HAZARDOUS AREA MONITORING FOR INDUSTRIAL PLANTS POWERED BY IOT

SUBMITTED BY

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LITERATURE SURVEY

JOURNAL TITLE 1

IoT Based Intelligent Industry Monitoring System.

ABSTRACT

The Internet of Things (IoT) is a newly emerging field with a vision of connecting ‘things’, human and machines together making them an integral part of internet. The entire world is moving towards modernization and automation which may result in excessive pollution of environment. Determining the air quality is a prime need of the hour. This paper deals with the development of pollution monitoring system with deployment of intelligent sensors. Monitoring the gas leakage level from any part of the globe can be achieved by integration of big data to the Google Cloud via web servers. Analysis of the data is simplified thereby enabling ease of monitoring. Alerts can be triggered in case of drastic deterioration of air quality. The proposed method finds application in industry and also in monitoring of pollution caused by vehicles.

ALGORITHM/METHODOLOGY

The vision of any industry should be to maximize productivity with guaranteed worker safety and environmental responsibility. A system for real time monitoring is proposed by deployment of intelligent sensors at different points of the industrial floor. The different sensors detect the level of gas emission, fuel leakage, boiler temperature etc. and can send notification to the floor manager via Google Cloud. A provision to raise alarms in case of detection of toxic gases, fuel leakage above the safe limit can help to avoid accidents.

The idea of developing an intelligent system to detect presence of leakage of gas / fuel and avoid accidents is for a social cause to save lives of people. Industry related and pit hole accidents have become common cause of death in near future. Workers involved in pit-hole cleaning, experience suffocation due to inhalation of foul and poisonous gases which may cause death.

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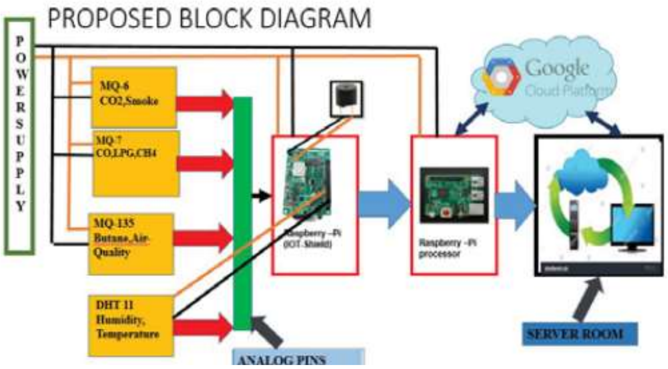

FEATURES

This IOT based Smart Industry Monitoring system gives real-time monitoring of weather conditions of Industry. It monitors temperature, humidity, level of chemicals, also detects the Leakage of gas, and detect the smoke when fire Accidents done. Information can be seen from anywhere in the world.

DRAWBACKS

Slight modification of the model enables the user to adapt it to any environment. Predictive maintenance is an upcoming industrial need, for which the proposed model can be improvised. In case of gas leakage the concentration of gas varies from point to point which has to be analyzed further. Moreover, the gases diffusing out during leakage may also combine among themselves producing other by products which have to be dealt in detail. These cases can open an eye for the budding researchers.

JOURNAL TITLE 2

IoT Based Industrial Parameters Monitoring and Alarming System using Arduino

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.

ALGORITHM/METHODOLOGY

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.

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.

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, lowoffset, 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.

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.

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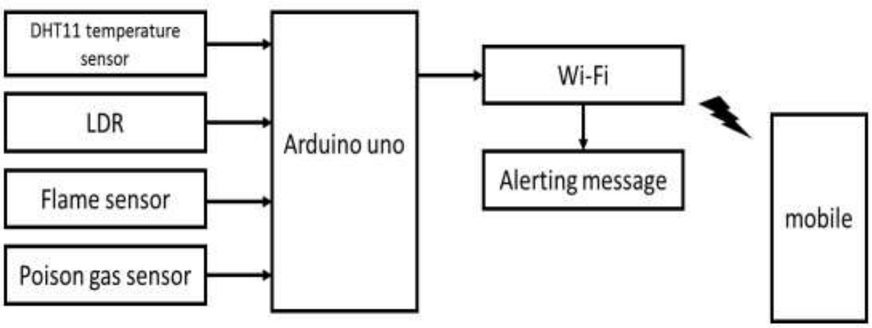

FEATURES

Electronic toll collection system.

Heating and air conditioning systems.

Home security devices.

Indoor Air Quality: Monitoring of toxic gas and oxygen levels inside chemical plants to ensure safety of workers and goods.

Compost: Control of humidity and temperature levels in alfalfa, hay, straw, etc. to prevent fungus and other microbial contaminants.

