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Smart Wireless Sensor and Automatic Function Dependent Fire Suppression Robot with IOT

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Abstract: When mechanical technology advances, interruption of human beings has deteriorated and robots are used for numerous works and the welfare of individuals. Fire mischief also happens now, posing a risk to human life and property, and often causes challenges for firemen to save lives. In such situations, a fire robot is used to protect people's lives, resources and atmosphere from lost flames. This model is an IOT-oriented fire detector robot. The authorities are told that they should imagine the fireplace and connect through an installed automatic receiver with people trapped there. The robot may be ordered to shift, turn its water pump or carbon-dioxide pump on over long distances, depending on the fire type. The form of fire and the amount of carbon-monoxide are known with installed sensors which generate a graph for analysis. The research is also useful for supplying safety officials with knowledge about the amount of toxic gases inhaled by the residents of the region concerned for a period of time to take sufficient steps to repair the harm.

Key words: IoT, Manual control (web page), Cloud data, Security, Fire.

1. Introduction

The new global theme in embedded systems is omnipresent computing. The incorporation of microcontrollers into everyday objects allows contact between daily objects to simplify life [1]. Devices such as mobile phones and wearables make us available, unwinding and up-to-date with daily activities worldwide [2]. It has been named the computers support humans or people who find it difficult to deal with. They are more rapid, cheaper and accurate than people to do repeated tasks [3]. Robots may be employed in many circumstances for a variety of reasons, but today many robots are used in hazardous environments (including bomb detection and deactivation) (e.g. in space)

In recent decades, there has been a lot of technical change. There are times where people have to risk their lives in order to work with these inventions [4]. One of the highly frequent conditions is triggered by factory fires, workplaces with toxic chemicals. Experts monitor these fires often results in death loss (every year there is a significant mortality rate of firemen on

duty) [5]. The Robotics department has created new models that will eliminate human needs to go to the building manually to extinguish flames. Flying drone is one of the most groundbreaking methods of reducing flames [6]. Destruction by fire exists sometimes without realization in everyday life. This form of robot is thus strongly demanded for its utility on the market [7].

2. Literature Survey

In old period, there are no fire extinguishers immediately. The fire service should be referred to the fire-prone area run by individuals of higher risk of their lives. It takes time to hit the furnace, and the fire is often kept out by water [8]. Fire extinguisher is later created with the advancement of science, which is limitedly loaded with CO2 [9]. In recent years there has been manually operated fire extinguishing robot, which is accompanied by pre-trained fire detection and avoidance robot in some settings [10]. It also sends an alert to the user through Bluetooth, which can communicate within a few meters [11]. The proposed robot uses IoT to stream live images of the area of fire susceptibility and puts away all fire forms by fitting them with the corresponding fire extinguishers according to the area of fire susceptibility [12].

A robot with the look and feel of a robot built to extinguish fire using a water pump as drive unit. A fire extinguisher is robot. The robot monitors the movement of fire extinguisher with Android smart phones via Wi-Fi networks using the robot's Wi-Fi module [13]. User instructions are passed into autonomous action to the robot microcontroller. The robot was fitted with Ultrasonic sensors and cameras. In providing user input and finding the cause of a burn, the camera played a part. The camera input on a robot is seen on a mobile computer [14]. This proposed work involves the construction of an entirely self-governing robot. If the user starts the robot, the robot can maneuver, drive in and quench the fire alone without assistance. The robot built reveals the fire by warning. The environment is pre-programmed. The robot is only usable in a pre-trained field such as home and not for general purposes

The robot has several operating modes, with a Bluetooth module interacted with Arduino Uno and a Smartphone application becoming the first means of operated traveling wirelessly. The second mode of operation is consummated by the combination with Arduino of the interfaced IR sensors, used for the detection of obstacles and temperature sensing by means of the LM35 IC temperature sensing. The planned robot is trained to perform fire brigade functionality. The key drawback is that Bluetooth is only used with a 400-meter contact.

