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Accidents Prevention in Industry using IOT

S.Keerthiga[1], F.Anishya[2] and R.P.Kaaviya Priya[3]

[1]*Student of Final Year, Information Technology, IFET College of Engineering, Villupuram.*
[2]*Assistant Professor, Information Technology, IFET College of Engineering, Villupuram.*
[3]*Assistant Professor, Information Technology, IFET College of Engineering, Villupuram.*
Email: keerthisaravanan18@gmail.com, anishyacse17@gmail.com, kavy0690 @gmail.com

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ABSTRACT

Nowadays in Industries we make use of large machines and boilers for doing so many works. These machines are operated with the help of the man power. Though these machines bring benefit to us, working with them without proper training or malfunctions will cause harm to workers and even leads to death. Pressure vessels are used in factories to store large amounts of energy in the form of heat. Since it stores enormous amount of energy, If the energy released in the event of rupture , then the higher the extent of damage or disaster or danger it poses will also be high, which will lead to unwanted death of the workers. So in our proposed system we are going to automate the machine to stop when it detects the humans with the help of Internet of Things.

Keywords: Arduino UNO, Thermal sensor, Ultrasonic sensor, LED Display, GSM modem.

1. INTRODUCTION

In recent times IoT is all sectors like social and economic significance. Consumer products, durable goods, cars and trucks, industrial and utility components, sensors, internet connectivity and powerful data analytic capabilities that promise to transform the way we work, live and play. Internet of Things is an evolving technology which can be used to automate various works of human and hence can reduce the man power in various sectors. Usage of the machines with improper training or accidental interruption with the machines will lead to loss of life. In recent days a 29 year old Men Thiyagarajan was a junior engineer, working as a maintenance lead at Renault Nissan plant at Oragadam died in a tragic accident on 6th January. He was checking machines at the power train section that assembles the engine. He was crushed by a hydraulic press. So in our proposed system we make use of two sensors for the detection of accidental human intrusion with the machine. The sensors detects the motion of the humans and the Thermal sensor is used to detect the presence of stationary humans by detecting body heat and Ultrasonic sensor is used to measure the distance between the machine and the humans. With the help of these sensors workers accidental interruptions and detected and the machine will be automatically turned off. If in case of any injury means it will sent the notification to the nearby admin or hospitals.

2. TRADITIONAL WORK

At present in industries sensors are only used to connect the various machines and to achieve operational efficiency and fuel monitoring in the machines. Potential industrial applications include the ability to monitor and predict the potential failures and breakdowns of critical equipment through sensor enablement and predictive analytics. Here IOT is used only to ensure the safety and security of remote equipment and assets through remote monitoring. Internet of Things is used in industries to ensure the safety of the costly machines and equipment and to increase their lifetime and durability.

3. LITERATURE SURVEY

A safety management service using Internet of Things (IOT) for accidents prevention and management was proposed to prevent safety accidents in chemical laboratories. The service can improved experimenter convenience and safeness for administrator by using sensors [1]. A system which is capable to detect fire and can provide the location of the affected region was proposed. This technology helps to reducing the catastrophic accidents caused by fire evaluated effectiveness as well as scalability. This system becomes more efficient and successfully integrated with every factories [2].

4. INDUSTRIAL INTERNET

In our Conventional work the sensors has been used namely ultrasonic sensor, thermal sensor, Arduino UNO. Thermal sensor to ensure the safety of the workers. When a worker accidentally interrupted with a machine means, the sensors sense the interruption of the humans into the machine and will automatically switch off the power of the motor of the machine. In case of any emergency an automatic alert machine will be sent to the nearby admin or hospital with the location coordinates by using the GSM modem. Then the hospital can contact the industry to know whether the accident have happened or not and can arrive at the location immediately. Thus the safety of the workers in the industry was ensured.

