Automatic Surveillance and Fire Fighting Robot Using IOT

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Abstract- This paper focus on improving the security of houses and industries against harmful Gas Leakage and fire flame. This device is very robust and help the user to notify about if there is any gas leakage or fire. It alerts the user when a person is not at home or offices directly from the Iot server. The designed robot can be easily controlled by sending the commands to the micro controller from anywhere from the world. These commands can be observed by using Attention commands and acceptable action is taken. The main aim of this paper is to design a semiautonomous electronic IoT based firefighting robot which can replace the traditional human firefighters and prevent them from the danger of firefighter. The robot sends message to controller and will take emergency precautions to eliminate the danger for firefighters. The device is made more efficient by sending the message via SIM card to user so that the user could be automatically alert when he/she is out of home or office.

INTRODUCTION

The key point of the proposed scheme is to optimally direct the power and resources of the distribution system through persistent display of data as IoT-based communication system. At proposed scheme, every home device is interconnected using data acquisition module with an internet protocol (IP) address, which generates an enormous wireless network of working devices. For encouraging improved demand response for the distribution system to take care of energy, IoT-based communication system is utilized. To simply treat energy, optimal load requirement forecast and energy control processes are deal with SMACA system. In addition, the optimal utilization of the available resources and flexibility of these networks is provided and prolonged with IoT-based distribution system [1]. Different people use the automation system for different purposes according to their comfort. Some of them use it for making their life more comfort like developing automatic door closer, automatic fan speed controller, home automatic system etc, and some of them make the use of automation for making the task easier such as automatic railway crossing gate controller or in metro, the automatic smart card detection system [2],[3],[4]. But the operation of all these systems or devices is not possible without the use of internet of things (IOT).

The designs which are developed is based on GSM and GPRS innovation and Public subservience items for communication [5]. It is a Gas or Fire battle 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 LM35 and gas sensor MQ6 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 SMS 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 [6].

Autonomous Fire Fighter Robot is the robot which autonomously detects and extinguishes the fire, it uses the flame sensor for detection, and the fire extinguisher is used to extinguish the detected fire. The robot can rotate while actively scanning for the fire, this scanning is performed by the sensors placed on the sides, when the fire is detected, the robot can move in the direction of the fire and it stops in front of it and trigger the extinguisher to turn out the fire. The aim of this project is to design a robot which acts as an extinguisher of fire. This proposed fire fighting robot is expected to produce a small but very powerful and versatile robot. It detects fire in the disaster prone area. We will implement this by using FPGA board. Here, the fire detection robot overcomes the problem of hitting the obstacle by sensing the obstacle and moves into the direction where it is obstacle free.

The firefighting robots can save a lot of lives some day, The lives of those affected by the fire disaster as well as lives of those people working as the firefighters, It can be useful in certain types of incidents where the environment will be very dangerous for the humans such as the hazardous materials, the radioactivity or the propane tank which can explode. The robots assisting firefighters are not an often seen sight, there are robotic devices which can already be used for such purposes, these include the bots that can be thrown into the fire site to inspect the situation, as well as the large remote controlled fire extinguishers. The robot is used to fight the fire where the humans cannot enter , It can identify the fire location and it can move automatically , It can turn itself automatically if there are any obstacles , It can take many pictures of the fire place regularly and it sends it to the central system , once the robot detects the fire location etc.

LITERATURE REVIEW

Fire-fighting robot may be used in industrial environment and even in household areas wherethere is more probability of occurring accidental fire [8-10]. Different sensors are used and fusion of their performances is ensured by an intelligent algorithm in Arduino computing platform or by soft computing techniques [11-12]. Su et al. [13] made an automatic fire detection system using Adaptive Fusion Algorithm (AFA). Multisensor Fire Detection System (MSFDS) along with Visual Basic to receive information was used and a general interface for supervised computer was designed in his study.

Viguria et al. [14] built an aerial/ground robot team applied to fire detection. They used a disturbed market based algorithm, called S+T and coordinated in between aerial and ground vehicles. Their simulations showed that if the number of services increased, communication and energy requirement would also increase.

Nam Khoonet.al [15] developed an Autonomous Fire Fighting Mobile Platform (AFFMP) that is equipped with the basic fighting equipment that can patrol through the hazardous site via a guiding track with the aim of early detection for fire. The tasks for the AFFMP once it navigates out of the patrolling route include the obstacle avoidance, locating for more precise location of fire source using front flame sensor and extinguish the fire flame. Their work was focused on outdoor fire fighting robot. For early warning, a vision sensor based fire detection method is proposed by Ko et al. [16]. They developed an AVM classifier for fire pixel verification.