The purpose of the project is to train the robot as a remote fire fighter. A water tanker system and a pump unit are included in the robot. Both systems are self-contained - the fires are quenched by the spray of water by wireless contact with a PIC microcontroller [15]. The transmitter end is with push buttons which aid in the robot movement in every direction send commands to the receiver. A distance up to 100 meters with an adjustable decoder is used to decipher the robot in firefighting until it is fed into another microcontroller to drive DC motors using IC driver. The robot's primary requirement is to detect the obstruction. The robot rolls

details from the surrounding environment with the robot sensors. Ultrasonic sensors, bump sensors, infrared sensors, etc. are used to unmask obstacles. The Ultrasound sensor is cost-effective and its range is high. The ultrasonic sensor constantly transmits the ultrasonic waves from the sensor head while the robot is in motion. The ultrasonic waves are mirrored on the target while the barrier is on the direction of the robot and the detail is lengthened to the microcontroller. Based on ultrasound signals, the motors are regulated. With pulse width modulation, the speed of motors is controlled (PWM).

3. Proposed Work

The aim of the proposed model is to build an IOT based robot to replace the conventional Robot for Fire Safety. This robot sends a fire alarm to the cloud that an Android application can display quickly. The installation of an Android program at end of the robot and for a robot allows the user to call the automated receiver attached to the robot that supplies live streaming images of the fire position until the alerts are received. This receiver often serves to contact the user with people who were trapped in the fireplace, so instructions can be provided on the escape routes which constitute the model's good real-time usage. Besides the alarm, carbon dioxide sensor values can be used to obtain an idea for the kind of fire and the spectator can manually show a fire extinguishing fire by the water pump or CO2 pump. The idea that cleaner fuels offer less CO2 than bad fuels because their moisture contents are considerably higher than clean fuels is used to identify combustion. This brings us to the greatest drawback of conventional robots that start the water pump automatically without understanding the fire type. When fire type B is used, water not only protects the burn-out phase, but also improves fire since it is less dense than water. Therefore, the fire continues to spread with it everywhere the water runs. The carbon dioxide level can be determined by a sensor MHZ-14 and a related PPM verse graph can be traced. A graphical analysis can be conducted for the initial minutes and the robot can then be directed to use water pumps or CO2 pumps, according to the type of burn. Higher CO2 values mean the type a burn, so water pumps can be used while CO2 pumps should be used for the lesser set of values.

