Monitoring And Controlling Industry Automation System Through Android App And Website Using Cloud

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ABSTRACT

Modern Industrial automation systems are totally software driven. The software that drives the system generates significant amount of data. This data can be used for monitoring of the industrial plants critical parameters to take decisions on time-critical actions and visualization of the plant behavior. These actions could be controlled by the user or automated. The Advent of cloud technologies has brought about convenience of accessibility of data on the finger tips. The cloud on the other hand provides infrastructure and service to leverage these opportunities. A monitoring system is used to monitor the critical parameters of an Industrial plant. A cloud is used so that the monitoring of the industrial plant can be done from any part of the world with the help of cloud services and the smart mobile phones available in the consumer market. This concept would revolutionize the perspective of the industrial conditional monitoring. This also helps integrate the legacy industrial automation system with new technologies such as cloud and Internet of things (IOT). Many industries are using Industry Automation Systems. The industry top level management persons cannot visit each and every plant or industries. So a service providing website is generated which can only be managed by top level persons of industries. The Android application is developed for the workers of the industry for monitoring and controlling the industry plants. The owner can also monitor the analyzed data via android application. The objective of this project is to investigate a cost effective solution that will provide controlling of Industry Automatically or manually. The motivation was to facilitate the users to automate their industries having universal access.

Keywords *:- Industrial automation, Cloud Computing, Android app, raspberry pi , Wireless. Introduction, IOT-Internet Of Things.*

1. INTRODUCTION

This project proposes a secured and energy efficient wireless industrial automation system via raspberry pi[1]. The aim of this work is to control the industrial devices, managing the power utilities and also monitoring the employee works. These are all done through Wi-Fi network with help of server pc. This server pc is password protected and it can be opened only by the authorized person. The main focus of this project is to reduce the power usage and to alert the people about the critical situations in the industry. This can be done by detecting the gas leakage and boiler temperature using the corresponding sensors. The system will activate the buzzer interfaced with the raspberry pi during the critical situations. Through control unit section, we can activate or deactivate the device. This is an embedded Linux based system implemented in System on chip and also increases the efficiency of the process by raspberry pi.

Currently a number of industrial automation systems in this world are software driven. These systems are standalone and restricted to the premise of the Industrial plant. These systems are thoroughly monitored periodically using a conditional monitoring system[2]. These systems monitor critical parameters of the automation system and help mitigating hazard conditions, assess the health of the automation system for smooth functioning. New technologies such as cloud computing can help improve the monitoring system. It would facilitate collection of large amount of relevant data and process it systematically to mitigate problems and improvise the whole industrial automation process. Cloud computing on the other hand improves accessibility of industrial data on smart devices such as Android Mobile phones. It makes the industrial data available to user while moving across the globe not limiting to premise of the industrial plant.

Several Industrial Automation protocols readily support upcoming technologies like internet of things (IOT).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. IOT has given us a promising way to build powerful industrial systems and applications by using wireless devices, Android, and sensors. These advancements have led to connectivity to inter related industrial automation systems across geographical boundaries. It has also made it possible to monitor the industrial plants locally or remotely with the help of Android mobile phones and Website. It has also improved control and accessibility to these systems from any part of the world in a secure way. Currently, there are significant changes in industrial process control, intelligent building control and automation technologies under pressure to reduce operating costs and to integrate important advances in telecommunications and software. The software has become an essential factor in production and enterprise-wide systems. Internet connection has fundamentally changed the arrangements for monitoring and control, and the use of open/public standards and personal computer systems (PCs, tablets, smart phones) bring significant benefits to their users and producers.

2. LITERATURE SURVEY

The Industry automation is carried out by various ways. Each industry uses different automation techniques as per their requirement and the type of industry. The numerically controlled machines are used by various industries. These machines are of computer controlled machines which uses computers to perform the control operations by acquiring, processing, calculating and controlling the process variables. This automation is a programmed version of machine tools and also called as Computerized Numerical Controlled (CNC) Machines. These CNC machines are used in cutting and milling applications for high accuracy and accurate precision operation. Computer – Aided Manufacturing (CAM)In this, the entire manufacturing process (includes production, planning and control) is automated with the use of numerically controlled machines, industrial robots and other types of automation devices. These automation systems also make use of computers to plan, design and layout the various products. Examples of this automation systems are computer-aided design (CAD), computer-aided design and drafting (CADD) and computer-aided process planning (CAPP). Industrial Robots. These are a type of automated machines or equipment's that can perform the different tasks for longer duration. These are mostly implemented in the areas that are highly dangerous or hazardous for humans. Flexible Manufacturing Systems. This automation is of fully automated one. Starting from planning and designing process to dispatching of products, the whole system is completely integrated to be automated. This automation combines numerically controlled machines, industrial robots and other automation equipment's into one integrated system.

