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An Innovative Method for Evaluating a MEAFFR

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Abstract: *There are many possibilities of fire that can start in an industry or any remote area. Detecting and extinguishing fires is a dangerous occupation. Fire accidents lead to the loss of property, risk the lives of many people and cause big destruction over a large area.The Automatic guided vehicle can be repaired, but people cannot be when serious injuries occur and that is the exact reason why robots are increasing in various sectors. The Automatic guided vehicle capable of fighting a simulated fire was designed and built. Flame and smoke sensors are also added in the prototype that can sense the smoke leak and trigger the alarm. It can put out a fire before it gets out of control. It will also reduce human involvement as the micro controller functions as the brain of the prototype by receiving the signals from the sensors and gives the command to the prototype to act accordingly to extinguish the fire and reach the appropriate position to maximize the extinguishing function. The following prototype is useful and somehow it can help in reducing the causality in case of emergency.*

Keywords: Automatic guided Vehicle, prototype, Extinguishing Fire, Remote area

I. INTRODUCTION

The expanding world population is bringing unintentional problems together. Fighting Fires are among the most critical of these problems. It is an unavoidable disaster that occurs suddenly or intentionally in place or mostly in household residences. This circumstance led to the loss of properties, risk lives, and causes big destruction in certain places. In 2019, a total of 11,037 cases of fire accidents were reported in the country. With 27,027 deaths, every fifth fire-related death in the world in 2017 took place in India. There are several possibilities of fire in an isolated area or in an industry. A firefighter must be able to reach the point of fire quickly and safely quench the flame, preventing further destruction and rescue victims to a comparatively safer location from the hazards.In the age where every day a new form of technology comes up, the world is slowly and steadily turning towards automated system and self-travelling vehicles. Technology has finally brought together the technique of firefighting and machines allowing for a more efficient and effective method of extinguishing the fire. A Fire-extinguishing automatic guided vehicle using a certain micro-controller, will automatically sense the fire with the help of sensors. They are capable of performing monotonous tasks more quickly,economically and accurately than human-beings. In this project, we will develop a simple Automatic guided vehicle using a micro-controller that could detect smoke and fire and not only alarm the people but also move towards the fire and pump out water around it to quench the fire.

II. LITERATURE REVIEW

In 2015, Hilmi Saygın Sucuoğlu present " The development of fire detection robot ".The main aim of this paper is to develop and build a fire detection robot that can be used for fire inspection and early detection in industrial settings. The robot is constructed and programmed to follow predetermined courses while avoiding obstacles using obstacle avoidance and motion planning units, as well as to scan the surroundings for fire sources using a fire detection unit. Using virtual lines set by the motion planning unit, the robot may trace patrolling routes.

In 2017, Akib Islam, P. Sathya present " Intelligent wireless Fire Extinguishing robot".In this paper design of an intelligent firefighting robot that can be operated wireless from anywhere in the world with the help of data received from the sensors is shown. The designed robot sends all the data from the sensors to the cloud where it gets analyzed. The robot is also capable of sending videos to the internet so that the user who is operating the robot wireless can view the situation

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inside the room which is caught in the fire. This robot eliminates the possibility of the failure of operation of fire fighting robot due to faulty sensor reading and it can accurately locate the position of the flames.

In 2018, Snehal Adsul, Ujjwala Lokhande, Snehal Motghare, Pranita Dagale, Prof. M. D. Sale present " Android Controlled Firefighting Robot using Arduino". In this paper, using a temperature sensor the suggested vehicle can detect the existence of a fire and extinguish it automatically. The suggested robot includes a water spray that can spray water at an angle of 180^0 degrees. The sprinkler may be redirected in any direction. It uses ultrasonic sensors to detect impediments. Bluetooth will be used to communicate between the phone and the robot, and the phone will have a GUI to control the robot's movement. The goal of this project is to create an Android application that can control the fire-fighting robot's activities.

