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IOT BASED FIRE DETECTION AND AUTOMATIC WATER SPRINKLER SYSTEM

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***Abstract*—Fire presents significant threat to life due to its severe hazards and ability to spread rapidly. fire poses a huge threat to human life. Fire detection systems, particularly vision-based systems, identify flames before any loss or destruction occurs. In this model, a novel vision-based technology is created that uses a camera to detect flames (the visible part of a fire) over long distances. An immediate alert is generated on android application. The goal of the proposed system is to notify the remote user when a fire accident occurs. This system can be installed in any remote area where there is a risk of fire. Using this system, we can detect a fire by using a fire sensor beside the camera. After detection of fire the camera is used to take the fire photo and it goes to micro controller. By using camera method, the report is automatically generated and delivered to the person immediately following the fire is detected in any part of the frame using Wi-Fi/GSM. To prevent major damage, the detector will detect flames caused by a fire accident and activate the water sprinkler. The appliance system includes components such as a buzzer for alarming, displaying temperature, humidity and to put out the fire, we use a motor pump.**

I. INTRODUCTION

Fire is a serious danger to life and property in worldwide. It is usually caused by combustion of materials which releases heat and light in large amount. Fire accident is common feature in factories, house, markets etc. due to inadequate fire protection and a lack of adequate fire alarm system. So we try to design automate fire detection with water sprinkler system because the event is very dangerous in our life A good firefighting system is one that reduces fire damage while also limiting the harm caused by the firefighting system itself. Fires have become a serious issue in recent years, and they must be dealt with quickly and efficiently to avoid the loss of lives and property. When the observed temperature exceeds 50degrees, it is considered a fire situation. It takes about 15 minutes for personnel to arrive for help in the event of fire threats in vital places such as hospitals, schools, and banks. Appropriately allocating fire alarms with proactive warnings could save lives and prevent property loss.

IOT: Internet of things (IoT) is the network of programmable software, sensors, electronics and communication facility that helps to gather and transfer data. The objective of the designed system is to alert the remote user while the fire accidents occur. The concept of Internet of things (IoT) nowadays is applied in many applications ranging from the smart industry smart agriculture to smart healthcare and smart home application Home automation is an area where IoT has several advantages remote plant locations, for example, will benefit from technology that allows for remote operation and maintenance; autonomous inter-appliance, in which devices communicate with one another aware of the information interchange, lowering engineering costs in the handling of all involved devices. Nowadays, fires can spread rapidly because people prefer to save money over investing in appropriate fire alarm systems. Some issues, such as affordability, effectiveness, and response, remain unsolved.

Considering the aforementioned difficulties, this research focuses on developing an enhanced Using a fire alarm system we can detect heat and smoke. The system uses IoT to read the data of heat and flame and analyses it, and then instantly activates the sprinkler system that operates automatically. As a result, the importance of this research is to develop a low-cost fire detection system that is affordable, effective, and responsive. Many studies have been undertaken to address these concerns, but fire detection issues are not adequately addressed because these systems rely on machine vision, which requires more photos to train the algorithms, and the detection rate is insufficient. Other approaches have some drawbacks, primarily slow response

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times and low accuracy. As a result, this article intends to reduce false alarms, provide faster response times, and introduce a new IoT method compared to prior research that primarily used Node-Red. The following is my contribution: (1) To determine which sensor combinations and algorithms can accurately and quickly detect fires, (2) we designed and developed a system that detects fire and activates the fire alarm, (3) the proposed system evaluates the situation and activates an automatic water sprinkler, where the water unit was designed separately, and (4) the system analyses the surroundings with camera monitoring, resulting in a faster response. Thus, the highlighted four points make the proposed system superior in terms of cost-effectiveness, performance, and ability to respond

II. PROPOSED METHODOLOGY

We identify the fire in our suggested fire detection system using multiple characteristics and situations. Following the detection of a fire, our technology will take real-time photos of the surrounding area. The flame sensor determines whether or not there is a fire or flame present. It works using an infrared flame flash technology. A photo transistor is used in this explicit flame detector. The infrared spectral band is used by flame detection systems. Carbon dioxide, which is produced by the combustion of organic compound materials, has a resonance frequency in this range. Put anything that can catch fire in front of the flame sensor. The flame sensor is triggered when it detects a fire or flame. This sensing relies on variables such as humidity and temperature. After detecting fire the camera will capture the image of the fire, it will be sent to android application with the help of microcontroller through wireless network. As temperature increases the temperature sensor will detect and it will trigger the buzzer and buzzer will blow. The water pump is connected to a IC. If a flame is detected, IC activates the dc motor and water pump. The sprinklers connected to the pump will sprinkle the water throughout the fire affected area.

