various sensors for measurement of respective parameters

IR sensor is used for obstacle detection purpose. Therefore, whenever somebody is entered into secured zone is detected by the IR sensor and buzzer will be automatically ON to indicate that the obstacle is detected.

Smoking and Fire detection is done with the help of smoke sensor interfaced to the controller. Pump will be turned ON by the controller when excess smoke detected by the sensor in order to stop the fire catches in industries.

The humidity sensor is used for detection of humidity in the environment when high quantity of humidity is detected then fan will be turned ON by the controller to maintain the level of humidity.

The CO sensor is used for detection of carbon monoxide gas in the industrial area. The motor will be turned ON for indication of increased proportion of CO gas.

Web control

All parameters measured by the respective sensors interfaced to the Micro-controller and then microcontroller will send these parameters to the Android phone via Bluetooth module .These parameters are then uploaded on web server with the help of Android APP which is designed from the web page so that user is able to monitor and control all these parameters from anywhere.

Feedback input

The information related status of load or device connected to the relay is given as feedback input to the controller. That is after turning ON the relay whether device connected to the relay is actually turned ON or not is given as a feedback to the Microcontroller.

The software required are eagle, eclipse, keil u-vision 4 and proteus. Eagle software is used for circuit designing and PCB layout. Eclipse is used for designing android app with Java language, keil u-vision 4 software used with embedded C platform. Simulation is done with proteus software.

IV. RESULT AND DISCUSSION

Sensors (Humidity sensor, CO sensor, Smoke sensor, Intrusion sensor) are used to percept the environment parameters and object conditions. All these parameters measured by the respective sensors interfaced to the Micro-controller and then microcontroller will send these parameters to the Android .Communication between Android phone and controller system is done wirelessly with the help of Bluetooth technology. Admin set particular threshold or set value for each sensor. Android check incoming signal value against threshold value. If sensor value reaches above threshold value, message will be send to mobile number which is entered by admin. Parameters measured by the respective sensors uploaded on web server with the help of android app so that user is able to monitor and control all these parameters from remotely.

Take one example. If there, proportion of humidity is high than set value then message displays as 'Humidity level has crossed the limit'. Then we have to start the server. After that, web page will be displays. Here link "ON" is given in front of 'fan' used for controlling purpose. Click above the link "ON" so that fan gets started. Hence, we monitored and controlled all parameters from remotely.

The result is given to the following table:

PARAMETERS	SET VALUE	OBSERVED VALUE
HUMIDITY	50	57
CO GAS	10	03
SMOKE	10	08

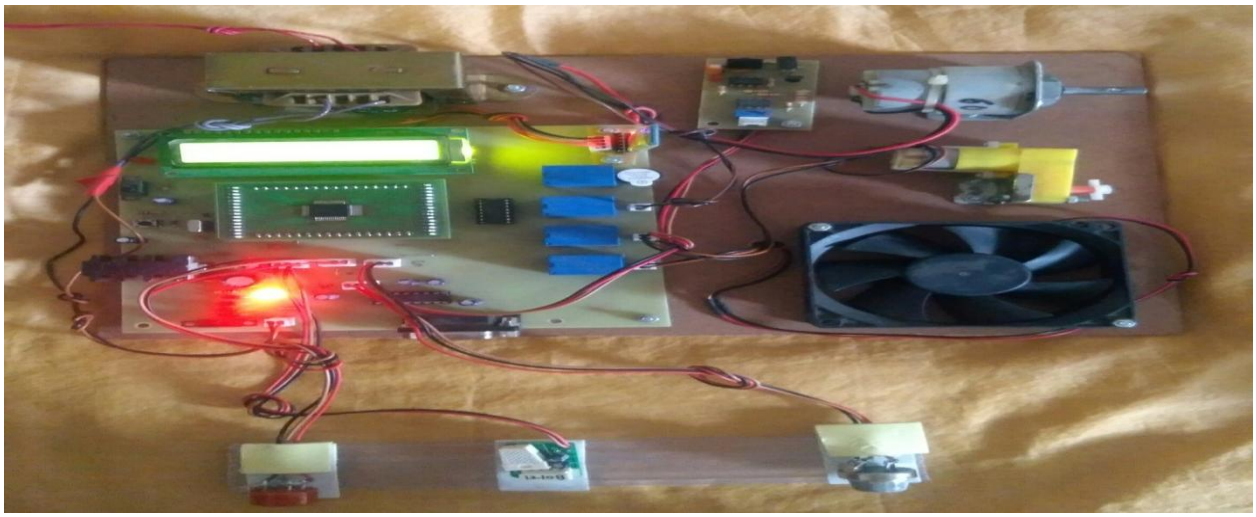

Figure3: Hardware design of the system

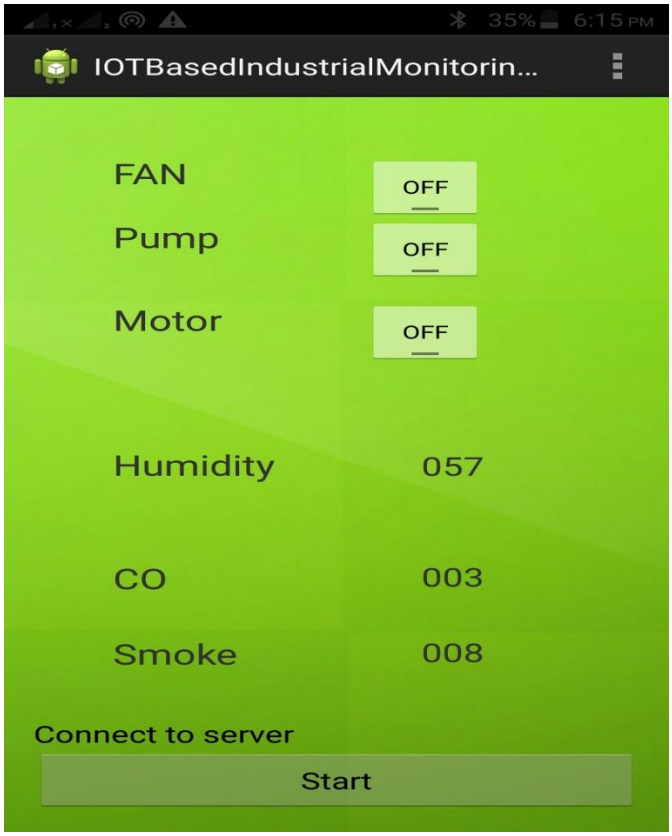

Figure4: Android application

Figure5: Web page design

V. CONCLUSION AND ENHANCEMENTS

Nowadays we need everything computerized. Earlier we can only monitor the situations with the help of cameras. Manual intervention required for monitoring and controlling. This is Time consuming process. Sometimes it will be late in this process and it will harm to property as well as life. In industries to reduce manual overhead we have implemented a system for Industrial Automation using IoT . The system is designed

for monitoring and controlling various parameters in the industry wirelessly with the help of Android APP from Web page designed for our system using IoT.

Enhancements

There is scope for develop a system which can be automatically control parameters based on the alerts/ indications from the monitoring system that is present sensor values reach to the set threshold values automatically.

Limitations of study

The study is not discussed on solutions of challenges in front of industrial IOT such as security, technical limitation, unemployment due to machines etc.

Sources of funding of the study

Study was self financed by author.

Implications of the Finding

The proposed system is helpful to excess production, economy improvement, and remote access and reduces manual intervention that makes human life convenient and enjoyable.

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