Industrial Parameter Monitoring and Alarming System using IOT

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Abstract. Today, smart grids, smart homes, smart water systems, intelligent transportation, are infrastructure systems that connect our world more than we thought possible. The common vision of such systems is usually associated with a single concept, the Internet of Things (IOT), where through the use of sensors, the entire physical infrastructure is closely related to the information e-communication technologies where intelligent monitoring and management can be achieved through the use of integrated networks devices. These devices will connect to the Internet to share different types of data. The proposed system uses the ubidots server and detection applications for the internet of things for an industrial monitoring system. In this document we use detection devices to check different parameters such as the number of production, the intensity of lighting, the detection of toxic gases and the ambient temperature.

Keywords: IoT, Cloud, Arduino, Temperature sensor, Gas sensor.

1. Introduction

In the proposed system, the parameters such as temperature, flame, brightness and poisonous gas are detected. If the temperature goes high the cooling fan will be automatically switched ON. The light is switched ON, when the darkness is detected and the light turns OFF when the brightness is detected during measuring the intensity of light. The buzzer sound is produced when flame sensor detects the fire. And in the same way if any poisonous gas is detected by the gas sensor, all the above mentioned parameters are monitored and a message is sent to the concern operator using Internet of Things.

The Internet of Things refers to the system of internet objects connected which are able to collect and transfer the data through an embedded sensor, wireless networks without the interruption of human. Applications in IoT assimilate data obtained from the sensor to perform the number of functions. The cloud applications are the combination of data obtained from sensor and digital data. Application enablement platform supports interactive, real-time data visualization (widgets), and an IOT App Builder that allows developers to extend the platform with their own HTML/JS code for private customization when desired.

Arduino is an open-source tool with the capability to make computers to sense and control the parameters from the physical world compared to the desktop computer. Arduino is a microcontroller board and a development environment for implementing the software on the board which can be utilised for developing interactive objects, by receiving the inputs from switches of different varieties.
or sensors. The projects based on Arduino is to communicate with the software running on the computer and can be stand alone.

The interpretation and evaluation of sampled process includes the analysis of data and monitoring. The manipulation of data is done in data analysis which describes the state of the physical process. The classification of data is done with respect to the calibration model. The situations that is yet to occur can be anticipated using proper control actions. The multivariate statistical model in the research work in finding out the variation from usual operations in the mineral process to anticipate the quality of the materials that are processed. The method is designated by the ability to envision the events but a drawbacks is the need of more relevant measurements.

The data obtained from the process are of poor quality, because of the instrument failure, improper calibration of instrument and increased noise levels. So without preprocessing or pre-treatment it is difficult to interpret. This principally limited the application of the method to few and relatively large process sections.

The second part of this work focuses on methods for measuring and modelling of the grinding process. The reduction of size is unavoidable in the mineral processing handling unit operations. To improvise the power drawn by the mill, the grading control can be done.

There exists a complex non-linear function for the grinding performance and power. The advanced process control systems aided in the development of these type of systems. Such systems such require relevant information in mill load, properties of slurries and charge position. The information are obtained from the measuring systems such as sensors and transducers which is of great value. The DEM has developed considerably in the fundamental physical modelling in various applications. In tumbling mill, in the instance of grinding has proven to be improvised in the knowledge. The combination of the experimental and mathematical modelling has facilitated in creating the control strategies for quality improvement and also the performance of the process.

2. Literature Survey

The internet of things is an embedded with electronics, a sensor, software collects the data and share across the internet. The objects can be read, located, recognized, addressed and controlled through internet disregarding the mode of communication. The things or objects are people, location, time or condition. The things listed above can be consolidated in the virtual world, the connectivity can be anywhere1.

The relevant information, statistics and data related to the different industrial processes can be collected in industry premises. The productivity, quality can be monitored in industrial products that are manufactured. The technologies such as Zig-bee, Infrared, RF has been dominantly used in industries in controlling the parameters2.