Enforcing Safety Requirements for Industrial Automation Systems at runtime Current industrial automation systems are becoming more and more complex, and typically involve different phases of engineering, such as design time and runtime. System requirements, which are usually elicited during design time by engineers, currently are not sufficiently represented at runtime, like the runtime enforcement of safety requirements for industrial automation systems. Such kind of enforcement usually is very hard to model and predict at design time. Hence, the need exists to capture and manage safety requirements at design time and runtime, since safety requirements of industrial automation systems may lead to high risks if not addressed properly. In paper, Enforcing Safety Requirements for Industrial Automation Systems at runtime. It introduced a safety requirements enforcement framework and the using of Boilerplates for requirements elicitation and by explicitly modeling the runtime requirements knowledge for

further application. It illustrated and evaluated the approach with data from a real-world case study in the area of industrial process systems. Major result was that the Boilerplates and explicit engineering knowledge are well suited to capture and enforce runtime safety requirements of industrial automation systems.

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 Industrial Automation using Internet of Things (IOT) paper, they have developed a system which will automatically monitor the industrial applications and generate Alerts/ Alarms or take intelligent decisions using concept of IOT. IOT has given us a promising way to build powerful industrial systems and applications by using wireless devices, Android, and sensors. A main contribution of this review paper Is that It summarizes uses of IOT In industries with Artificial Intelligence to monitor and control the Industry.

There are websites that provides the services for managing the various industry data and for securely storing the confidential data of the companies. They lack in controlling of the industry devices and also they do not provide any analyzed results to the industry workers for making the decisions in critical situations. They lack in providing the real time condition of the industrial plant. At current time CCTV are used for monitoring the industrial plants and devices, but it is not too much feasible and it is expensive. The video or footage taken by CCTV need to be manually analyzed.

3. PROPOSED SYSTEM

There are multiple Industries which are using the Industrial Automation Systems to carry out their work. For such industries, a common service providing website and an android application is implemented. The figure 3.1 describes the architecture of proposed system.

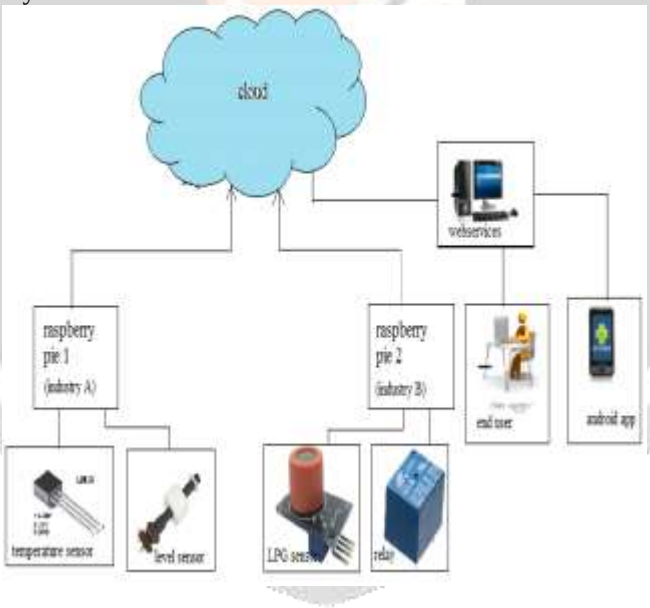

Figure 3.1 : Proposed System Architecture.