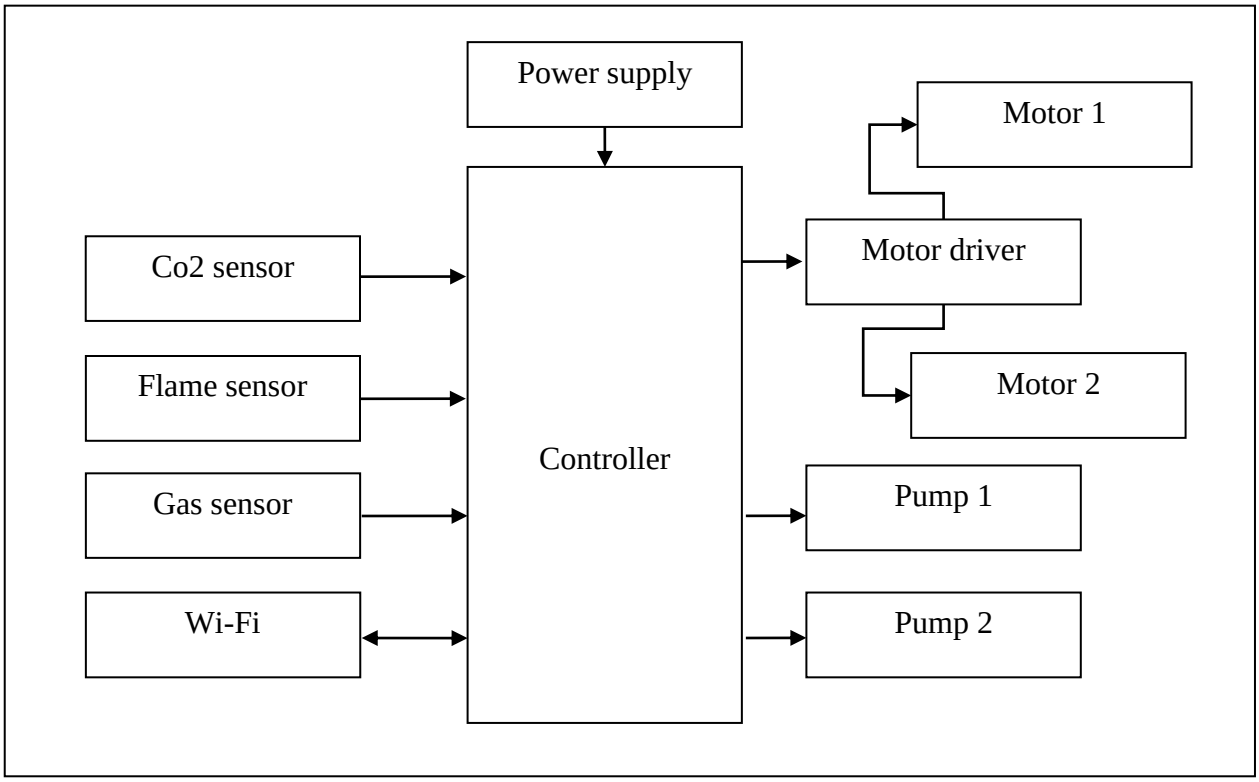

Figure 1: Block diagram of the system

Compared to standard ones, this model also provides a visual overview to quantify for a time the exposure to carbon monoxide within the field of fire. Possible consequences and casualties should be predicted and safety officials should consequently be told about the amount of hours in which residents can avoid remaining inside the area impacted by the fire until they are reached by the emergency team. Figure 1 shows the block diagram of the system.

4. Results and Discussion

MQTT Box (Chrome application) and MQTT Dashboard are used to monitor the robot's movement and to start or finish all pumps. Figure 2 shows Hardware design of the proposed system. Figure 3 shows control option in webpage.

Figure 2: Hardware of the system

Our robots use numerous temperature and proximity sensors to detect, avoid and extinguish fires around them. Control option and eye movement and task operation here. Figure 3 shows the Control panel screen.

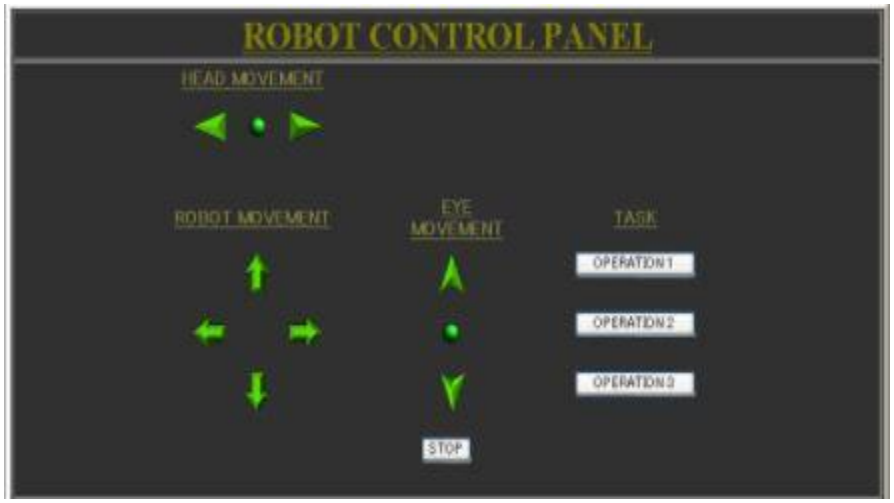

Figure 3: Control screen

The CO2 values and fire warning notifications can also be displayed. The data is translated to graphs for fast analysis after sensor values from the MQ7 sensor and MHZ-14 sensor have been recovered.