Kim et al. [17] made a portable fire evacuation guide robot system and demonstrated that robot system can be thrown into a fire to gather information, locate displaced people and evacuate them. They designed the robot with aluminum compound metal for thermal resistance with waterproofing and an impact distribution frame for impact resistance. White et al. [18] developed a vehicle mounted fire fighting system and included a series of flame and heat retardant coverings placed on all exposed parts of the system to prevent damage from exposure to extreme heat. Our effort is to develop an autonomous fire fighter robot which is constructed by locally available fire resistant and water-proof materials and performs on an arduino based fire detection and extinguishment algorithm. The robot is also fabricated so that it can save itself from fire by keeping safe distance from the source. At different distances from the fire and at different day time, the performance of the robot is evaluated by performing sensitivity tests on the sensors taking serial monitor readings in Arduino.

The vast majority of the work on fire fighting robots is focused on fire detection algorithms and less on the mobility of the robot inside the building such as climbing stairs and obstacles. Fighting fire within the building requires good thermal protection of the electronic components of the robots. This kind of protection has been considered in the proposed firefighting robot. Taiser T [19], presented the design and assembly details of a

robot developed to take part in an educational robotic competition. A control law based on Lyapunov theory was developed and implemented on a Programmable Logic Controller to control the robot.

Daniel J. et al. [20] conducted a design project to create an autonomous mobile robot that navigates through a maze searching for a fire (simulated by a burning candle), detects the candle's flame, extinguishes the flame, and returns to a designated starting location in the maze. The firefighting contest promotes interdisciplinary design and teamwork. Kuo et al. [21] designed fire detection system using three flame sensors in the fire fighting robot. The adaptive fusion method was proposed for fire detection of fire fighting robot. He used computer simulation to improve the method to be adequate for fire detection.

He incorporated the fire detection system in the fire fighting robot, and program the fire detection and fighting procedure using sensor based method. Chee et al. [22] have conducted a good review paper about variety of technologies and state-of-the-art technology of fire fighting mobile robot. The paper also describes the first Malaysian designed and built fire fighting mobile robot, namely, MyBOT2000.

METHODS

The GSM modem transmits the data collected using sensors mounted on the robot. The robot is semiautonomous, so responds to the data with some specific actions for which it is programmed. For example, fan starts when data indicates that there is fire or gas leakage. 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 [7],[8]. The micro controller used here in this project is ATMEGA 328 incorporated in an Arduino UNO board. The whole device will actuate when the user need information or data in a form of messages like work like" Harmful threat detected" through the SIM card which is inserted in the mobile phones or smart phones [9],[10].
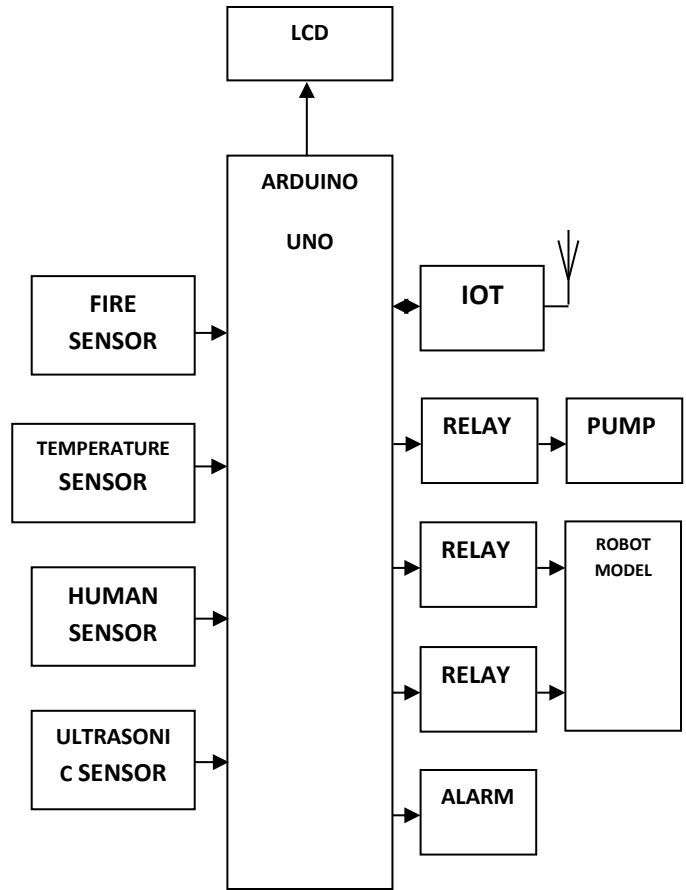

Fig 1: PROPOSED BLOCK DIAGRAM

WORKING:

- In our project the robot is designed to move automatically.
- The robot acts according to command given by the android App.
- It will move all the direction like forward, reverse, left, right.
- The ultrasonic sensor is used to sense object in front of robot mechanism.
- The Human and fire sensing unit is available in robot mechanism.
- If fire is detected, robot will switch on the pump and indicate alarm and send alertmessage to Android app.

