IoT Based Industrial Parameters Monitoring and Alarming System using Arduino - A Novel Approach

Sagar Prem Lalwani[1], Mehakpreet Kaur Khurana[2], Swati Jaikumar Khandare[3], Obaid Ur Rehman Ansari[4], Dr. Sanjay B. Pokle[5]
Student[1, 2, 3, 4], Professor[5]
Department of Electronics and Communication Engineering
Shri Ramdeobaba College of Engineering and Management, Nagpur, Maharashtra, India

Abstract:
Today, smart grid, smart homes, smart water networks, intelligent transportation, are infrastructure systems that connect our world more than we ever thought possible. The common vision of such systems is usually associated with one single concept, the Internet of Things (IoT), where through the use of sensors, the entire physical infrastructure is closely coupled with information and communication technologies; where intelligent monitoring and management can be achieved via the usage of networked embedded devices. These devices will connect to internet to share different types of data. We have proposed an Industrial Monitoring System using XAMPP server and sensing based applications for internet of things. In this paper we use sensing devices to check different parameters like production count, illumination intensity, power consumption, relative humidity and temperature of room.

1. INTRODUCTION

There are many things we hear about industrial internet of things as it is a new emerging technology. We use sensors to continuously monitor industry appliances which is highly impossible to be managed by human. Here an attempt is made to develop an auto-monitoring system through which the industry person can monitor the parameters on a website which can be accessed either on phone or on personal computer and generate alert signals through the website that will alert the people working in the industry through alarm. The website is created by utilizing XAMPP server interfacing with database that is using 'PHP' language as the guideline of the framework. 'PHP' stands for hypertext preprocessor which is a web page programming language that was designed to produce dynamic web pages. For this purpose PHP code is embedded into the HTML source file with PHP tags and interpreted by the web server. This framework is centered on recording and updating the information and also providing facility for the industry person to send alert signal to the industry workers if required.

2. LITERATURE SURVEY

The concept of the internet of things was introduced by the members of the radio frequency identification development community in 1999. This concept is very popular because of the growth of mobile devices, embedded and real time communication, cloud computing and data analytics. The internet of things is a network of physical objects embedded with electronics, software and sensors having the ability to collect data from the world around us and share data across the internet.The term internet of things refers to the general idea of things, especially everyday objects that are readable, locatable, recognizable, addressable and controllable through the internet, irrespective of the communication means such as wired or wireless LAN, WAN or any mean. The things or objects of real world can be People, Location (object), Time of information

(object) or Condition. These things can easily get integrated in the virtual world enabling anytime, anywhere connectivity. Now, the system architecture also includes different types of elements which are shown as follows:

1. Sensors: The sensors are the devices that are useful for gathering the information at the point of activity. This information is actually captured by appliances, wearable devices, some specific device mounted controls, and so on. Thus these are the elements of IoT that sense any type of information depending upon purpose of the application.

2. Communication: The information sensed by various sensors needs to be transmitted to a cloud based service for subsequent processing. This requires Wi-Fi, WAN, LAN or some internet communication network. Along with this communication networks the support for other capabilities such as Bluetooth, short range communication method or GPS for locating the positions is often required for effective communication. The communication network is typically based on the M2M technique. The M2M stands for machine to machine communication system in which at one end sensors are attached to sense any desired information and at other end the devices that deliver the information to the actual user are attached.

3. Cloud based capture and consolidation: Gathered data is transmitted to a cloud based service. At this cloud, the useful information is provided for the end user. Some information processing is also done at this level.

