

Industrial Automation using IOT having Intelligent Security System

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ABSTRACT

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 automatically monitor the industrial applications and generate Alerts/Alarms or take intelligent decisions using concept of IoT. Security has becoming an important issue everywhere. Home, industries and vehicle security is becoming necessary nowadays as the possibilities of intrusion are increasing day by day. Safety from leaking of raw gas and fire are the most important requirements of home and industries security system for people. A traditional security system gives the signals in terms of alarm. However, the GSM based security systems provides enhanced security as whenever a signal from sensor occurs, a text message is sent to a desired number to take necessary actions in this system use GPS and GSMA main contribution of this review paper is that it summarizes uses of IoT in industries with Artificial Intelligence to monitor and control the Industry.

Key words: IoT, GSM, GPS, Artificial Intelligence.

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I. INTRODUCTION

Home and industries security has changed a lot from the last century and will be changing in coming years. Security is an important aspect or feature in the smart home applications. The new and emerging concept of smart homes offers a comfortable, convenient, and safe environment for occupants. Conventional security systems keep homeowners, and their property, safe from intruders by giving the indication in terms of alarm.

This report mainly focuses on the security of a industries when the user is away from the place and industrial areas away from cities if fire occurs during night this system sends the location details by means of sending longitude and latitude angles by using GPS and sends messages to fire station, police station, and predefined numbers. At the fire and police station received information has a destination address to find route in google map from fire and police station. This system uses fire sensors and gas sensors that finds fire occurred or not if occurred it sends control signal to microcontroller. The microcontroller receives the GPS information by GPS modem connected to the microcontroller and it sends the message using GSM modem containing information of longitude and latitude

angle calculated by GPS. The microcontroller also sends signal to the alarm and signal to the emergency window that opens by means of actuators.

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.

In previous year, Industry was monitored manually, but this report introduces Artificial Intelligent to monitor as well as control the Industry autonomously without human intervention.

II. LITERATURE SURVEY

Industrial automation involves the integration of physical machinery and processes with sensors, computers, and software. The result is an intelligent manufacturing infrastructure for increased safety and efficiency, and lowered costs. However, industrial automation comes with its own set of challenges. These include the need to connect multiple proprietary control systems, maintain end-to-end system uptime, reduce energy consumption and total costs, adhere to regulatory requirements, and increase safety and security at every phase.

At its core, industrial automation aims to bring together the advances of two transformative revolutions: the machines, facilities, fleets and networks that arose from the Industrial Revolution, and the powerful advances in computing, information and communication systems established via the Internet Revolution. The intersection of these two diverse and disparate sets of technologies often results in a mixture of individual solutions. Businesses need their distributed manufacturing and business processes and control systems to behave like a single, flexible computing platform combined securely with a modern development platform to build, deploy and update applications.

The next major transformation in industrial automation is underway. Intelligent devices, ubiquitous Internet connectivity and growing IT infrastructure are combining to uncover and drive new business opportunities. As manufacturers increasingly automate their processes and machines, they become an important and growing segment of the Internet of Things (IoT). This term is used to define a system in which the Internet is connected to the real world via ubiquitous sensors and devices. The vision of IoT is to integrate diverse sets of data from physical sensors and the rest of IT to enable analytics that can anticipate events, issues and other needs. As a result, the system as a whole can have a view of what's taking place at any location and point in time. This leads to a set of connected systems that could greatly reduce waste, lower costs, and eliminate loss for just about any human-machine or machine-machine activity.

Fully leveraging low-cost, low-energy sensors and devices that make up the Internet of Things can help unlock savings in terms of power consumption and total system cost. IoT enables sensors and end devices to directly communicate with enterprise infrastructure to provide in-context data awareness around system functionality. According to the 2014 VDC Research paper, "Brewing Embedded Market Success with Java," IoT technology is helping manufacturers sell more products, and bundle additional services with each sale.

A robust IoT platform allows you to seamlessly integrate every automation system and component via standard communication protocols, linking controllers and actuators, machinery, enterprise systems, automated systems, and even video and audio feeds. The goal is to combine sensors and devices (and their data) with analytics to discover

previously untapped operational efficiencies and achieve greater optimization.