The paper mainly focus on presenting an economical and elementary approach to design an intelligent UPS monitoring and controlling system, adopting the concept of mobile to machine and machine to mobile communication is one of the most effective wireless communication (GSM) is one of the part must effective wireless communication that can be utilized easily. GSM based UPS monitoring and controlling system helps to increase production efficiency of industrial ups in a remotely controlling the network. In addition to monitoring a system using SMS it provides additional facilities which include report generation, maintaining the log in data base3.

IoT, the Internet of things is the network of physical objects with electronic software embedded in it. The connectivity with a network serves the objects to acquire and exchange data. The paper presents a system which monitors the parameters in the industrial applications to generate the alarms or decision making using intelligent decisions using the IoT4.

This work focuses on the real-time monitoring of lead-acid in multiples based on wireless communication using IoT. The system is developed in such a way that, the level of the acid, state of charge, and other electrical parameters are indicated and monitored. A data acquisition system is built.
with an embedded hardware and software. The wireless local area network serves as the main part of the system.

3. Methodology

The main objective of the work is to prove that the sensor system collecting the data containing the information from the process that are monitored and to obtain the multivariate models to specify the dynamic the operating conditions. The present work is designed with an objective to control the influence of significant factors varying in monitoring process and the reflections of variations in the measured signal. The model is validated for the behaviour in the communication with the results applied from the modelling which is obtained from measurements made with sensors is demonstrated.

![Fig.1 Block diagram](image)

The wireless communication mode is implemented in monitoring the parameters using Arduino used in measuring and controlling of global parameters. The microcontroller is used in managing the process as well as Arduino. The non-electrical parameters such as temperature, gas, intensity of light and smoke are measured and monitored.

Methodology used in the proposed work is to monitor the system using Raspberry pi used to measure and control different parameters with the wireless mode of communication. The parameters such as gas, light intensity, temperature, and water level using Raspberry pi with the PC connected to it. The microcontroller can operate in windows or Linux as operating system, with a communication mode as a master and multiple slaves. Raspberry pi can transfer the data from one end to the other end with a wireless communication.

The waste water treatment operation can be recognized and analyzed with some dominating difficulties which are overcome by developing the basic algorithms. The supervisory control is associated with the chemometrics, which helps in monitoring the waste water treatment.

4. Algorithm and Method used

4.1. Arduino Uno

The software is developed using development environment by writing it on the board, which is a open source computing platform as that of a microcontroller board. The arduino is capable of controlling the appliances such as lights, motors and so on and can be used to develop to receive inputs from switches and sensors. The Arduino boards can be assembled, the IDE can be downloaded as free from the internet.

4.2 Gas Sensor Module

It is crucial to monitor the gases in air conditioners, electric chimneys and safety systems at industries where the gas sensors are most important in such a system. The gas sensors are as small as
nose, which reacts to the gas present which responds to the changes in the concentrations of molecules at gaseous state. The sensing element is housed in the sensor module consisting of steel exoskeleton. The current is allowed to flow through the connecting leads. The heating current is passed through the gases coming close to the sensing element. The element gets ionized and the sensing element absorbs. The value of the current flowing varies with the change in resistance.

4.3 Temperature Sensor
Since most parameters such as electronic, chemical, physical and biological systems are influenced and affected by the temperature and intended to measure. The chemical reactions, electronic circuits, biological process operate within the limited temperature ranges for yielding the best performance. The LM35 can be used as a temperature sensing device within the range of 0.01°C of surface temperature.

4.4 LDR-Light Dependent Resistor
A Light Dependent Resistor is a resistive type detector whose resistivity depends on the electromagnetic radiation incident which are termed as light sensitive devices. The material is made up of high resistance semiconductor materials. The change in resistance occurs after 8 to 12 ms while the light is incident on a photo cell. It takes few seconds for the resistance to rise back again to its initial value after the light is removed which is named as resistance recovery rate. The property is applied in audio compressors.