2.1 Block Diagram

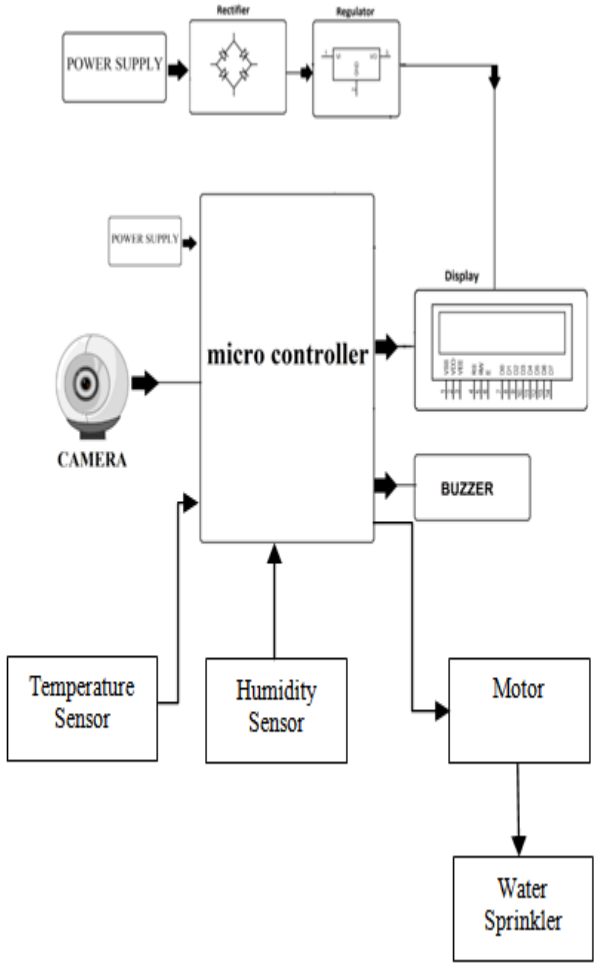

Fig 1: Block diagram of IOT based fire detection and Automatic water sprinkler

A. Microcontroller at mega 328

Microcontroller at mega 328 CPU type is 8-bit AVR and the maximum CPU speed is 20MHz. It has a Flash memory of 32KB and SRAM 2KB EEPROM 1KB. The maximum I/O pins are 23. The "pico Power" ATmega328p is a popular alternative to the ATmega328. The ATmega328 is a low-cost microcontroller that is widely used in a variety of projects and is self-contained systems. This chip is most commonly used on such a well Arduino development platform.specifically the Arduino Uno.

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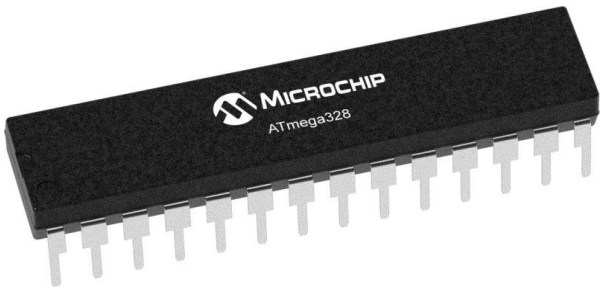

Fig 2: Microcontroller at mega 328

B. Buzzer

A buzzer is similar to an alarm clock. It produces an output that sounds like an alarm and then turns on the machine. Two pins make up the buzzer. The micro controller's data pin is attached to the negative end. The micro controller's Vcc is connected to the positive end.

Fig 3: Buzzer

C. IC (L293d Motor driver)

The L293D IC is a common Motor Driver IC that allows a DC motor to drive in any direction. This IC has 16 pins and is used to control a pair of DC motors in any direction instantly. It means that we can control two DC motors with an L293D IC. This IC can also drive small and quiet large motors. A motor driver is what you need to serve the purpose. A motor driver takes the low-current signal from the controller circuit and amps it up into a high-current signal, to correctly drive the motor. It basically controls a high-current signal using a low-current signal.

Fig 4: IC

D. Humidity and temperature sensor (Dht11)

Humidity sensors are ultra low cost. A humidity sensor senses relative humidity. This means that it measures both air temperature and moisture. Relative humidity is the ratio of actual moisture in the air to the greatest amount of moisture that air at that temperature can hold, expressed as a percentage. Because the warmer the air is, the more moisture it can hold, relative humidity varies with temperature.

Fig 5: Humidity and temperature Sensor

E. 16x2 LCD Display

LCD (Liquid Crystal Display) screens are electronic display modules that have many applications. A LCD display is a very basic module that is widely used in a variety of gadgets and circuits These modules are beneficial to others. multi-segment LEDs with seven segments. The reasons for this are that LCDs are inexpensive, easily programmable, and have no restrictions on displaying special or even custom characters. A 16x2 LCD can display up to 16 characters per line has two such lines. Each character is shown in a 5x7 pixel matrix on this LCD. A command is a set of instructions given to an LCD to perform a specific task such as launching it, clearing its screen, positioning the cursor, and controlling it the display, and so on. The data is stored in the data register.

