IOT BASED GAS PIPE LEAKAGE DETECTOR INSECT ROBOT

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ABSTRACT

Gas pipes play important roles for cities, industries and thus in growing economies. So gas leakages lead to losses as well as are a threat because they can also lead to fire accidents. Placing sensors at each section of pipe is very costly. So here we propose an innovative robot that clings on to the outer surface of the gas pipe and moves with the pipe to check for leakages. The robot consists of gas sensor that is used to detect gas leakages. As the robot keeps moving along the metal pipe it keeps monitoring for any gas leakage, leakage detected over to the IOT login system,. The main objective behind this paper is to develop a robot to perform the act of surveillance in gas pipelines industrial areas Robots can be manually controlled or can be automatic based on the requirement. The purpose of this robot is Gas Leakage Detection to send that obtained information to the user. In this project, one can control the robot with the help of mobile or laptop through Internet of Things (IoT). This robot will collect data from remote place and able to send those data to a remote IoT cloud database. This robot will be controlled via android mobile phone,each sensor which can be constrained by Arduino dependent on IoT .Each gadget is extraordinarily recognizable by the controlling programming which is the idea of IoT. In proposed system we are going to designed a low-cost Microcontroller Based Android controlled Robot. The robot will move forward, backward, left and right direction by following the instructions given from the mobile. This system can be helpful for various purposes.

Keywords: Gas Sensors, Fire Sensors, Arduino UNO, Buzzer, IoT, LCD, Smoke Sensor.

1. INTRODUCTION

We observe that in any industry a large amount of work is repetitive and hence boring or tiresome. One of such work is the security check or general audit related to gas leakage or fire appliances. In past many years industrial accidents has rose as a bigger challenge in India. It was reported that there were nearly about 6300 deaths in 8004 incidents of industrial accidents while there were 30 industrial accidents in a single month from May to June 2020. So, looking at the seriousness of the issue it will be wise and sensible to automate this process using robots. The main objective of the project is to build a cost efficient wireless robotic system for industrial security application with wireless video streaming in the area which is hard to reach or hazardous areas thus by substituting the human in such areas. "IOT based Gas Leakage Detection System with Database Logging, Prediction and Smart Alerting" will distinguish gas leakage utilizing sensor (utilized for recognizing regular gases) and check the presence of more amount of harmful gases and cautioning through alarms. Robot which can be used for either prevent our homes or industries, offices etc from fire or from harmful gases. The new and novel thought behind this research is that our robot will move in the area of suffocated fire or harmful gases in our homes or in buildings of other offices, when nobody is at home and offices. This robot will find the presence of fire using infrared sensor and gas sensor and when the flame or fire is observed by the robot, it will battle with detected fire

using fans and send the message in a form of signal to a server of IOT. These Gadgets can be used at various places where feasibility of human is very difficult. Wireless network has proclaimed its incoming on vast stage and thus the whole world goes dynamic. It is need to regulate all the things without disturbing the ecosystem. This construction and design of fire or gas battle robot is remotely controlled by using GSM module embedded in Arduino UNO. The employment of "Embedded System in Communication" gave rise to several attention-grabbing applications which assured comfortless and safety to our life. The main object of this paper is to construct a IOT alert-based Fire/Gas battle Robot tools that may replace conventional flame battle device. The tool detects the flame thereby sending message to landlord of the house, this device is made more efficient by SIM card installed in users' phone for sending messages so that user got alert during fire. A robot is designed and constructed here to move into different locations and receive the details of that area with the help of inbuilt sensors on it. The sensors on it can detect gas like CO, LPG, smoke. The robot also detects the fire. The robot acts according to the command given by the program. It will move in all the direction like forward, reverse, right and left. The Robot will send the real time streaming, which could be seen at monitor or mobile through wireless connection of Wi-Fi module i. e one can control the robot with the help of mobile or laptop through Internet of Things (IoT). Today we are in the world of robotics. Knowingly or unknowingly, we have been using different types of robots in our daily life. The aim of the thesis is to evaluate what students can learn about the fields of engineering, mechatronics, and software development as they design, construct, and program an autonomous robot. This will to provide a guideline to the students who are new in the world of Arduino and help them to understand about embedded system, IR sensors, microcontroller and how to make a robot using Arduino. Robotics is the branch of technology that deals with the design, construction, operation, and application of robots. A machine capable of carrying out a complex series of actions automatically, esp. one programmable by a computer's is defined as a robot. The project is to develop a robot that will move according to the code assigned but find a free space, navigating from any obstacle on its way. This kind of obstacle is very useful in industries where automatic supervision is needed, for example, in places where it might be risky for humans to be.

