Safety in Construction Site by Using IOT

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Abstract- **In this article is deals with the safety in the construction site, the project was executed with the use of Internet of Things (IoT) concepts based. The desgin and development of construction site safety based on human motion detection and monitoring technology this article is about the implementation and deployment of wireless control system and accessibility in to a construction environment. A PIR motion Sensor and camera module are used to detect motion and video processing, The proposed system uses controller interface system with Raspberry pi which is low power consumption and low cost also. At the construction time equipments will cross through human vision motion is detected with distances and the audio buzzer is intimate the distances also. The entire control system is build using ATMEGA8A micro controller and tested for construction environment.**

Index Terms- IoT, Raspberry pi.

I. INTRODUCTION

The vision of Internet of Things (IoT) is to change the world as we know it. To name a few examples in construction applications, machines will be talking to each other to optimize production and assembly of materials, project coordination will be based on informed decision making, and smart systems will accurately predict and prevent risk of many kinds currently embedded in the harsh construction site work environment. Most construction enterprises, however, are still stuck with business processes that are as far removed from the IoT as paper based communication is from using a Fax or, more recently, E-Mail. For years now, visionary construction companies have been connecting things, but if closely looked, they resemble nothing so much as digital islands.

Often individual departments tackle and perform a specific task, but they do not make sure the information created is available everywhere in the organization. The result is a large disconnect, making operations inefficient at best, costly or life threatening at worst. While the Building Information Modeling (BIM) method intends on supporting integrated or interdisciplinary delivery of construction projects, there generally is no connection between most of the architectural or engineering firms during the project design or planning phase with manufacturing or construction companies during the project execution phase. Furthermore, seamlessly connecting the early project phases with the operation and management (O&M) phase is important considering the true lifecycle costs of a project.

An estimated 80 % of a building's cost occur during the O&M phase. For these and more reasons, lean management in construction was examined. Koskela [1] developed the Transformation-Flow-Value (TVF) Theory, saying that construction can be conceptualized with the transformation of resources and the creation of value and flow of materials and people. Ever since then, several lean production control theories have been developed for the construction sector [2]. Although they eventually developed to practical methods, tools for efficient (automated) data collection on construction sites and (near) real-time analysis are still missing. It is therefore humans that enter field data in machines (e.g., tablets) that then process for most parts autonomously data to information.

Humans again interpret the results and transfer information to valuable knowledge. Proper construction project information management, from data generation to knowledge availability and sharing, is an essential key to the successful implementation of production controlling methods. Though a constant and reliable flow of information to assess work progress, constraints, and productivity is required

Construction sites are considered as one of the most dangerous places for workers. Rife with risks, potential hazards are numerous. According to Cindy Lovell, "the construction industry accident fatality rate stands at more than double that of the all sector average." She added that "construction sites are a health and safety nightmare". Many factors make construction work challenging for workers and engineers such as weather and safety concerns. Considering the Gulf Corporation Council (GCC) region with temperatures exceeding 40 °C and long working hours, construction workers may lose focus on their surroundings. Distracted workers around the operation of heavy machinery at the construction site along with unaware drivers are prone to life-threatening accidents. On most construction sites, trucks and other vehicles move in and out regularly for different purposes, but unfortunately, there are seldom any systems in place to manage the traffic.

The advancement in growing field of technology has opened new gates for innovation using internet. In other words, almost every "object" can be a part of this internetwork. With smart connectivity, physical objects are networked and will gain the ability to communicate with each other. The main aim of "The Internet of Things (IoT)" is to enhance the capabilities of objects and forms a smart environment so that people can benefit from it to make life much simpler. The IoT applications cover the building of smart cities, the set up of smart environment, the provision of smart public services, the plan of e-Health, and the building of smart home/office, etc .As the population is growing at very faster rate, the demand for resources is also increasing as result the resources on earth are depleted quickly. To solve this problem governments around the globe are taking necessary initiatives to save this depleting resources. The proposition has been promoted on campuses of educational institutions as well as cities around the world. Smart campuses or smart cities are trendy applications in the paradigm of the IoT. The concept of "Green Building" implies the proposition of systems which are environment friendly or simply installing low power consumption systems.
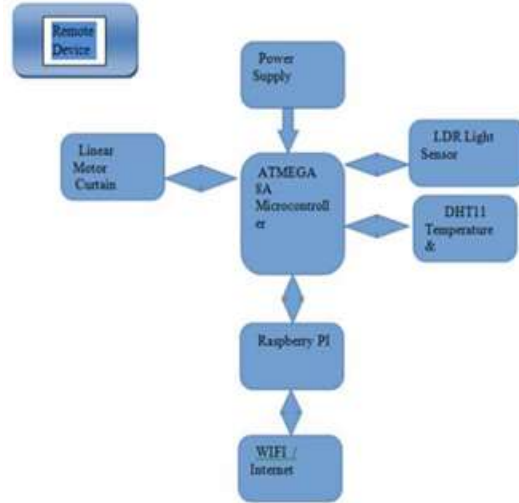
II BLOCK DIAGRAM

Fig 1 Block Diagram For IoT Based Construction safety.