Fig 6: LCD Display

F. Camera module (Esp32 cam)

The ESP32-CAM is a small, low-power based on camera module the ESP32. It has an OV2640 webcam and an onboard TF circuit board. The ESP32-CAM sis suitable for a wide range of intelligent IoT applications, including WIFI image upload, wireless video surveillance, and QR identification.

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Fig 7: Camera module

G. Flame Sensor

A sensor flame sensor is one that is most sensitive to normal light. A flame-sensor is one kind of detector which is primarily intended for detecting and responding to the occurrence of a fire or flame. This sensor/detector can be constructed using an electronic circuit and a receiver, similar to electromagnetic radiation. This sensor employs the infrared flame flash method, which allows it to operate through a layer of oil, dust, water vapouror ice.

Fig 8: Flame Sensor

H. Gas Sensor (Mq135)

Air quality sensor capable of detecting a variety of gases such as NH3, NOx, alcohol, benzene, smoke, and CO2. Excellent for use in the office or factory. The MQ135 gas sensor is highly sensitive to ammonia, sulphur dioxide, and benzene steam, as well as smoke and other harmful gases.

Fig 9: Gas Sensor

2.2. Flow chart

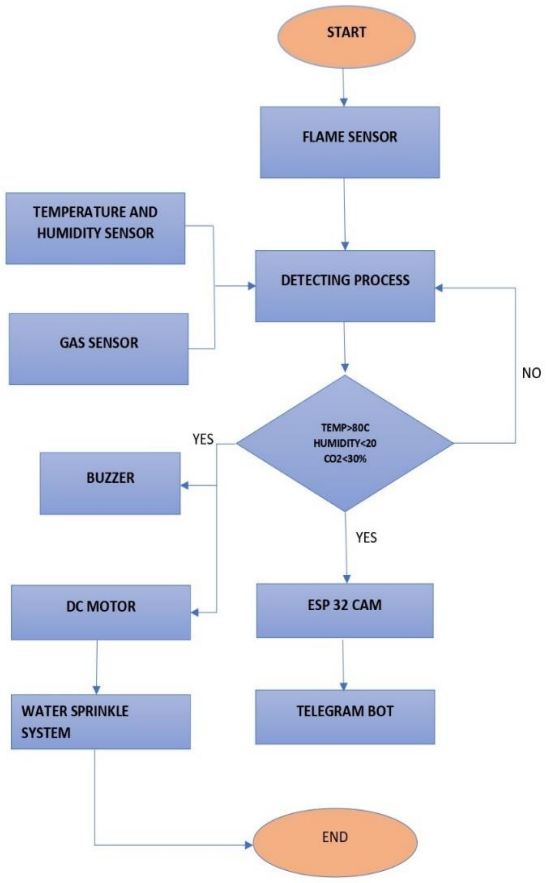

Fig 10: Flow Chart

2.3. Placements of the Sensors in real time application

A proposed prototype of a fire detector system in which a room is outfitted with gas, temperature, and flame sensors that are propagated to ensure quick readings, water sprinklers are evenly distributed, a router of the Global System for Mobile Communications module is added, and accessories such as a buzzer are included. The prototype is a fire testing stand with a water system backup.

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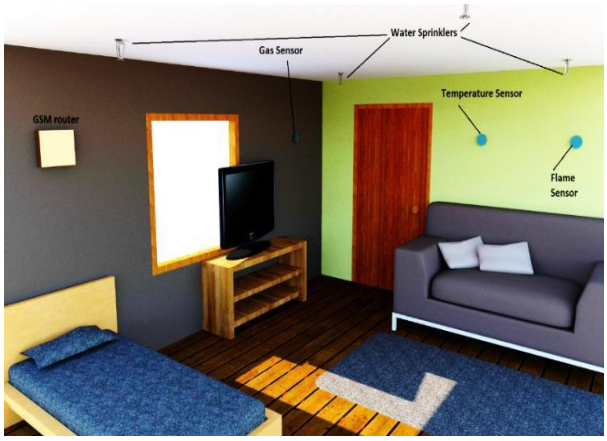