In 2019, Vynzarali R. Amenodin, Hussein P. Lawanza, Mojahid C. Maradia , Margie Rose D. Apig, Norhana D. Dimakuta, Chel Dianne B. Falceso and Chgris T. Sagarino present " An ardruino based firefighting robot". The main purpose of this study is to create a prototype firefighting robot (F2R) using a relay, fire sensor, and mini pump. The prototype activates its relay when it sense fire. The fire sensor is used to detect the fire. The mini pump releases water which is used to put off the fire. The prototype undergoes stages wherein the researchers conceptualized and planned the prototype. Second, is the development of the robot, programming and the researchers have improvised the prototype robot for its better performance in detecting fire, and extinguishing the fire.

III. METHODOLOGY

As the name implies, we are developing a fire detection and suppression system. A flow diagram of the working of the proposed automatic guided vehicle is given below.

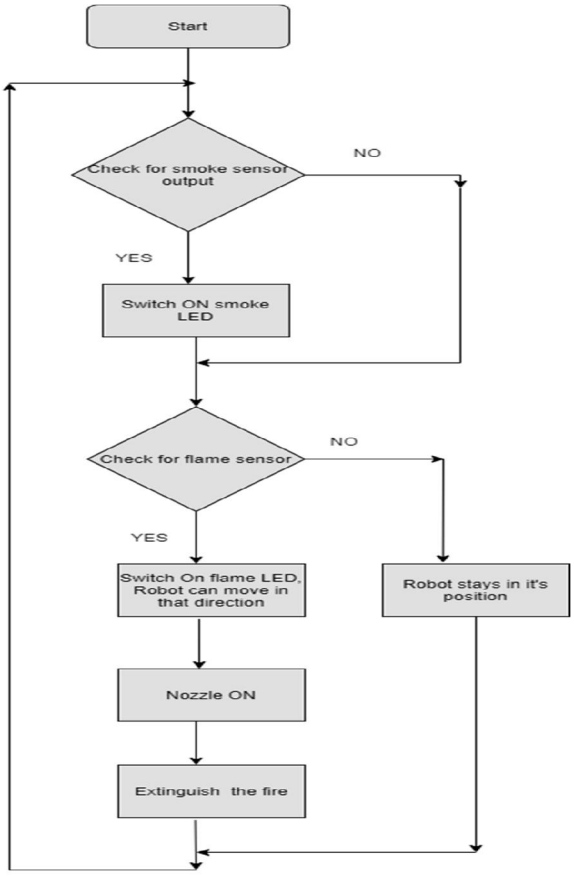

Figure 1: Flow chart of working of the proposed vehicle.

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IV. COMPONENTS USED

A. Arduino Uno

Arduino is an open-source electronics platform that uses simple hardware and software to make it easy to use. The ATmega328P is used in the Arduino/Genuine Uno micro-controller board. There are 14 digital input/output pins (six of which may be used as PWM outputs), six analog inputs, a 16 MHz quartz crystal, a USB connection, a power connector, an ICSP header, and a reset button on the board. It comes with everything you'll need to get started with the micro-controller.

B. Flame Sensor

By measuring light wavelengths between 760 and 1100 nanometres, this sensor can detect a flame. The test distance is determined by the size of the flame and the sensitivity settings. The flame does not have to be directly in front of the sensor because the detection angle is 60 degrees. To avoid damage, the sensor is kept at a set distance from the fire. There are two sensor outputs

1. Digital – sending either zero for nothing detected or one for a positive detection
2. Analog – sending values in a range representing the flame probability/size/distance; must be connected to a PWM capable input.

C. Smoke Sensor

The MQ-2 smoke sensor detects smoke as well as combustible gases such as LPG, Butane, Propane, and Methane. The Gas Sensor (MQ2) module is useful for detecting gas leaks (in home and industry). It can detect flammable gas and smoke. When the gas concentration rises, the Gas sensor's output voltage rises. The potentiometer may be rotated to change the sensitivity. Please keep in mind that the sensor should be preheated for at least 24 hours.

D. Micro Submersible Pump

A pump is a mechanical device that is used to extinguish a fire by pumping water onto it. Extinguishing a fire requires the use of a DC water pump. It extracts water from a bottle. It pumps water with a basic motor. This is a low-cost, small-size Submersible Pump Motor that runs on 3 to 6 volts of electricity. It can process up to 120 litres per hour while drawing only 220 milliamps. Simply attach the tube pipe to the motor outlet, immerse it in water, and turn it on. Make sure the water level is higher than the engine at all times. Due to the heating, a dry run may cause damage to the motor, as well as make noise.