2. LITERATURE SURVEY

Since the development of first robot by George Devol in 1954, robotics has been evolved so far rapidly in many fields. There are vast applications of robots in industrial and military work hence reducing manpower with the help of IOT and AI. In recent years robotics is also applied in security purpose or as surveillance robot in industries and military applications. According to the P. Parameswari et.al., 2014

[1] Zigbee transmitter and receiver was used to create a wireless robot. AT89S52 was tkey microcontroller to control all the other sensors. LCD display was used to show the output. According to Jayant Patil, 2017

[2], Raspberry Pi was used to control the sensors, motor driver, LCD display and an external camera, while external wife module was used to create a Wi-Fi network. According to M. Ashok Kumar et.al., 2018

[3] Arduino UNO was used as the core microcontroller to control the devices while Nodemcu ESP8266 was connected to send the data of the sensors to cloud database. According to G. Anadravisekar et.al., 2018

[4], Arduino UNO was the controller used to control Wi-Fi module, sensors, camera, and dc motor. External power supply was generated of 12 volts by connecting two 6-volt batteries. The evolution of the project was observed from microcontrollers to Arduino IDE and from Bluetooth module to ZigBee module further extending to Wi-Fi module. We found that the Wi-Fi module would provide added security and added range of distance. The Nodemcu Esp8266 was found to be useful to be used as a Wi-Fi module and the sensors can be integrated on it. While ESP32 cam which has integrated camera can be used for surveillance as well as for controlling the motor driver to control the directions.Robot navigation problems can be generally classified as global or local, depending upon the environment surrounding the robot. In global navigation, the environment surrounding the robot is known and a path which avoids the obstacles is selected. In one example of the global navigation techniques, graphical maps which contain information about the obstacles are used to determine a desirable path. In local navigation, the environment surrounding the robot is unknown, or only partially known, and sensors have to be used to detect the obstacles and a collision avoidance system must be incorporated into the robot to avoid the obstacles. The artificial potential field approach is one of the well-known techniques which has been developed for this purpose. Krogh, for example, used a generalized potential field approach to obstacle avoidance. Kilm and Khosla used instead harmonic potential functions for obstacle avoidance. On the other hand, Krogh and Fang used the dynamic generation of sub goals using local feedback information.

[5] During the past few years, potential field methods (PFM) for obstacle avoidance have gained increased popularity among researchers in the field of robots and mobile robots. The idea of imaginary forces acting on a robot has been suggested by Andrews and Hogan and Khatib. In these approaches' obstacles exert repulsive forces onto the robot, while the target applies an attractive force to the robot. The sum of all forces, the resultant force R, determines the subsequent direction and speed of travel. One of the reasons for the popularity of this method is its simplicity and elegance.

[6] This paper introduces histogram in-motion mapping (HIMM), a new method for real-time map building with a mobile robot in motion. HIMM represents data in a two-dimensional array, called a histogram grid, that is updated through rapid in motion sampling of onboard range sensors. Rapid in-motion sampling results in a map representation that is well-suited to modeling inaccurate and noisy range-sensor data, such as that produced by ultrasonic sensors, and requires minimal computational overhead. Fast map-building allows the robot to immediately use the mapped information in real-time obstacle-avoidance algorithms. The benefits of this integrated approach are twofold: (1) quick, accurate mapping; and (2) safe navigation of the robot toward a given target.