5. Results
The industrial parameter monitoring design includes the arduino microcontroller in measuring the physical quantities and controls using the wireless communication. These processes were managed using this microcontroller. The parameters that can be tracked are Gas, temperature, light intensity and Smoke. The human intervention is possible in domestic processes, so this procedure removes the human interaction replacing with the system integrated with programmed electronic circuits. The Arduino is the main controlling and manipulating device and hence be able to perform mathematical tasks. The monitoring and controlling application is developed in Raspberry pi.
References

[1] Dr. S.W Mohod, Rohit S Deshmukh—Internet of Things for Industrial Monitoring and Control Applications, International Journal of Scientific & Engineering Research, Volume 7, Issue 2, February-2016

[2] Satya Sai Krishna Gopal, A V Prabu, G. Sateesh Kumar, P. Gopi Krishna—UPS Parameter Monitoring And Controlling Using Iot And Gsm, International Journal of Pure and Applied Mathematics, Volume 116 No. 6 2017, 133-139

[3] Harish Ramamurthy, B. S. Prabhu, Rajit Gadh, Asad M. Madni—Wireless Industrial Monitoring and Control Using a Smart Sensor Platform, IEEE Sensors Journal, Volume 7, May 2007, Pages: 611 – 618.

[4] Ashish Rauniyar, Mohammad Irfan, Oka Danil Saputra, Jin Woo Kim, Ah Ra Lee, Jae Min Jang and Soo Young Shin—Design and Development of a Real-Time Monitoring System for Multiple Lead-Acid Batteries Based on Internet of Things, Future Internet 2017, 9, 28; doi:10.3390/fi9030028

[5] Eugene Y. Song, Kang Lee—Networked smart transducer interface standard, IEEE Instrumentation & Measurement Magazine, Volume 11, April 2008, Pages: 11 – 17.

[6] BhosaleKiran Uttam, Galande Abhijeet Baspusaheb, Jadhav Pappu Shivaji, Prof. Pisal R.S—Industrial Automation using IoT, International Research Journal of Engineering and Technology (IRJET), Volume: 04 Issue: 06 | June-2017

[7] Hong Shen, Jing Chen—Efficient Matrix Multiplication on Wireless Sensor Networks, Seventh International Conference on Grid and Cooperative Computing, Oct. 2008.

[8] Kallaiarasi1, Shubham Gautam2, Anshuman Behera3, Mansi Mewara4—Arduino Based Temperature and Humidity SensorS. Journal of Network Communications and Emerging Technologies Volume 8, Issue 4, April (2018), Pages: 329-331.

[9] Marco Sgroi, Adam Wolisz, Alberto Sangiovanni-Vincentelli and Jan M. Rabaey—A Service-Based Universal Application Interface for Ad-hoc Wireless Sensor Networks, November 2003.

[10] M.M. Molla, S.I. Ahamed—A survey of middleware for sensor network and challenges, International Conference on Parallel Processing Workshop, Aug. 2006.

[11] Sang Hyuk Lee, Soobin Lee, Heechol Song, Hwang Soo Lee—Wireless sensor network design for tactical military applications, 2009 IEEE Military Communications Conference, Oct. 2009.

[12] Seema Bandyopadhy, E.J. Coyle—An energy efficient hierarchical clustering algorithm for wireless sensor networks, Twenty-second Annual Joint Conference of the IEEE Computer and Communications Societies, April 2003.

[13] Sophiya Kunjumon, Kenneth Pinto, Jude Salduhana—Temperature and Humidity Monitoring and Alert Management System, International Journal of Engineering Research and General Science, Volume 4, year 2016, Pages: 349-351.

[14] Wendi B. Heinzelman, Amy L. Murphy, Hervaldo S. Carvalho, and Mark A. Perillo—Middleware to Support Sensor Network Applications, year 2004.