E. Motor Driver IC (L293D)

The L293D is a 16-pin motor driver IC that is widely used. It is mostly used to drive motors, as the name implies. Two DC motors may be driven simultaneously by a single L293D IC, and the direction of these two motors can be regulated individually. The H Bridge circuit, which is employed in the IC l293D for motor driving and also enables bidirectional motor control. Change the polarity of the DC motor's input voltage to adjust its spinning direction. An H-Bridge is a typical method for accomplishing this.

F. Servo Motor (SG90)

The SG90 Micro Servo Motor is a small and light server motor with high output power. The servo can spin 180 degrees (90 degrees in each direction) and functions in the same way as regular servos but in a smaller size. Servo motors are high-torque motors that are extensively employed in robotics and a variety of other applications because their rotation is simple to regulate. Servo motors, unlike typical DC motors, generally feature a signal pin in addition to the two power pins (Vcc and GND) for control purposes. The signal pin is utilized to spin the shaft of the servo motor to any specified angle.

G. Arduino IDE (Version 1.6.7)

The Arduino project provides a complete development environment (IDE) for programming micro controllers based on the Processing programming language, which additionally supports C and C++. The open-source Arduino IDE makes writing code and uploading it to the board a simplicity. The Arduino acts like the main brain of the project, which receives

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inputs from the sensors and then processes the information and finally commands the other hardware components as per Instructions which are coded in the Arduino IDE.

IV. WORKING

The Arduino is the project's main brain, but we employ a flame sensor to detect the radiation that is emitted from the fire and a smoke sensor to detect smoke or any other flammable gas in the environment. When a fire burns, it emits a little amount of infrared radiation, which the sensor module's IR receiver detects. As a result, we deploy three of these sensors in three different orientations on the automatic guided vehicle to determine which way the fire is burning. Once the direction of the fire has been determined, we can utilize the motors to move closer to the fire by using the L293D motor driver. The central focus of this Automatic guided vehicle is to detect an environmental fire and use a water pump to extinguish it.

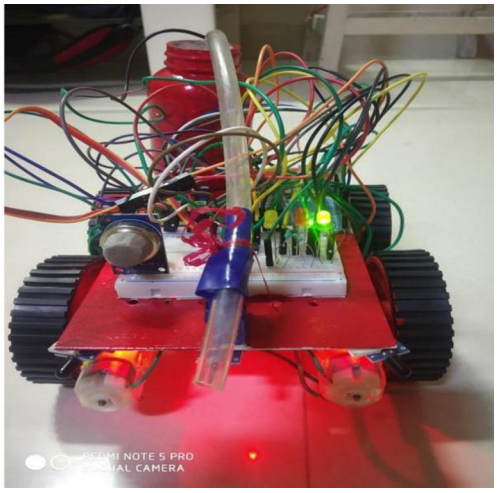

Figure 2: Automatic Guided Vehicle (Front View)

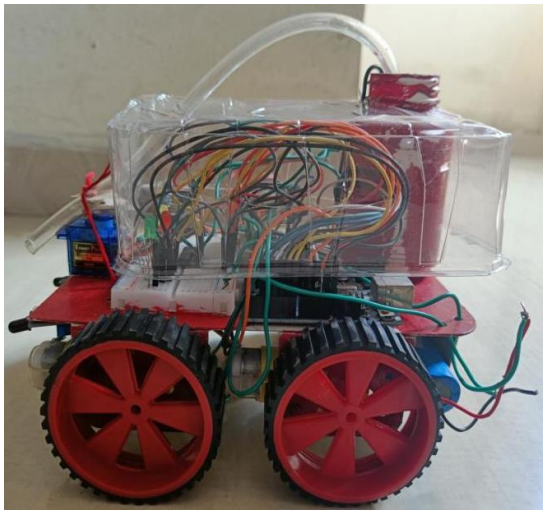

Figure 3: Automatic Guided Vehicle (side view)

The developed Automatic guided vehicle successfully detects radiation from the fire by using a suitable flame sensor and then switches the red LED on. If it also detects smoke or any other flammable gas it then switches on the Yellow LED. After the red LED is switched on the automatic guided vehicle moves in the direction of the fire and stops at some predetermined distance from the fire, then it operates the pump and water starts coming out of the hose that is attached to the servo motor thereby performing the sweeping action so that fire is extinguished effectively. If no fire and no smoke is detected then the green LED glows indicating that everything is safe.

