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Industrial Robotization Utilizing IOT

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ABSTRACT

The Internet of Things deals with bringing control of devices over Internet. The Internet of Things is the network of physical devices, vehicles, buildings, software, sensors, actuators and network connectivity that enable these objects to collect and exchange data. For example, any physical object can be transformed into an IOT device if it can be controlled or communicate information. Industrial automation is the use of control systems such as computers or robots for handling the different processes and machineries in an industry to replace a human being. Industrial automation fulfills the aim of the company by allowing the company to run a manufacturing plant for 24 hours a day this leads to significant improvement in the productivity of the company. Robots can be programmed to do any task. This makes the manufacturing process more flexible. This proposed system connecting the industry machine with the mobile application for the industry automation. Being at one place user will get access over all the machineries in the industry. It makes the whole system automated. In this Project proposed efficient industry automation system that allows user to control the industry appliances over the internet and also user can monitor the temperature level, gauge level and humidity level through the mobile application. If there is any fire in the industry user will get the fire alert through the mobile application. Industry Automation reduces the manwork in industry.

Keywords : Automation, IoT, Mobile Application, Robot, Sensor.

I. INTRODUCTION

Internet of things is the propagating and blooming technology. IOT is the collection of sensors data through embedded system and this embedded system upload the data on the internet. There are lot of challenges in IOT and industrial automation for example trust, data integrity, data and service security, information privacy and scalability. The field of automation had a notable impact in a wide range of industries beyond manufacturing. Automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services. Automation is greatly decrease

the human sensory and mental requirements as well. This proposed system monitor the fire alert, temperature level, humidity level and gauge level and programmed robotic arm do the work in automatic. Fire is the major cause of accidental death claiming valuable lives and expensive property.

The major property of fire is it spreads exponentially with time spreading in no period of time and destroys everything it catches. Hence the detection of fire in time is important so that many lives and property can be saved. It can detect smoke, the rise in temperature, rise in flame etc. The proposed system is capable of detecting smoke, different gases and fire. The proposed system user can monitor the temperature level, humidity level, gauge level and fire alert through the mobile application. The robotic arm is doing the certain task. A robotic arm is type of mechanical arm that usually programmable, it has some similar functions to a human arm. In industrial robots do indeed offer considerable advantages if they are used at the right time, in the right place and for the right task.

a. IoT platforms and architecture

Cloud-based IoT platforms and architecture connect the real and virtual worlds. They help companies manage IoT device connectivity and security – as well as collect device data, link devices to backend systems, ensure IoT interoperability, and build and run IoT applications.

b. Harnessing the IoT data explosion

Smart devices generate a massive amount of IoT data that needs to be analysed and leveraged in real time. This is where predictive and Big Data analytics come into play. Machine learning is also used to add context to data – and trigger actions without human intervention.

c. IoT benefits to organization

The internet of things offers several benefits to organizations. Some benefits are industry-specific, and some are applicable across multiple industries. Some of the common benefits of IoT enable businesses to

- Monitor their overall business processes;
- Improve the customer experience (CX) ;
- Save time and money;
- Enhance employee productivity;
- Integrate and adapt business models;
- Make better business decisions; and
- Generate more revenue.

d. The Industrial Internet of Things (Eliot) & M2M

In manufacturing, the IoT becomes the Industrial Internet of Things (Eliot) – also known as the Industrial Internet or Industry 4. 0. The Eliot uses machine to machine (M2M) technology to support everything from remote monitoring and telemetry to predictive maintenance.

II. RELATED WORK

Sasikumar et al, IOT is achieved by using local networking standards and remotely controlling and monitoring industrial device parameters by using Raspberry Pi and Embedded web server Technology. Raspberry Pi module consists of ARM11 processor and Real Time Operating system whereas embedded web server technology is the combination of embedded device and Internet technology. Using embedded web server along with raspberry pi it is possible to monitor and control industrial devices remotely by using local internet browser. Muskan et al, They have developed new technologies that have allowed us to move from the First generation of the Internet into the current transition into the Fourth

generation. This generation has been propelled by the concept of the Internet of Thing.

Navya R Sogi et al proposed method using the raspberry pi running with Linux OS coded with C++ program that retrieves the temperature as well as humidity readings and these values are sensed and sent to the internet. Shivani Ahir et al presents a PC based temperature monitoring and control system using virtual instrumentation, LabVIEW. Data acquisition is an important role in industry in order to ensure the quality of service. Temperature sensor measures the temperature and produce corresponding analog signal which is further processed by the microcontroller. The simulator acquires data from the microcontroller through Ethernet port. The data will be displayed on the LCD in microcontroller and PC monitor. Automation and control can be done with the help of control circuitry.