DRAWBACKS

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.

JOURNAL TITLE 3

Implementation of an industrial automation system model using an aurdino .

ABSTRACT

This paper discusses a model of an industrial system on a small scale, which performs sequential operations using relays. The system shuts down automatically once it detects high water or temperature levels, which are hazardous for industrial operation. This model is implemented using an Arduino microcontroller as it proves to be the most viable alternative. Being an opensource platform with the minimal cost it helps prototype the system with ease. Its compatibility with sensors helps provide the required feedback and the Arduino controls the system by taking corrective measures. The status of the system is depicted using devices like the Liquid Crystal Display (LCD), buzzer, etc. The sensor data is derived and stored in a Data Acquisition System (DAS), this data can then be used for control and monitoring purposes. Thus, the designed system helps replicate an industrial application and reduce the cost of setting up and maintaining an actual Distributed Control System (DCS), Programmable Logic Controller (PLC) or Supervisory Control and Data Acquisition (SCADA)in viable industrial environments. It also provides flexibility, with rapid prototyping and ease in error rectification.

ALGORITHM/METHODOLOGY

HARDWARE IMPLEMENTATION:

Various blocks of the system were implemented in hardware in Fig. 2, following the circuitry in Fig. 3. The various components that make this circuit include (1) Water and temperature sensor, (2) Arduino UNO board, (3) Relay Module, (4) External power supply & Voltage Regulation block, (5) LCD, Buzzers and LED's (Loads), (6) Real Time Clock (RTC) Module and (7) PLX DAQ.

SOFTWARE IMPLEMENTATION:

Arduino IDE 1.0 and PLX-DAQ were the two major software's used for the implementation of this design. Apart from this, 2 libraries for the LCD and clock module were incorporated into Arduino IDE. These are the 'LiquidCrystal.h' and 'DS1302.h' for the LCD and the RTC module respectively.

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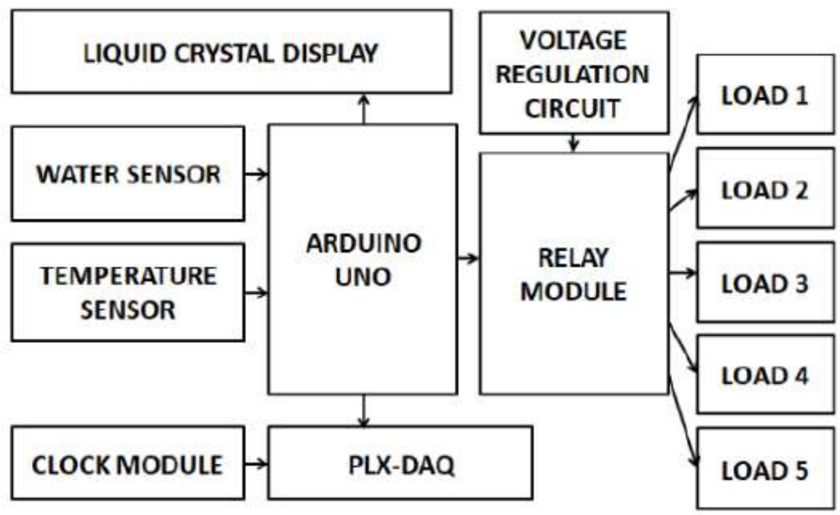


FEATURES

Conventional controllers prove to be expensive for small industries due to the high initial cost of setup compared to a basic microcontroller system. An Arduino thus, with its minimal cost proves to be a feasible option

Arduino being an open source platform, can perform any control function and replicate any industrial process by mere C/C++ programming language eliminating the need of wiring and technical expertise.

In addition to the initial setup cost, the added cost of assembly, manufacturing and maintenance activities is also minimised.

The use of Arduino can be extended further, by incorporating compatible shields, external modules, sensors and actuators like Humidity sensor, Bluetooth module, motors, etc.

The Arduino platform is also compatible with many software's like MATLAB, PLX-DAQ, etc., through the Arduino IDE further increasing its applications.

An Arduino provides flexibility, helps rapidly prototype and rectify errors with ease.

DRAWBACKS

The existing industrial systems like DCS, SCADA, etc., are still irreplaceable in a number of domains. Where an Arduino can perform similar functions, its use is still limited to certain applications and industrial environments due to industry standard and certification requirements. In rugged environment conditions like high temperatures, the use of an external protection shield becomes essential. Since PLC's and conventional industrial systems are built for the purpose, they have built-in protocols and provide extensive resources to aid set-up and operation. An Arduino in comparison would require additional hardware, programming skills and technical support.