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V. Experimental Results

The researchers utilized a matchstick to evaluate the performance of the flame sensor in the initial phase testing of the prototype fire automatic guided vehicle. Nine of the eleven experiments have been discovered, resulting in an 80 percent success rate. The fire extinguishing automatic guided vehicle has a detection range of 40 to 200 cm and a mean of 120 cm. The range of 40 to 60 meters is extremely successfully detected at 100 percent. Between 80 and 120, there is a 75 percent chance of being identified. The range of 140 to 190 meters is discovered, however it is slightly effective. In this testing of the prototype in motion with water, 200 to 240 cm cannot be identified and is ineffective. According to the researchers, the prototype in action with water covers a limited range of distance; in the presence of water, the prototype finds it difficult to go beyond the distance of 160 to 200 cm, where the prototype can still acknowledge the fire but cannot go towards it, so the prototype can detect but not effectively, and the distance of 220 to 240 cm where the prototype cannot detect and is ineffective.

VI. Conclusion

This fire extinguishing automatic guided vehicle was created to assist firefighters in avoiding dangerous circumstances. By checking its modified surroundings for rapid changes in temperature, this team created a robot gadget that can assist limit or controlling impending potential fires. The vehicle was designed in such a manner that no human intervention is required in the event of a fire. It has additional functions, making it a more realistic robot to use in real-time. Fire accident rates can be reduced by implementing this approach in industries and other factories.

References

[1]. Phyo Wai Aung , Wut Yi Win (2014), "Remote Controlled Fire Fighting Robot", International Journal of Scientific Engineering and Technology Research ,Vol 03, Issue No.24, September 2014.

[2]. Hilmi Saygın SUCUOĞLU (2015), "The Development of fire detection robot", Adnan Menderes University, Republic of turkey, MSC Mechanical Engineering, 013,2015.

[3]. Mr. Borse Karan Dipak, Mr. Bansode Vishal Laxman, Mr. Gadekar Atish Mahadeo, Mr. Adhav Gitanjali Subhash, Miss. Shelke Amruta Ashok(2016), "Review of Fire Fighting Robot", International Journal for Scientific Research & Development, Vol. 4, Issue 01 (2016)

[4]. Akib Islam, P.Sathya (2017), "Intelligent Wireless Fire Extinguishing Robot", International Journal of control systems and robotics vol 2 (2017).

[5]. Snehal Adsul, Ujjwala Lokhande, Snehal Motghare, Pranita Dagale,Prof. M. D. Sale (2018), "Android Controlled Firefighting Robot using Arduino", International Research Journal of Engineering and Technology vol 05, May 2018.

[6]. N N Mahzan, N I M Enzai, N M Zin and K S S K M Noh (2018), "Design of an Arduino-based home fire alarm system with GSM module",J. Phys.: Conf. Ser. 1019 012079 (2018).

[7]. Vynzarali R. Amenodin, Hussein P. Lawanza, Mojahid C. Maradia , Margie Rose D. Apig, Norhana D. Dimakuta, Chel Dianne B. Falceso and Chgris T. Sagarino (2019), "F2r: An ardruino based firefighting robot", Research Gate ,DOI: 10.13140/RG.2.2.18663.29605, April 2019.

[8]. Malathy Iyer (2019) India news homepage on The Times of India.[online]. Available: https://timesofindia.indiatimes.com/india/every-5th-fire-death-in-world-is-in-india-study/articleshow/72920852.cms.

[9]. Manoj Vinay.R, Naveen.c , Chondamma.C , Saara k (2021), " Fire Fighting Robot",Journal of Emerging Technologies and Innovative Research Vol 8 issue 3 (2021).