The above diagram shows the architecture of proposed system , in which Industry A and Industry B having industry automation system are connected to the cloud. The raspberry pie is server of the industry that connects various devices to the main system and upload data on the cloud. These data is processed and analyzed by the cloud and the user can access the industry remotely via the cloud by registering on web services. Due to this, multiple industries can be connected to the cloud at the same time and can remotely access their respective industries. The Website will provide the user with various services like analyzing and monitoring data, current status of his industry plants and devices, which will make it easier to take decisions at critical time. The user has to register him on the website by providing his various details like number of plants, devices and type of sensors used in his plant. After successful registration the user will be provided with a unique login id and password which he will be using for next login. By

Login in the user can view his current status of plant, and various parameters details like change in temperature, level of fluids in container and amount of hazardous gases released from the plant. This website is beneficial for the user because he can analyze all the details of various parameters in his industry plant of specific duration and he can give proper suggestions or commands to the low level management persons for controlling. For example: Suppose the Industry A is a chemical industry which releases the hazardous gases in environment. The limit specified for the industry is 100 ppm(parts-per-million)and within a week the industry has released the gases more than the limit specified this can cause harm for the environment and also the user has to pay fine for the environmental damage to Government. This situation can be prevented by analyzing this critical parameters by using services provided by website to help user for taking appropriate decisions and controlling the critical parameters of his industry.

The Android application is provided for the low level management persons like workers and industrial plant managers. The workers and the managers will be provided different Login id and passwords for monitoring and accessing the various devices the industrial plant. This is beneficial for the workers as they can give commands to the devices in industry from different unit of the industry, this saves the time and also energy consumption. The worker is also able to view the current status of the industry plant like specific machine status whether it is processing or idle, how much processing is completed and remaining and various critical parameters status in graphical format.

The Cloud is the centralized server that will manage all the data coming from the multiple users of Industries. The data that user provides on website is stored on cloud which will be synchronized with the actual industrial plant devices by recognizing the unique id of the devices.

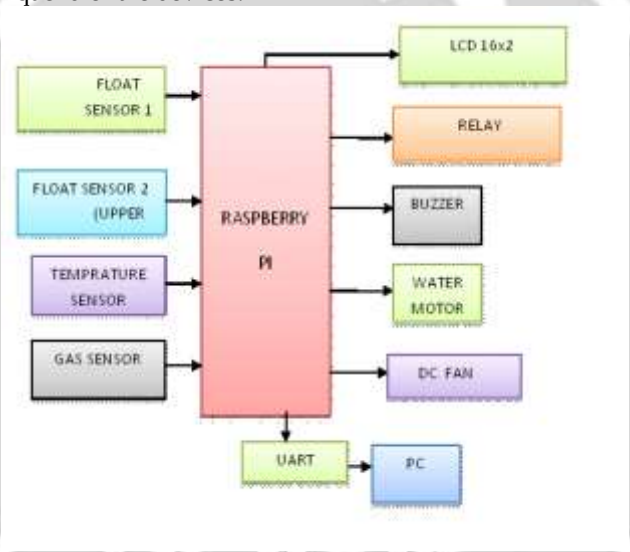

Figure 3.2: Block diagram of the Multiple Industry automation via cloud.

System can operate using two modes : 1) Auto mode 2) Manual mode. If users want to go into any one of the mode, hyper terminal will ask in which mode you want go according to that, if user want to go into auto mode, he/she will enter X and if user want to go into manual mode he/ she will enter Y. When user enter X ,project will work as explained below:-As Shown in the block diagram float sensor 1 & float sensor 2 are placed in the water tank at low level and high level respectively. When water falls down & reaches at low level , float sensor 1 activate which is then applied to Raspberry pi which gives signal to water motor to starts the motor. When water starts increases & reaches to high level, float sensor 2 sense that signal due to which water motor will become off. Temperature sensor LM35 is used to measure the temperature & at the same time, temperature will be displayed on the LCD display. When temperature exceeds 40^0 c , dc fan will be on & when it falls down below 40^0 c dc fan will be off. Gas sensor is used to detect the combustible or toxic gases. When a gas sensor senses any toxic gas buzzer will be activate & relay will on. When user enter Y , project will work according to manual mode as:-

A = Fan ON
B = FAN OFF
C = MOTOR ON
D = MOTOR OFF
E = RELAY ON
F = RELAY OFF

3.1 The hardware specification for this project :

1. Temperature measurement.(LM35)
The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 μA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a −55° to +150°C temperature range, while the LM35C is rated for a −40° to +110°C range (−10° with improved accuracy.