[7] Real-time obstacle avoidance is one of the key issues to successful application of mobile robot systems. All mobile robots feature some kind of collision avoidance, ranging from primitive algorithms that detect an obstacle and stop the robot short of it in order to avoid a collision, through sophisticate algorithms, that enable the robot to detour obstacle. The later algorithms are much more complex, since they involve not only the detection of an obstacle, but also some kind of quantitative measurements concerning the obstacle's dimensions. In our system the ultrasonic sensors are continuously sampled while the robot is moving. If an obstacle produces an echo, the corresponding cell contents are incremented. A solid, motionless obstacle eventually causes a high count in the corresponding cells. Misreading, on the other hand, occur randomly, and do not cause high count in any particular cell. These

methods yield a more reliable obstacle representation in spite of the ultrasonic sensor's inaccuracies.

3. PROPOSED SYSTEM

The block diagram of IOT based firefighting robot is shown by fig.4.1, which consists of plurality of sensors, Arduino uno and IOT module. Power offer could be a regard to supply of electricity. A device which provides electricity or different kinds of power to drive an output load or various number of installed components. The supply is mostly ordinarily injected to voltage consuming component, less typically to mechanical parts, and barely other parts. In this device a 12V DC power is offer to all electronics related component.

The Attention commands are transferred to the electronic devices. In reverse, the electronic device transfers the stored messages from the wireless module. The micro controller checks the IoT command and after validating the command it performs further certain task on the robot or device. The micro controller used here in this project is an Arduino UNO board. The whole device will actuate when the user needs information or data in a form of messages like work like" Harmful threat detected"

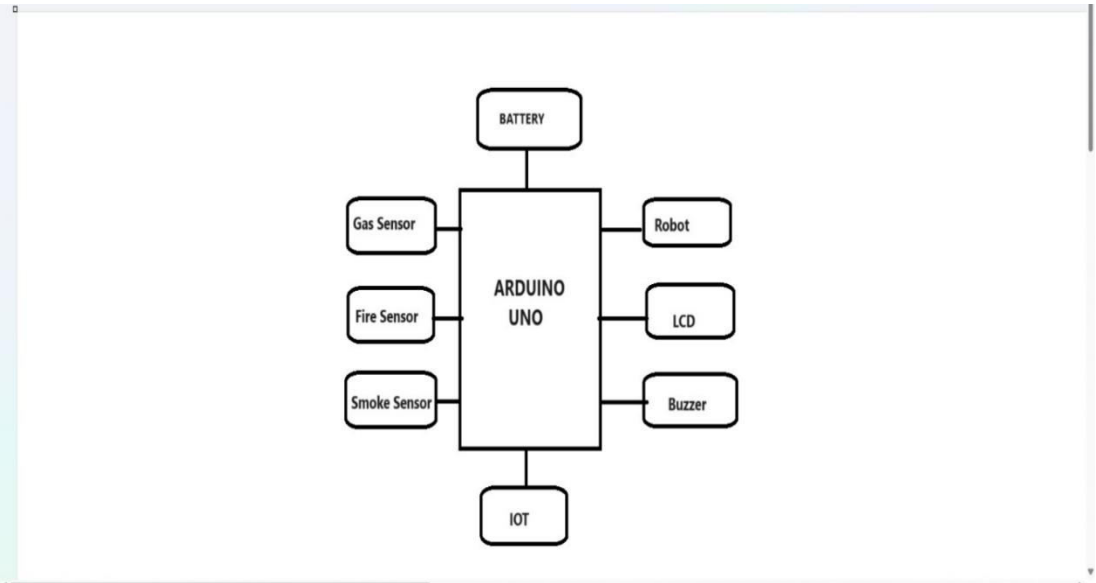

Figure 1. Block diagram

WORKING:

In the project, we are using Arduino UNO, Gas Sensor, Smoke Sensor, Fire Sensor, Buzzer, LCD, Battery, and IOT Module. Instead of using the RPS we used the battery, When the power supply is given to the Arduino UNO then all the components will be activated. We have to connect the WIFI module to the IoT module. Then the robot will be activated and it start working and navigate through the pipe line path, when it detects the Gas leakage, Smoke or Fire then the Buzzer will be activated and all the information will be displayed on the LCD display. This insect robot is placed at the surface of the pipe lines and it starts the working. Overall, IoT based gas pipe leakage detection robot hold immense potential in revolutionizing pipeline safety and environmental protection. With continued research and development, these tiny crawlers can play a significant role in creating a safer and more sustainable future. This type of robot will perform under extreme harsh environments, which is useful in many pipeline networks.