5. SENSORS

1. Ultrasonic sensor
2. Arduino UNO
3. GSM Modem
4. Thermal sensor

Thermal sensors are used to detect the presence of stationary humans by detecting the body heat and can therefore automatically turn off unnecessary lighting or air. Here we are using this sensor to differentiate a static worker from a worker in motion, hence avoiding the confusions.

5.1 Ultrasonic sensor

Ultrasonic sensor is used to measure the distance between the objects using sound waves. It is used because, humans can present at a distance from the machine. If the worker is far from the machine means then there is no use of sensing them and switching the power off of the machine. In such case turning off the motor is of no use. Hence the Ultrasonic sensor is programmed with a certain distance (i.e., very close to the machine), then only the sensor detect the human motion and turns the machine off.

5.2 Arduino UNO

The Arduino UNO is a main microcontroller board and has 14 digits input or output pins, a USB connection, power jack and reset button. It is simply connect to computer with a USB cable or it with an adaptor or battery to get

started. Here, UNO is the latest version series of USB Arduino boards and to the reference model for Arduino platform. The UNO differs from all preceding boards and not in use of FTDI USB-to-serial driver chip.

5.3 GSM Modem

Wireless communication can be achieved using many devices. Those devices are Zigbee, GSM, etc. In this paper GSM is used. Zigbee can also be used but the disadvantage with it is its short range, less complexity and the speed of data is less. Hence compared to Zigbee, GSM has more advantage because it is simple to use and because of its less cost.

GSM modem is a unique type of wireless modem, accepts a SIM card and it operates similar to mobile phone with its own specific mobile number. GSM modem mainly consists of antenna for wireless communication, SIM holder, communication port, ON or OFF switches and power supply. It is used for forwarding the alert messages to the hospital in case of any emergency.

6. METHODOLOGY

When humans accidentally interact with the machine, the motor of the machine is turned off with the help of the Arduino UNO microcontroller and the sensors. The Ultrasonic sensor and the thermal sensor is used to detect the humans. The ultrasonic sensor is programmed with specific distance. Sensors produce the analog output voltage between 0 and 5V. An LED is present on the sensor board. It is used to indicate the presence or absence of humans. Hence the machine is turned off.

The GSM modem sends the location coordinates to the nearby hospital through the SIM card which provides wireless connectivity. The GSM modem is programmed with the phone number of the nearby hospital. Then the hospital can contact with the industry to know about whether the accident have occurred or not and arrive at there in time. Four modules are used in the proposed system;

1. Intruder detection using sonic sensor
2. Monitoring the room temperature using thermal sensor
3. Machine Automation
4. Safety Alert using GSM

6.1 Intruder detection using sonic sensor:

1. It uses to measure the distance of target objects or materials through the air using “non-contact” technology
2. They measure the distance without damage from machines to workers
3. It is easy to use and reliable, whether it is used in an indoors or out, tough sonic sensors can take abuse

6.2 Monitoring the room temperature using thermal sensor:

1. The most commonly used in this type of sensor to which detect the heat or temperature
2. It can be used to detect solids, liquids or gases over a wide range of temperature
3. These sensor uses to convection and radiation to monitor the changes in temperature

6.3 Machine Automation:

1. It is the uses of control systems such as machines or motors and information technologies
2. It handles the different processes and machineries in an industry to replace a human being
3. This is the step for beyond mechanization in the scope of industrialization

6.4 Safety Alert Using GSM:

1. GSM modem is a unique type of wireless modem, accepts a SIM card
2. It operates similar to mobile phone with its own specific mobile number
3. GSM modem mainly consists of antenna for wireless communication, SIM holder, communication port, ON or OFF switch and power supply
4. It is used for forwarding the alert messages to the hospital in case of any emergency