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III. SYSTEM MODEL

a. Proximity Sensor

A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact. A proximity sensor often emits an electromagnetic field or a beam of electromagnetic radiation (infrared, for instance), and looks for changes in the field or return signal. The object being sensed is often referred to as the proximity sensor's target. Different proximity sensor targets demand different sensors. For example, a capacitive proximity sensor or photoelectric sensor might be suitable for a plastic target; an inductive proximity sensor always requires a metal target. Proximity sensors can have a high reliability and long functional life because of the absence of mechanical parts and lack of physical contact between the sensor and the sensed object. Proximity sensors are also used in machine vibration monitoring to measure the variation in distance between a shaft and its support bearing. This is common in large steam turbines, compressors, and motors that use sleeve-type

b. Ultrasonic Sensor

The ultrasonic sensors are devices that generate or sense ultrasound energy. They can be divided into three broad categories: transmitters, receivers and transceivers. Transmitters convert electrical signals into ultrasound, receivers convert ultrasound into electrical signals, and transceivers can both transmit and receive ultrasound. In a similar way to radar and sonar, ultrasonic transducers are used in systems which evaluate targets by interpreting the reflected signals. For example, by measuring the time between sending a signal and receiving an echo the distance of an object can be calculated. Passive ultrasonic sensors are basically microphones that detect ultrasonic noise that is present under certain conditions.

The design of transducer can vary greatly depending on its use: those used for medical diagnostic purposes, for example the range-finding applications listed above, are generally lower power than those used for the purpose of changing the properties of the liquid medium, or targets immersed in the liquid medium, through chemical, biological or physical effects. The latter class include ultrasonic probes and ultrasonic baths, which apply ultrasonic energy to agitate particles, clean, erode, or disrupt biological cells, in a wide range of materials.

c. Temperature Sensor

Ordinarily, temperature is a qualitative measure for classifying how matter appears to be hot or cold. More specifically, matter is made up of moving particles (molecules), each molecule has its own motion speed, the kinetic energy. Temperature is a physical parameter that describes the average kinetic energy of molecules, it is not a measure of energy itself, but it is proportional to the average kinetic energy of molecules. That means that the hotter molecules are, the more they move and the higher is the temperature. By contrast, when molecules do not move at all, i. e., their kinetic energy is zero, so the temperature is 0ºK (absolute zero, -273. 15ºC).

d. Gas Sensor

MQ-9 gas sensor using gas-sensitive materials with lower conductivity in clean air tin oxide (SnO2). High and low temperature cryogenic loop detection mode (1. 5V heating) to detect carbon monoxide sensor conductivity increases with the increase in the concentration of carbon monoxide gas in the air, high temperature (5. 0V heating) detection of combustible gases methane, propane and cryogenic cleaning adsorption of stray gas. Changes in the conductivity can be converted to an output signal corresponding to the concentration of the gas using a simple circuit. MQ-9 high sensitivity to carbon monoxide, methane, liquefied gas sensor, this sensor can detect a variety of carbon monoxide and the flammable gas is a suitable for a variety of application.

e. Fire Sensor

A flame detector is a sensor designed to detect and respond to the presence of a flame or fire, allowing flame detection. Responses to a detected flame depend on the installation, but can include sounding an alarm, deactivating a fuel line (such as a propane or a natural gas line), and activating a fire suppression system. When used in applications such as industrial furnaces, their role is to provide confirmation that the furnace is working properly; it can be used to turn off the ignition system though in many cases they take no direct action beyond notifying the operator or control system. A flame detector can often respond faster and more accurately than a smoke or heat detector due to the mechanisms it uses to detect the flame.

f. PH Sensor

PH sensor is one of the most essential tools that's typically used for water measurements. This type of sensor is able to measure the amount of alkalinity and acidity in water and other solutions. When used correctly, pH sensors are able to ensure the safety and quality of a product and the processes that occur within a wastewater or manufacturing plant. In most cases, the standard pH scale is represented by a value that can range from 0-14. When a substance has a pH value of seven, this is considered to be neutral. Substances with a pH value above seven represent higher amounts of alkalinity whereas substances with a pH value that's lower than seven are believed to be more acidic. For instance, toothpaste typically comes with a pH value of 8-9. On the other hand, stomach acid has a pH value of two.

g. ESP8266 Wi-Fi Module

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.

h. Sim900A

The Sim900A has 2 built in RS232 serial ports. One is for common communications to allow a PC to talk to the module, and the other is a "service" RS232 port (the "debug" port) used for upgrading firmware, and probably other similar tasks. The SIM900A communicates at TTL voltage levels (0 to supply voltage-0. 1V) on these ports, and my module has an onboard MAX232 chip on the communications port only to translate RS232 at TTL level to the standard voltage levels (-12V to 12V) and can interface directly to a PC. It can be accessed the communications port at TTL levels if remove the jumpers near the antenna connector.

IV. PROPOSED SYSTEM

The proposed technique incorporates four essential sensors known as proximity sensors, Temperature sensor, Gas sensor and fire sensor. In this proposed system node MCU used to connect all the sensors.. Gas sensor analog output to connect to the ADCO (A0) of node MCU. We can directly use the ADC pin (A0) for reading analog voltages in the range of 0V to 33V. Flame sensor digital output to D5 (GPIO14) of node MCU. The temperature sensor is connected to D6 (GPIO12) of node MCU. In LCD display SDA to D8 (GPIO15) and SDK TO D7 (GPIO13) of node MCU pins. Other pin of LCD are given to the power pins of node MCU. In robotic arm the servo 1 is connected to the D1 (GPIO05) of node MCU. Servo 2 is open source firmware that is built on top of the chip manufacturer's proprietary SDK.