4. HARDWARE IMPLEMENTATION AND RESULTS

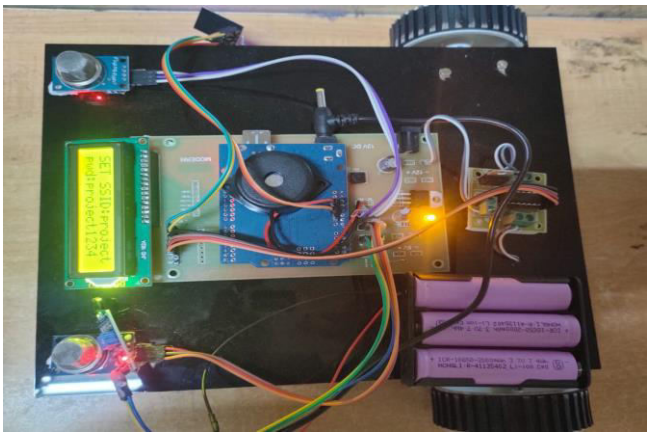

Figure:2 Robot

IOT based gas pipe leakage detector insect robot is equipped with Gas, Smoke and Fire Sensors. It also contains other components like, Arduino, battery, LCD, buzzer, IOT and robot. All these components are placed on the movable dc motor. Using IOT the robot will be activated.

Figure:3 Connecting Wi-Fi

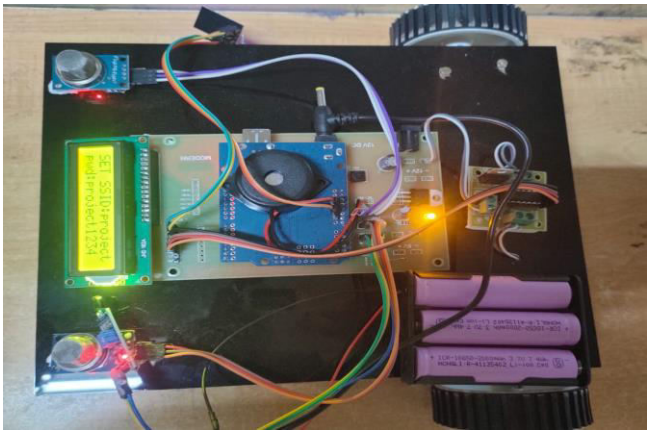

Figure:4 Mother board

When the power supply is given to the Arduino, all the components start working, all the Sensors are activated and start working as shown in the figure:4

Figure:5 Display Gas Detection

If the gas is detected then the gas detection is displayed on the LCD display figure:6

Figure6: No leakage Detection

If no gas is detected then it shows no leakage detection on the LCD display

5. CONCLUSION AND FUTURE SCOPE

This paper concludes that the usages of gas and fire detecting robots are very much safer and economical compared to manual methods in industrial. The principle of IoT based gas detection system using MQ2/MQ4 sensor is seen here to detect LPG/Methane. The purpose of this robot is Lpg/Methane Gas Leakage Detection to send that obtained information to the user. In this project, one can control the robot with the help of mobile or laptop through Internet of Things (IoT). This robot will collect data from remote place and able to send those data to a remote IoT cloud database. This robot will be controlled via android mobile phone. We can control the movement of the robot by sending instructions via IOT telnet app from our android phone. This method is beneficial in many ways due to its easy usage and higher leakage detection rate compared to old methods. It is also seen that the notification in case of any leakage is sent to the concerned authority through buzzer or alarm. we are going to designed a low-cost Microcontroller Based Android controlled Robot. The robot will move forward, backward, left and right direction by following the instructions given from the mobile. This system can be helpful for various purposes.

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