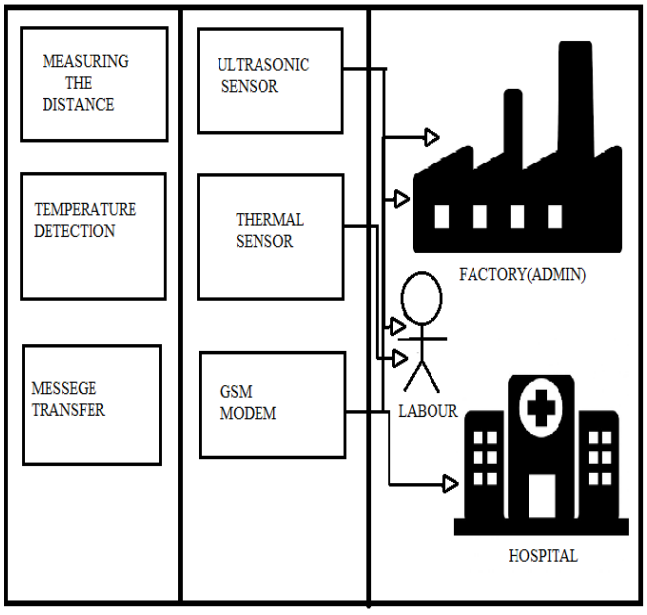
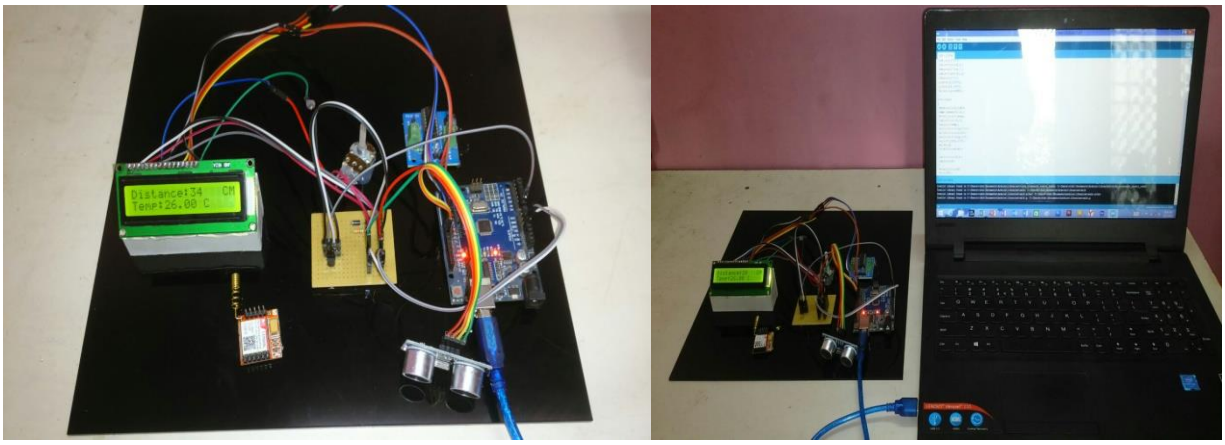


Fig.1. System Architecture

7. EXPERIMENTAL RESULTS

The sensors were deployed in the selective positions in the machines and they are connected to the Arduino UNO microcontroller. The GSM modem is also connected the microcontroller. The power supply of the motor of the machine was also connected to the microcontroller. All the sensors work properly and detect the humans correctly

when they are very close to the machine and turn the motor off. Alert message was properly delivered to the respective hospital with the location coordinates.



8. CONCLUSION

The potential of major industrial accidents has become more significant in production of storage and use of hazardous substances increased. In the ever increasing mechanization, electrification, chemicalization and sophistication have made industrial jobs more and more complex and intricate. This has led to increased dangers to human life in industries through accidents and injuries. To protect employees/workers from the danger or risk of industrial accidents, we have introduced this concept of "IOT based automated prevention of industrial accidents". By using this we can prevent the loss of life and many injuries. The recent industrial practices have provided many safety measures to workers, even though many accidents will occur due to the technical causes and human causes. These industrial accidents can be prevented using the "IOT based automated prevention of industrial accidents".

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