The firmware provides a simple programming environment, which is a very simple and fast scripting language. The ESP8266 chip incorporates on a standard circuit board. The board has a built in USB port that is already wired up with the chip, a hardware reset button, Wi-Fi antenna, LED lights, and standard sized GPIO (General Purpose Input Output) pins that can plug into a breadboard. It has processor called L106 32 bit RISC microprocessor core based on the Tensilica Xtensa Diamond Standard 106Micro running at 80 MHz and has a memory of 32 K bit instruction RAM, 32 K bit instruction cache RAM, 80 K bit user data RAM&16 K bit ETS system data RAM. It has inbuilt Wi-Fi module of IEEE 802. 11 b/g/n Wi-Fi.

Sensor working principles

Ultrasonic sensors emit short, high-frequency sound pulses at regular intervals. If they strike an object, then they are reflected back as echo signals to the sensor, which itself computes the distance to the target based on the time-span between emitting the signal and receiving the echo. The basic principle of working of the temperature sensors is the voltage across the diode terminals. If the voltage increases, the temperature also rises, followed by a voltage drop between the transistor terminals of base and emitter in a diode.

Sensitive material of the MQ9 gas sensor is SnO2, which with lower conductivity in clean air. It makes detection by the method of cycle high and low temperature, and detect CO when the low temperature (heated by 1. 5V). When a high temperature (heated by 5. 0V), it detects Methane, Propane, etc. A fire detector works by detecting smoke and/or heat. These devices respond to the presence of smoke or extremely high temperatures that are present with a fire. However, other sensors are multi-function, and they will detect the presence of both smoke and high temperatures.

The overall working principle of pH sensor and pH meter depends upon the exchange of ions from the sample solution to the inner solution (pH 7 buffer) of glass electrode through the glass membrane. The porosity of the glass membrane decreases with the continuous use that decreases the performance of the probe.

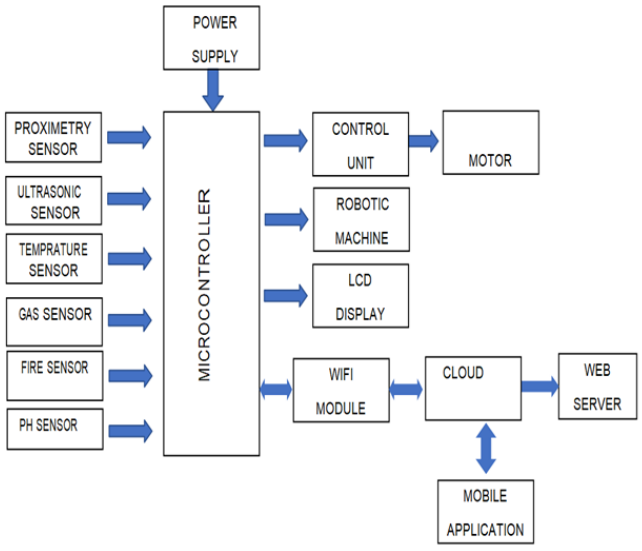

Figure 1. Block Diagram

V. PROPOED SYSTEM IMPLEMENTATION

Proximity sensor which is known as infrared. sensor which will detect the light. Ultrasonic sensor will detect the sound. The temperature sensor is known asLM35 which will detect the temperature level. Gas sensor known as MQ9 sensor which will detect the carbon-monoxide. Fire sensor which will detect the fire. PH sensor is to detect the active hydrogen level. The power supply is used to give the current to node MCU. Mobile app is used by the user to perform certain tasks. This task where received to wifi it will given to MCU at that time output pin of MCU will give the current to control unit which 8s relay module. When the power supply is given to relay module it will generate the electro magnetic waves and the machines will start to work. LCD display is used to display the current information of the machines and the web server is used to store the data. Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things. Blynk Server - responsible for all the communications between the smartphone and hardware. Blynk is a new platform that allows you to quickly build interfaces for controlling and monitoring your hardware projects from iOS and Android device.

VI. CONCLUSION

Implementation of web server using arduino for intelligent monitoring is a new method to monitor an industrial environment which designed here for the real time implementation. This system can have communication Port. It supports online supervision and control Private Network (LAN) as well as Public Network (Internet). The whole system has good portability, good openness and low cost and it is also easy for maintenance and upgradation. It is possible to interface various kinds of Sensors with these modules and make different applications. This system can monitor embedded system operation straight through Internet and achieve network monitoring. This work can further be extended by using high end embedded servers with wireless sensor networks with increase in sensor nodes and parameters. Automation through IOT can help to get rid of the short distance

communication. Thus, introducing internet in industries can help to have control over the application from all over world. In future, the project can be improved by creating an individual website for different industry. It also be improved by expanding it to the private industry and sectors for better improvement by connecting a Arduino instead of Raspberry pi.

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