2. Level identifier. (Float Sensor)
Water Level Sensor ; Model No. : ZP3208-P; Max Contact Rating : Max Contact Rating;10W : 10W;Max Switching Voltage : 100V DC.
Level sensor detects the level of liquids and other fluids including slurries, granular material and powders that exhibit an upper free surface. The level measurement can be either continuous and point values. Continuous level sensor measures the level within a specified range and determine the exact amount of substance in a certain place, while point level sensor indicate whether the substance is above or below the sensing point .We are using continuous level sensor which will detect the fluid level in container and notify the user when the level is low or high.

3 .Gas detection.(LPG Sensor)
Nowadays, security is the major problem in many fields due to robberies, fire accidents and blasts due to LPG gas leakage. At present, LPG gas can be used in the car, in the storage tank or service station. But, due to some reasons the LPG gas might leak from the gas cylinders, this may cause the cylinder blast, damage the industry and risk of a life to the living persons in the industry. Sometimes fire accidents are very small, but if proper action is not taken to control the fire, then it can spread in complete house. To overcome this problem, an LPG gas sensor is used to detect the presence of a dangerous LPG gas leak in various places.

4. Automatic Device power ON/OFF
The devices or machineries in the industries need to be manually switching ON or OFF. To reduce the human intervention the automatic mode is provided to the machineries so that they can switch ON or OFF as per the time given by user. The machineries or devices can be controlled or command can be given to them by android application of switching ON and OFF. The threshold value for the devices will be set after that value is crossed then the system will automatically turn on or off.

5. Relays
A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal.
A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays.

6. Power Supply

It uses two power supplies, one is regulated 5V for modules and other one is 3.3V for microcontroller. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

4. RESULT

Figure 4.1 SignUp page.

Figure 4.2 Registration of company details.

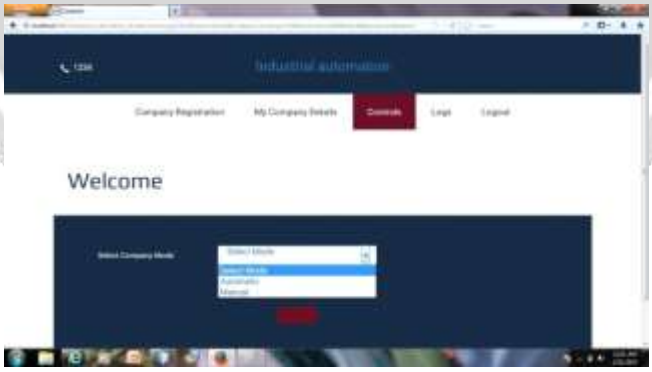

Figure4.3 Mode selection

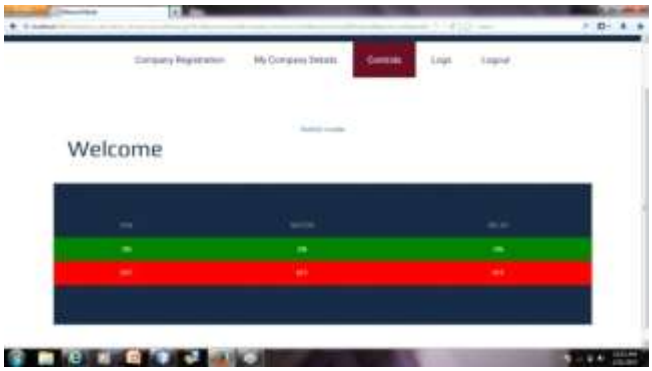

Figure4.4 Remotely controlling devices.

Figure 4.5 Company details.

5. CONCLUSION

We have proposed a system framework in which an Cloud based Industry Automation System that can be controlled remotely upon user authentication is proposed and implemented. The service providing Website is generated which can only be managed by top level persons of industries. The Android application is developed for the workers of the industry for monitoring and controlling the industry plants. The owner can also monitor the analyzed data via android application. This service can be used by multiple industries at a time. The Website and the Android Application are connected to the cloud. The Cloud will keep updating the data to the database so that the real time data monitoring and controlling is carried out.

6. REFERENCES

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