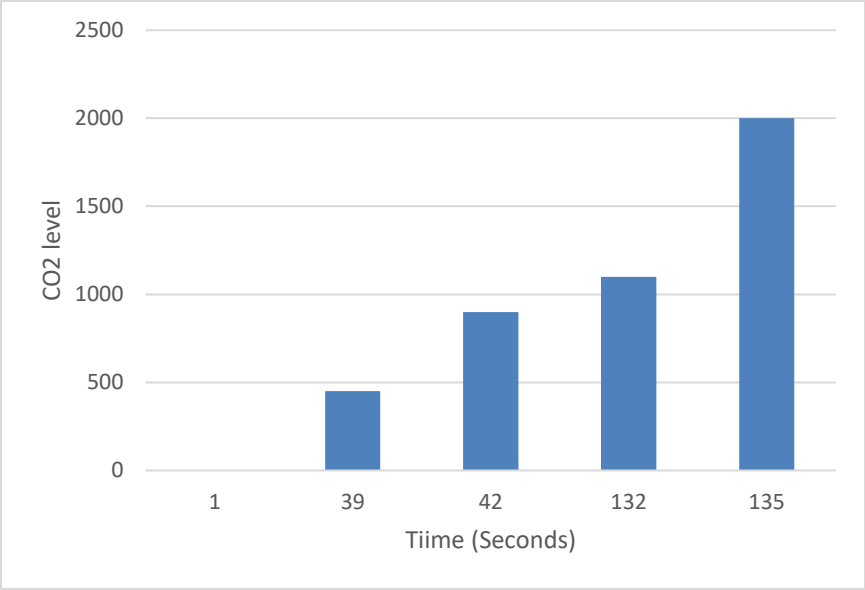

Figure 4: Increase in CO2 level.

The level of CO2 for a particular PPM vs sec duration is shown in Figure 4. The x axis Time and Y axis is CO2 level.

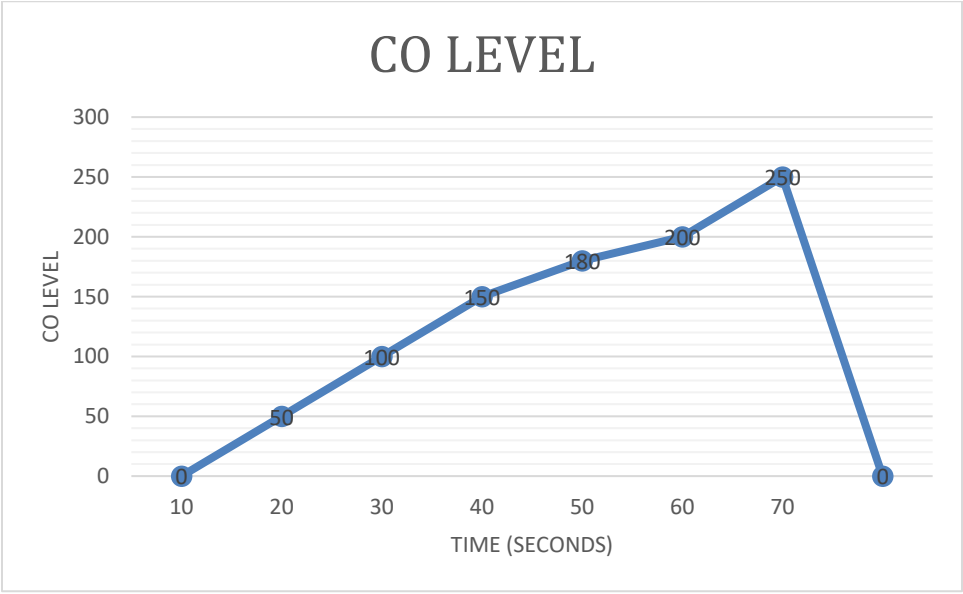

Figure 5: CO level

Figure 5 indicates the CO stage. These levels vary from 3 to 5 PPM, which is somewhat above 0 ppm, so the current level of toxic gas is too low to do a lot of harm. The x axis Time and Y axis is CO level.