IoT is driving a new generation of controllers and sensors with increased connectivity and embedded intelligence to further increase automation, optimization and uptime. Wireless IoT protocols deliver expanded connectivity with easier integration across manufacturing sites.

By combining device data with analytics, you'll uncover hidden value in your automation data, such as the ability to predict the onset of equipment failure and initiate repairs before they occur, and gain greater system insight. Additionally, easier and cheaper integration of devices and systems equates to increased innovation and the creation of end-to-end process feedback loops. All of this enables continuous refinement in your processes and greater system intelligence, giving you a competitive edge.

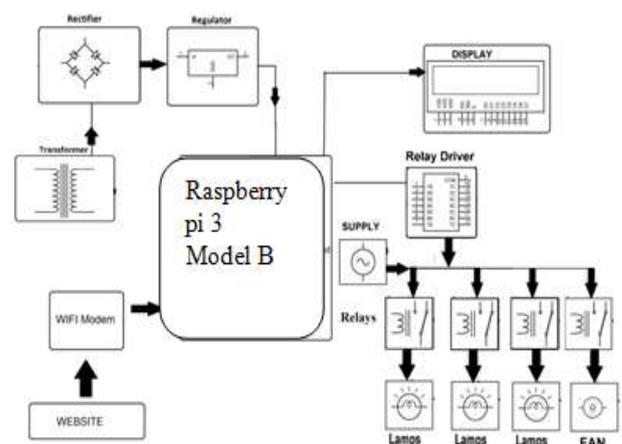
III. PROPOSED SYSTEM

1) For Automation:

Our system uses an ARM family microcontroller for processing all user commands. A WIFI modem is used to connect to the internet and receive user commands. On sending commands through the internet they are first received by our WIFI modem. The modem decodes information and passes it to the microcontroller for further processing. The microcontroller then switches loads and operates the motors as per Receivers commands. Also it displays the system state on an LCD display. Thus we automate entire industry using online GUI for easy industry automation.

2) For Security System

Proposed system consists of various sensors like fire sensor, gas sensors, light sensor, PIR sensor, Magnetic switch, Ultrasonic sensor etc. Home appliances like LED lights and fans are also connected to make the home energy efficient. The proposed system is controlled by an ARM microcontroller. If fire sensor detects fire then send control signal to the microcontroller interfaced to it the microcontroller take necessary action like emergency alarm, emergency window opener and sending location information to the host using Cloud Messaging.



IV. COMPONENTS

- Hardware Specifications for Automation
 1. Raspberry pi 3 Model B
 2. Motors
 3. Power supply
 4. Motor Driver
- Hardware Specification for Security system:
 1. Ultrasonic Sensor
 2. Magnetic Switch sensor
 3. PIR sensor
 4. Actuators
 5. Smartphone

Raspberry Pi 3

- Quad-core 64 bit ARM Cortex A53, 1.2 GHz
- HDMI, Composed video via 3.5 jack.
- 10/100 Mbps, Ethernet and 802.11 wireless LAN
- 40 Pins, Default 17 GPIO
- Power Source 5V, 2.5A Micro-USB.
- Small size, Weight- 45gm.

PIR Motion Sensor

- Power requirement- 5 volt 500mA.
- Sensitivity up to 10 feet.
- TTL compatible.
- Easy interfacing.
- Detects change in infrared energy.
- Energy saver.