JOURNAL TITLE 4

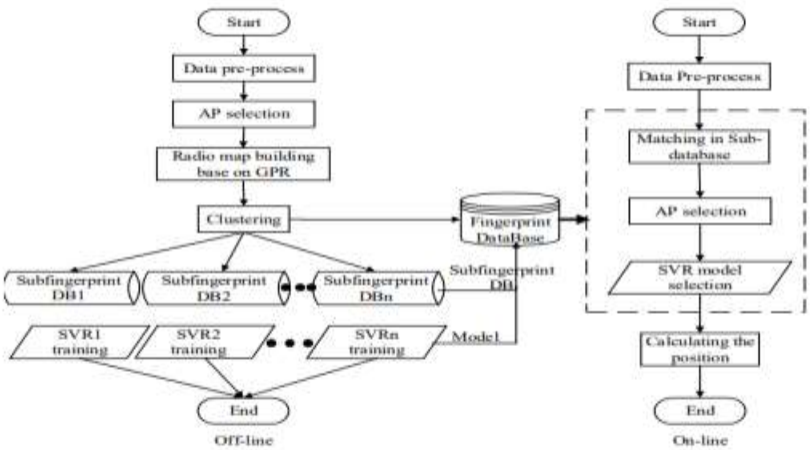
A Two-Level Wi-Fi Fingerprint-Based Indoor Localization Method for Dangerous Area Monitoring.

ABSTRACT

Localization technologies play an important role in disaster management and emergence response. In areas where the environment does not change much after an accident or in the case of dangerous areas monitoring, indoor fingerprint-based localization can be used. In such scenarios, a positioning system needs to have both a high accuracy and a rapid response. However, these two requirements are usually conflicting since a fingerprint-based indoor localization system with high accuracy usually has complex algorithms and needs to process a large amount of data, and therefore has a slow response. This problem becomes even worse when both the size of monitoring area and the number of reference nodes increase. To address this challenging problem, this paper proposes a two-level positioning algorithm in order to improve both the accuracy and the response time. In the off-line stage, a fingerprint database is divided into several sub databases by using an affinity propagation clustering (APC) algorithm based on Shepard similarity. The online stage has two steps: (1) a coarse positioning algorithm is adopted to find the most similar sub database by matching the cluster center with the fingerprint of the node tested, which will narrow the search space and consequently save time; (2) in the sub database area, a support vector regression (SVR) algorithm with its parameters

being optimized by particle swarm optimization (PSO) is used for fine positioning, thus improving the online positioning accuracy. Both experiment results and actual implementations proved that the proposed two-level localization method is more suitable than other methods in term of algorithm complexity, storage requirements and localization accuracy in dangerous area monitoring.

ALGORITHM/METHODOLOGY



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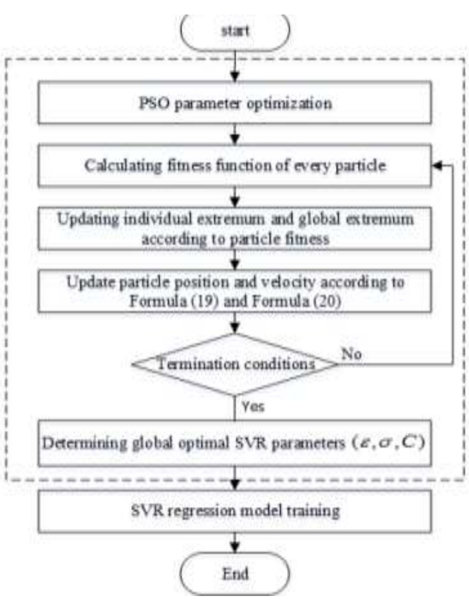

FEATURES

Algorithm Complexity and Storage Requirements.

Localization Accuracy.

DRAWBACKS

Due to the fluctuation of wireless signals, the change in environments and monitoring areas, and the increase of reference points, indoor fingerprint positioning systems often face the contradiction of positioning accuracy, computational complexity and storage requirements. This paper proposed a two-level positioning method to address the challenge: in the coarse positioning stage, an APC algorithm based on Shepard similarity was used to realize clustering; then, in the fine positioning stage, an SVR with PSO parameter optimization was used for precise positioning. Both experiment results and actual implementations proved that the proposed method was more suitable than other methods in term of algorithm complexity, storage requirements and localization accuracy in dangerous area monitoring. Future work will focus on the miniaturization of the mobile device and the integration of fingerprint indoor positioning with pedestrian dead reckoning (PDR) positioning. In fire scenarios, where the environment changes quickly, the fusion of indoor fingerprint positioning and PDR can be used for disaster management. Other sensors, such as magnetometers, gyroscopes and accelerometers can also be considered for integration with indoor RSSI fingerprint positioning to improve positioning performance.