Fig 11: Components Placements in Real-Life

III. RESULTS

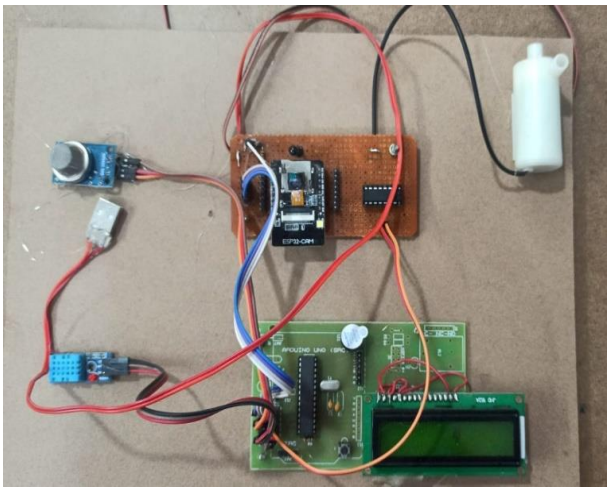

Fig 12: Sample Output

IV. CONCLUSION

The fire detection systems proposed in the literature were designed to stop fires without regard for responsiveness. As a result, this research takes into account the existing issues and develops an efficient and a powerful fire detection system based on IoT technology, gas, temperature, and smoke sensors to collect data accurately and quickly. The structure of this system enhances the effectiveness and efficiency of fire detection. The water pump was activated, sucking water from the tank and releasing it into the water sprinkler to keep the fire from spreading until the property owners and emergency services arrived. As a result, the proposed system overcame the challenges of affordability, effectiveness, and responsiveness.

V. REFERENCE

[1] Bu, F. and Gharajeh, M.S., 2019. Intelligent and vision-based fire detection systems: A survey. Image and VisionComputing,91, p.103803.

[2] Saeed, F., Paul, A., Rehman, A., Hong, W.H. and Seo, H., 2018. IoT-based intelligent modeling of smart homeenvironmentforfire preventionandsafety.JournalofSensorandActuatorNetworks,7(1),p.11.

[3] Saeed, F., Paul, A., Karthigaikumar, P. and Nayyar, A., 2019. Convolutional neural network based early firedetection.MultimediaToolsandApplications, pp.1-17.

[4] Kodur,V.,Kumar,P.andRafi,M.M.,2019.Firehazardinbuildings:review,assessmentandstrategiesforimprovingfiresafety.PSU ResearchReview..

[5] Mahzan, N.N., Enzai, N.M., Zin, N.M. and Noh, K.S.S.K.M., 2018, June. Design of an Arduino-based home firealarm system with GSM module. In Journal of Physics: Conference Series (Vol. 1019, No. 1, p. 012079). IOPPublishing.

[6] Suresh,S.,Yuthika,S.andVardhini,G.A.,2016,November.Homebasedfiremonitoringandwarningsystem.In2016InternationalConferenceonICTinBusinessIndustry&Government(ICTBIG)(pp.1-6).IEEE.

[7] Kanwal, K., Liaquat, A., Mughal, M., Abbasi, A.R. and Aamir, M., 2017. Towards development of a low cost earlyfire detection system using wireless sensor network and machine vision. Wireless Personal Communications, 95(2),pp.475-4

[8] Nfpa.org.NFPA-Data,Research,AndTools.[online]Available:https://www.nfpa.org/News-and-Research/Data-research-and-tools2018

[9] Liu,Z."Reviewof Recent Developmentsin Fire Detection Technologies". Journal of Fire Protection Engineering,13(2), pp.129-151,2003.

[10] Mowrer,F." Lagtimesassociated with fire detection and suppression".Fire Technology,26(3),pp.244-265,2010.

[11] Gong, F., Li, C., Gong, W., Li, X., Yuan, X., Ma, Y. and Song, T., 2019. A real-time fire detection method from video with multifeaturefusion. Computationalintelligenceandneuroscience,2019.

[12] Fonollosa, J.; Solórzano, A.; Marco, S. Chemical Sensor Systems and Associated Algorithms for Fire Detection: AReview. Sensors2018, 18, 553.

[13] Moinuddin, K.,Bruck, D. and Shi, L."Anexperimental study ontimely activation of smoke alarms and their effective notification in typical residential buildings".FireSafetyJournal,93, pp.1-11,2017.

[14] Taha, I.A. and Marhoon, H.M., 2018. Implementation of controlled robot for fire detection and extinguish to closedareasbasedon Arduino.Telkomnika, 16(2),pp.654-664.

[15] Willstrand, O., Karlsson, P. and Brandt, J., 2015. Fire detection & fire alarm systems in heavy duty vehicles: WP1–Surveyoffiredetectioninvehicles.

[16] Desima, M.A., Ramli, P., Ramdani, D.F. and

Rahman, S., 2017, November. Alarm system to detect the location of IOT-based public vehicle accidents. In 2017 International Conference on Computing, Engineering, and Design (ICCED)(pp. 1-5).IEEE.

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