5. Conclusion

Firefighters are exposed to a variety of hazardous situations. In most cases, it may not know the exact scenario for the workplace. Protective equipment can provide maximum protection. This famous dream of reducing liability for occupational accidents and diseases is no longer only to benefit people, but add to the economic machinery this work is built upon. Because the situation is risky, monitoring data close to the job site puts lives at risk. Therefore, a WSN-based lifesaving system was developed. The system is compact and can be attached to any drone or mobile robot to monitor CO, CO2 and LPG, smoke levels. The paper not only presents the efficient execution of a fire combat robot but also provides improved capabilities that allow it to be more realistic in real time situations in which identification of the fire form is necessary to prevent increasing fires with the spill of fire extinguishing agents during the extinguishing phase. Measuring sensitivity is to carbon monoxide together gives the built model another new feature.

Reference

[1]. Chang HT, Chen PC, Ho CY. Discussion about the Intensity of Fire Rescue Training in Miaoli County.
[2]. Reddy G, Puviarasi R. Design of fire fighting biped robot with human detection module. Indian Journal of Public Health Research & Development. 2017;8(4):1200-2.
[3]. Indu MA, Gayathri R. Design of Rescue Robot by Detecting Human to Prevent From Calamities. Science and Technology. 2020 Sep;2(06).
[4]. Antony AP. Advanced Human Detection Robot. Central Library; 2017 Jul 24.
[5]. Rajesh M, Prasad MS, Dubey MB. Alive Human Being Detector and Anti theft Robot.
[6]. Gupta D, Gupta P, Yadav R, Mohite U. Detecting Alive Human Using Robot for Rescue Operation.
[7]. Kumar BP, Bhaskarrao Y. A Distributed Framework for Surveillance Missions Robots to Detect Intruders. Indian Journal of Public Health Research & Development. 2017;8(4):1080-3.
[8]. Ramabhilash SO, Singh SK. A Semi-Autonomous Coal Mine Monitoring Security System Based on Wireless Control Using RTOS. Indonesian Journal of Electrical Engineering and Computer Science. 2018 Jan;9(1):33-5.
[9]. Hameed MA, Ahmed SH, Saeed AT, Sana AM. An Efficient Model for Increasing Reliability and Security of Internet of Things Applications in Iraq. Journal of Computational and Theoretical Nanoscience. 2019 Mar 1; 16(3):869-73.
[10]. Sabarinathan N. An Effective Method For Qos-Constrained Work Flow Scheduling Of Cloud Services. International Journal of MC Square Scientific Research. 2011 Dec 20;3(1):7-17.

[11]. Chang HT, Chen PC, Ho CY. Discussion about the Intensity of Fire Rescue Training in Miaoli County.
[12]. Sabhanayagam T, Kumar TS, Narendra M, Sahayaraj JM. Internet Connected Modern Fire Fighting Robot. InJournal of Physics: Conference Series 2021 Jul 1 (Vol. 1964, No. 4, p. 042088). IOP Publishing.
[13]. Jodkowski L. Possibilities and Methods of Risk Assessment under ISO 9001.
[14]. Sunaryo W, Yusnita N, Mustofa M. Improving job performance through strengthening the organizational culture and interpersonal communication. JurnalKonselingdanPendidikan. 2020 Oct 1; 8(3):145-50.
[15]. Flores-Cortez O, Cortez R, González B. Design and Implementation of an IoT Based LPG and CO Gases Monitoring System. InCS& IT Conference Proceedings 2021 Jun 19 (Vol. 11, No. 8). CS & IT Conference Proceedings.