Piezoelectric Sensor

Sensor/ Transducer Type	
Accelerometer	Sensor to measure acceleration that makes use of the piezoelectric effect
Bio Sensor	Bio sensors are designed to sense and measure biological processes.
Strain Gauge	Strain gauges measure force that makes use of the piezoelectric effect
Pressure Sensor	Pressure sensors measure pressure that makes use of the piezoelectric effect
Temperature Sensor	Sensor measure temperature that makes use of the piezoelectric effect
Vibration Sensor	Sensor measures vibration that makes use of the piezoelectric effect

Magnetic Switch

- Min ON switching distance-3mm
- Max OFF switching distance-14mm
- Switching Capacity 30V dc max
- Operating Temperature -5° to $+70^{\circ}\text{C}$ ($+23^{\circ}$ to $+158^{\circ}\text{F}$)
- Repeat Switching Accuracy ± 0.1 mm (± 0.004 inches)

V. THE CHALLENGES OF IOT IN INDUSTRIAL AUTOMATION

Increased automation and non-human intervention represents enormous potential for increased efficiency and value throughout the entire industrial domain. The Internet of Things adds to this by vastly increasing the potential to innovate. But with all of this come potential challenges and concerns.

» **Safety and security:** The first challenge is the safety of workers and security of systems involved in production, control, and monitoring processes. This is the central challenge of combining control systems with communication or social systems, yet maximum value demands an integrated experience.

» **Implementation portability and cost:** Manufactures are challenged with the additional potential cost of increased automation. Many of the systems involve disparate and diverse legacy applications, implemented over time, which need to be integrated with newer technology. Often proprietary, they require specialized tools and implementation skills, while others require varying hardware and OS support.

» **System availability and uptime:** When entire assembly lines, factory conveyor systems, plant operations, or city-municipal services are at stake, the uptime of each individual component is critical. From sensors and control systems to servers, every part of the automated system must work flawlessly and communicate reliably to ensure the highest level of productivity.

» **Energy consumption:** Given the breadth of IT deployment in a typical industrial automation solution, energy usage can fluctuate and otherwise become hard to predict or plan and budget for. The ability to continually reduce energy consumption can be a competitive advantage.

» **Standards and regulatory requirements:** Failing to meet standards and requirements of regulatory bodies may result in waste in terms of energy and other resources, non-interoperable production lines, worker safety hazards, or the risk of being shut down due to non-compliance.

» **Enterprise integration and coordination:** When your automated processes connect to your corporate network and decision-making systems, it truly adds value. Building autonomous control systems that leverage the value of IoT means increased integration with outside systems and enhanced connectivity.

VI. ADVANTAGES

- Reduce the Maintenance cost of the controlling system and industrial devices.
- Optimized critical operating system.

- Remote access to all industrial devices/machineries over the internet.
- More intelligent security system as compare to other traditional security system.
- Presenting this actionable information to the right person, either plant personnel or remote experts, and at the right time
- Multihop communication can be used to increase the range of a WiFi network.
- The Wifi technology depends on the physical layer and medium access control layer of IEEE 802.15.4 standard.

VII. DISADVANTAGES

- The sensors (or nodes) used in IAS have limited resources (i.e., limited processing power, low memory, and limited battery).
- The IAS has to co-exist with other systems operating in the same free band called Industrial Scientific and Medical (ISM) bands. Hence the communication of IAS can be interfered by other systems (i.e., Bluetooth, WiFi, cordless phone, and microwave oven) operating in the same frequency band.
- For remote monitoring the IAS may need to have internet connectivity

VIII. APPLICATIONS

- **Industry and office:-**We can implement sensors in wide area over the machines and instruments. Control and Monitor circumstances by using concept of Artificial Intelligence and IoT.
- **Hospital and Labs:-**We can plot sensors on patient's body and Doctor can check current status on his android phone and also take necessary actions and decisions.
- **Home:-**We can implement sensors to household appliances and monitor and control with the help of Artificial Intelligence.

IX. CONCLUSION

In industries to reduce manual overhead we have implemented Internet of Things (IoT) in Industry to monitor as well as to inform the responsible person to take appropriate measures, but this will partially fulfill our requirement. As sometimes it will be late in this process and it will harm to property as well as life. For this purpose we are developing a system for Industrial Automation using IoT with the help of Artificial Intelligence.

The GSM & GPS based industry security system has been designed and tested with the mobile network. The user can get alerts anywhere through the GSM technology thus making the system location independent. A flexible way to control and explore the services of the mobile, AT commands is used in the system. The communication of home is only through the SMS which has been tested with the mobile networks and is working on any mobile network. This system user friendly and software has many features.

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