Above fig. 1 shows the architecture diagram of the proposed robotstructure which consists of flame sensor as input of the system. Raspberry Pi 3B is used as a microcontroller that connected with other components. Motor Driver (L298N) is used to activate the moving of the servo motor. Flow of water and fire extinguisher were pump after being controlled by the operator. On the other

hand, the operator can monitor the robot movements by using 5MP micro camera which connects to a smartphone through VLC player. Various components that we use in project are:

CONSTRUCTION AND WORKING & RESULTS

We use a 12V 1 Amp battery to give power supply to the XLR8 board. Since the board's supply voltage is 3.3V, we use a voltage regulator LM7805 to limit the voltage and is passed to XLR8 board. We also use a voltage regulator LM1117 to limit the voltage to 5V and is passed to two DC motors. The Filter used in this is used to produce the complete DC pulsating voltage. Since the Micro processor used in this has very little voltage it can supply voltage to the motors which is 5V. So we use L293D driver to supply voltage of 5V to motors. So L293D acts as an interface between microprocessor and the motors in the robot. A threshold value is given to the temperature sensor which detects the temperature. In this the obstacle avoidance feature is maintained by two IRsensors. Initially, the XLR8 is programmed using embedded c code. In this robot, if any object is placed infront of the device the IR sensors gets activated. If the obstacle is placed on the left side of the motor, the IR sensor on the left gets activated and drives the motor to another side. Similarly if the obstacle is placed on the right side, the IR sensor on the right side gets activated and drives the motor to another side. Thus the obstacle avoidance is maintained by IR sensors. And once the temperature value reaches the threshold value, the temperature sensor.
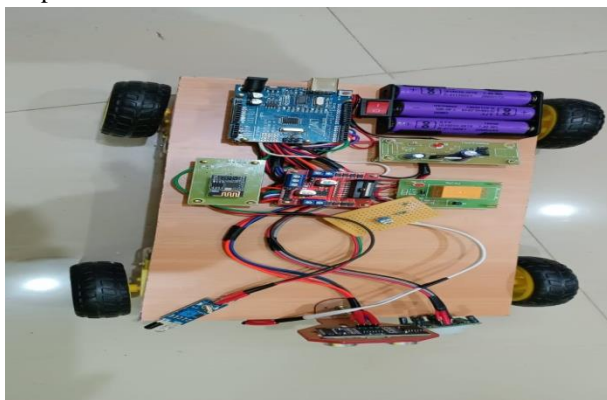

Fig 2: Working function

The user can switch in either modes i.e., automatic or manual. If it has been switched in automatic mode, the robot itself detects the fire automatically, then its relay gets ON and hence it goes to the fire detected area and then extinguishes fire by sprinkling water on to it. If it has

been switched to manual control, the user gets the status of the surroundings of the robot through camera by creating a server page which is connected using IOT in order to control the robot with the help of Raspberry Pi. The Advantage of this manual control over automatic control is that in automatic mode it takes time for the robot to monitor itself. But whereas in manual mode when the users get the status regarding the fire, he can control it manually to save the time and to stop causing more harm.
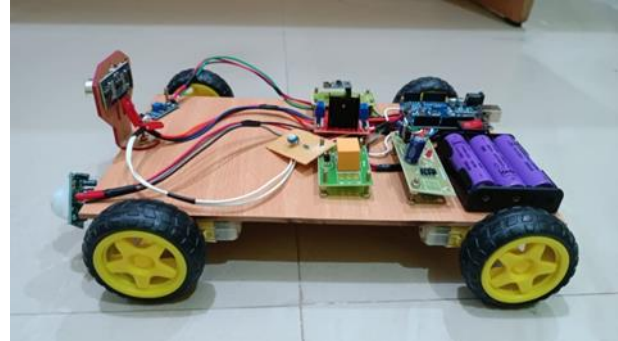

Fig 3: Amp battery to give power supply

In the working model of our project, we have been used IOT. Internet of Things (IoT) is an ecosystemof connected physical objects that are accessible through the internet. The 'thing' in IoT could be a person with a heart monitor or an automobile with built-in-sensors, i.e. objects that have been assigned an IP address and have the ability to collect and transfer data over a network without manual assistance or intervention. The embedded technology in the objects helps them to interact with internal states or the external environment, which in turn affects the decisions taken. In our project we are controlling our robot and giving the instructions as we needed.

CONCLUSION

It is designed by using a temperature sensor. Fire fighting is the act of extinguishing fires i.e., it sprinkles water on to the fire. Monitors the areas where natural calamities and bomb explosion occurs. Robot detects temperature, at the site where the robot exists. This robot is helpful in those areas where natural calamities and bomb explosions will occur. If fire is detected with the help of sensors or manually operates the water pump mechanism through relay circuit. The proposed method is verified to be great beneficial for the security purpose and industrial purpose. Through this we can conclude that a robot can be used in place of humans reducing the risk of life of Fire fighters. We can use them in our Homes, Labs, Offices etc. They

provide us greater efficiency to detect the flame and it can be extinguish before it can become uncomfortable and threat to life. Hence, this robot can play a crucial role.

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