The basic block diagram of the IoT based construction safety is shown in the above figure. Mainly this block diagram consist of the following essential blocks.
1. Power Supply
2. Sensor circuit
3. Microcontroller ATMEGA8A
4. Shades Actuators (Stepper Motor)
5. Remote Device
6. WIFI Router
7. Raspberry PI

III. COMPONENTS

1) Power Supply:
There are varieties of voltage regulators available in market for different values of output that is required. Example: LD1117, LM2575, LM78XX, LM79XX series. In our project we will be requiring voltage regulators providing voltages of 5V and 12V for the operation.

2) Sensor circuit:
This is one of the main part of project. The main intention of this block is to sense the reading and store them. For sensing the temperature and humidity we can use available temperature sensors like LM35, DHT11, etc and for light we are using LDR sensors. The readings from the sensor are fed to microcontroller and hence compared with original values and hence motor operation is controlled.

FIG 2. PIR Sensor

3) Microcontroller:

The microcontroller is used for controlling action of the motor. Examples of microcontroller are AT89 or AT90 series, ATmega Series, AVR32 series, PIC Microcontroller series, ARM series, etc. According to the desired operation the control signal is sent to the motor. The selection of microcontroller should be based on ports required, processing speed, power consumption, cost, etc. For this project we have considered parameters like power consumption, microcontroller with ADC, USART and less number of ports, and lastly the main parameter considered is low cost.

FIG 3. MICRO CONTROLLER

4) Shades Actuators (Motor):

This block consists of motor that will be used to control the action of the curtains used in green building. By sensing the temperature, humidity and light intensity of the room the curtains will move back and fro. We can use different types of motors like DC Motors, BLDC, Stepper Motor, etc.

5) Remote Device:

A remote device specifies which object is to be controlled or it is the device which can be controlled by connecting it to particular network or internet.

6) WIFI Router:

Wi-Fi is a technology for wireless local area networking with device based on the IEEE 802.11 standards. A wi-fi router is a device that performs the functions of wireless access points. It is used to provide access to the internet or a private computer network. It can function in a wired LAN(Local Area Network) , in a wireless only LAN (WLAN), or in a mixed wired/wireless depending on the manufacturer and model. Example of Wi-fi router manufacturers are Apple Inc., D-Link, TPLink, Netgear, Belkin, Motorola, etc.

FIG 4. Wifi Router

7) Raspberry PI (Server Board):

The Server board acts as minicomputer. There are different server boards like Arduino, Raspberry Pi, Intel server boards, Orange Pi, etc. Here in this project we have used Raspberry Pi. It is a series of credit card-sized single-board computers developed in the United Kingdom by the Raspberry Pi. We can mount the Micro SD card and store the values obtained during monitoring of the system.

FIG 5. Raspberry PI

IV. IMPLEMENTATIONS

The system was installed in the construction site the heavy equipments in the site fixed with the Remote sensors PIR sensors

The PIR sensor is detect the human and distances are also measured by the sensors, the buzzer unit is fixed with the machines and make sound with intimations of the distances also

The distances and machine name was displayed as well as in the board for the emergency conditions in the construction site
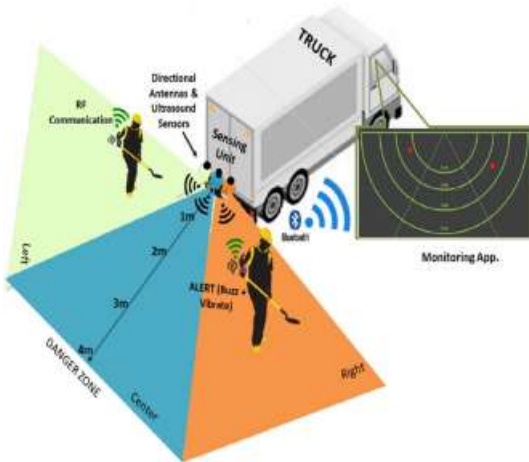

FIG 6. Field test scenario for the back over accidents prevention system

The module was initially programmed to transmit every 10 s. After being charged for 9 h, it was able to transmit continuously for 6 h in total darkness. Since the night is estimated to last for 12 h, a new setting to increase the lasting time of the stored energy is configured. It is capable to supply energy endurably during darkness
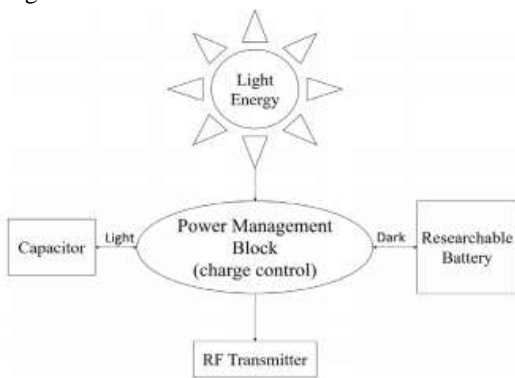

FIG 7. A configuration to save the energy and continuous power supply

V.CONCLUSION

A novel solution for preventing fatalities in construction sites was presented. By applying new design techniques at the architectural, circuitry, and system levels, this paper demonstrated two IoT-based autonomous, power saving, and real-time sensing systems. The proposed system is designed to be seamlessly integrated into construction sites, to operate in real time, and to facilitate following safety workflows without hindering normal construction sites activity.

Multiple tests were conducted to demonstrate the system's feasibility and effectiveness. The results show that our architecture reduces the risk of construction site accidents with low capital and operational costs.

We have used the concept of Internet of Things to implement the same. We have continuously monitor the readings taken by sensors fed to microcontroller and observe the same readings on website which is created.

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