4. Delivery of Information: This is actually the last step of delivery. This is the point at which end user, commercial user or industrial user comes into picture. The goal of delivery of information is to provide information in as simple and transparent manner as possible. The delivery of information typically needs the execution of well-designed and optimized user interface across multiple platforms. The delivered

information should run on various operating systems such as Android, Windows and Linux and so on.
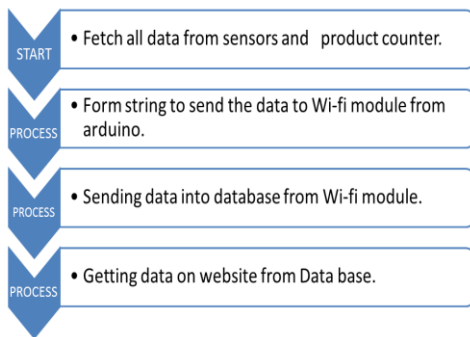
3.1 BLOCK DIAGRAM
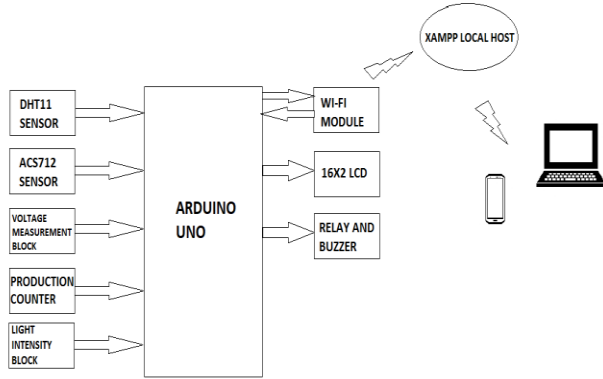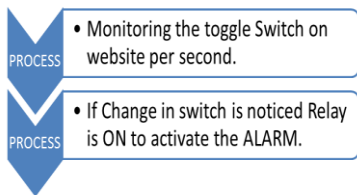

3.2 FLOWCHART

Figure.1. Up Flowchart

Figure.2. Down Flowchart

4. COMPONENT DESCRIPTION

4.1 Arduino UNO

The Arduino UNO is a widely used open-source microcontroller board based on the ATmega328P microcontroller and developed by Arduino.cc. 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 14 Digital pins and 6 Analog pins. It is programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts.

4.2 Wi-Fi Module (ESP8266)

ESP8266 offers a complete and self-contained Wi-Fi networking solution, allowing it to either host the application or to offload all Wi-Fi networking functions from another application processor. When ESP8266 hosts the application, and when it is the only application processor in the device, it is able to boot up directly from an external flash. It has integrated cache to improve the performance of the system in such applications, and to minimize the memory requirements.

4.3 Current Sensor (ACS712)

The Allegro ACS712 provides economical and precise solutions for AC or DC current sensing in industrial, commercial, and communications systems. The device consists of a precise, low-offset, linear Hall sensor circuit with a copper conduction path located near the surface of the die. Applied current flowing through this copper conduction path generates a magnetic field which is sensed by the integrated Hall IC and converted into a proportional voltage. Device accuracy is optimized through the close proximity of the magnetic signal to the Hall transducer.

4.4 Temperature & Humidity Sensor (DHT11)

This DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal-acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component, and connects to a high performance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost-effectiveness.

5. PROPOSED ARCHITECTURE

Temperature & humidity sensor, the production count circuit, illumination intensity circuit and power consumption circuit are used to percept the environment and object conditions. Analog signals are provided to Arduino device produced by sensors and circuits. The digital equivalent of these signals is transmitted to the database server by virtue of the Wi-Fi module interfaced with the Arduino. 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. In this we use LAN as database for scalability. The industry person who will check the status of the industry through the website will have to login using a user id and password to get access to the website, this ensures security of the data.

OBJECTIVE:
- Maintenance of industrial device is crucial
- Reduce the maintenance cost
- Optimize critical monitoring system

Website Development Optimization using XAMPP/PHP:
XAMPP is a free and open-source, cross-platform web server solution stack package consisting mainly of the Apache HTTP server, MySQL database and interpreters for scripts written in PHP programming language.
Website designing using HTML-CSS:
Steps involved in website development process:

1. Analysis
2. Design & Development
3. Content writing
4. Coding
5. Testing & security
6. Maintenance & update.

APACHE –Apache is a web server program that is responsible for talking to web browsers and connecting them with the information they request. MySQL (Structured Query Language): MySQL is relational database management system (RDBMS) that facilitates the storage and retrieval of structured information. PHP (Hypertext Preprocessor): PHP is a scripting language that interfaces with Apache to provide content that is dynamically generated, often from information that is stored in a database.

A TYPICAL REQUEST GOES AS FOLLOWS:

1. Apache receives a request for URL and forwards this request onto PHP.
2. PHP sends 'queries', in a language called SQL, to the database, which responds by generating the required information.
3. PHP formats the information into the webpage constructed from HTML that is then passed back to Apache.
4. Apache sends the webpage to the browser which displays it to the user.

6. RESULT

6.1. Login Page
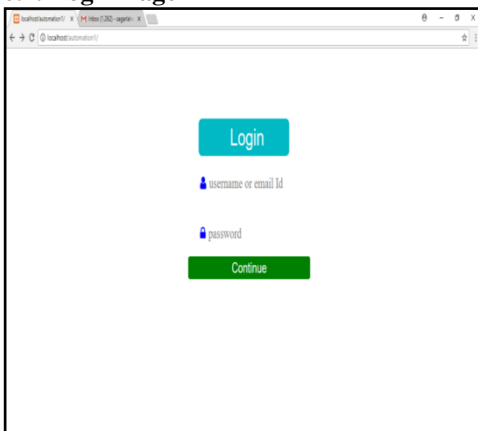
6.2. Website Display

7. ADVANTAGES

TECHNICAL FEASIBILITY: This system is specially designed for authorized users who can use the network and start secure communication online through internet in the periphery of the existing network. The system is technically feasible. The system consists of client server architecture and coded in java which are easily available. All the resources that are required for the system can be made available easily.

AVAILABILITY OF REAL TIME DATA: The availability of data in real time can reduce downtime as abnormal conditions are identified as they happen and solutions are accessible rapidly. An embedded controller linked to sensors in the process can often predict possible failures and take action or request a service call. Technicians have remote access to sensor data and to actuators allowing them to issue commands. The production line may not have to shut down and the causes of failures can be identified and resolved reliably.

USE OF ARDUINO UNO: It is a low powered architecture, easy to get started, with great online support, rapid prototyping super easy that is capable of sending data wirelessly to the server via a computer with a lot of GPIOs with PWM capabilities and maker friendly.

FUTURE DEVELOPMENT: This paper based on IoT can be further expanded by providing additional facility to the industry person with the help of Android app for achieving better control and monitoring of industry. Further, smoke and gas sensors can be interfaced with the system to ensure security of industry workers and goods in case of fire or toxic gas leakage.

8. APPLICATIONS

1. Electronic toll collection system.
2. Heating and air conditioning systems.
3. Home security devices.
4. Indoor Air Quality: Monitoring of toxic gas and oxygen levels inside chemical plants to ensure safety of workers and goods.
5. Compost: Control of humidity and temperature levels in alfalfa, hay, straw, etc. to prevent fungus and other microbial contaminants.

9. 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.

10. REFERENCES

[1].Ashwini Deshpande, Prajakta Pitale, Sangita Sanap, "Industrial Automation using Internet of Things (IOT)", IJARCET Volume 5 Issue 2, February 2016.

[2]. Geetesh Chaudhari, Sudarshan Jadhav, Sandeep Batule, Sandeep Helkar, "Industrial Automation using Sensing based Applications for Internet of Things", IARJSET Vol. 3, Issue 3, March 2016.

[3]. Keyur K. Patel, Sunil Patel, "IOT Based Data Logger for Monitoring and Controlling Equipment Working Status and Environmental Conditions", IJIRCCE Vol. 4, Issue 4, April 2016.

[4]. Mahesh Jivanii, Sharon Panth, "Wireless IEEE 802.11 Based Device Control Ad-Hoc Network Using Responsive Web Design (RWD)", IJ-ETA-ETS Volume 7 Issue 1, Jan'14 – Jun'14.

[5]. IoT: https://dzone.com/articles/the-internet-of-things-gateways -and-next-generatio

[6]. W3Schools: https://www.w3schools.com

[7]. Connect to MySQL with PHP in XAMPP / Create a new database: https://www.youtube.com/watch?v=ueWpNe0PG34

[8]. create mysql database, tables and insert data using php functions: https://www.youtube.com/watch?v=5QHBj4brHNM