# Robotic Implementation of Fire Detection System and Web based Communication System

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**Abstract -** *This paper shows the structure and development of sensor and MAT Lab based flame recognition robot caution and control framework. Most purchaser evaluation fire discovery frameworks depended exclusively on smoke alarms. The assurance given by these has been built up to be restricted by the sort of flame present and the location innovation at use. The issue is additionally intensified by the absence of satisfactory alarm and warning components. A run of the mill framework depends on the physical nearness of an individual to follow up on the alarm. In creating nations, lack of common sense and tending to adversely influences the flame and salvage group's reaction time. To address this issue, fire identification robot ready framework was executed utilizing a Renesas small scale controller with contributions from a MQ2 smoke sensor and thermister. The yield of the location framework is sent over SMS (Short Message Service) utilizing a SIM900 Global System for Mobile Communication (GSM) module to the house proprietor or guardian progressively. The flame and salvage group likewise get told progressively with area data. An examination between the productivity of the warning framework utilized by standard fire indicators and the multi-sensor remote based notice approach received in this paper demonstrated huge enhancements as opportune discovery, alarming and reaction.*

*Key Words*: **Renesas Microcontroler, SMS, water pump, sensor**

## 1. INTRODUCTION

Fire is a marvel ignition showed in light, fire, and warmth. There are three principle components required for flame to exist, these are; oxygen, warmth and fuel. These make up what is known as the flame triangle. The extent of every one of these components decides the idea of the flame. With flame and a portion of its results being utilized in a great deal of helpful applications, for example, cooking, control age and the assembling procedure, among others, it can possibly additionally cause destruction. As indicated by the Center of Fire Statistics of the International Technical Committee for the Prevention and Extinction of Fire (CTIF), somewhere in the range of 70,000 and 80,000 passings happen every year because of flame flare-ups since the start of the 21st century [1]. In a creating like Ghana, the circumstance is the same. In 2014, about GHS3.4M (894,761USD) [2] was lost because of flame episodes. Fire related loss of lives and properties keep on

expanding in spite of overwhelming flame wellbeing efforts being done by the open organizations. Despite the fact that it is imperative to cling to fire wellbeing measures, setting up early location frameworks significantly alleviate the impacts of flame episodes. This has prompted a great deal of novel commitments in the field of flame recognition. Preceding the presentation of innovation, fire discovery was done for the most part by visual examination and affirmation. This anyway changed during the late 1930s when Walter Jaeger incidentally found a sensor which fit for identifying smoke accordingly preparing for examination into present day smoke sensors [4]. Smoke alarms are comprehensively sorted into photoelectric based and ionization based identifiers. Photoelectric based locators utilize the light dissipating capacity of smoke particles to recognize the nearness of smoke while the ionization based indicators are structured with an ionization chamber containing a radioisotope (normally Americium-241). Without smoke particles the ionized air atoms inside the chamber permit the section of a little electrical flow between the charged anodes in the chamber [5]. The nearness of smoke particles prompts a drop in the current between the terminals. The need to create an increasingly dependable flame recognition framework without false alerts has prompted the appropriation of a multi-sensor approaches. Not at all like flame discovery methodologies depending entirely on smoke, this methodology depends on the recognition of more than one flame signature. Because of the viability and productivity of multi-sensor based flame discovery frameworks, momentum examine ablaze identification is to a great extent concentrated on growing better calculations and preparing strategies dependent on the information got from the sensors, in this manner lessening false cautions. A rising marvel in flame location is the utilization of numerous parameters and sensors in the recognition component [6], [7]. Some multi-sensor fire discovery procedures being utilized right now incorporate information combination calculations [8], [9], picture handling with neural systems [10], [11], [12], and Bayesian systems [13]. Most existing flame identification frameworks consequently activate a discernable caution by means of an alarm or a strobe light on identifying fire. Others anyway require manual incitation of the alarm utilizing a catch or a break glass station. Remote notice has been done customarily utilizing the Public Switched Telephone Network (PSTN), be that as it may, GSM has been received because of its

safe and solid nature. With fast reception of savvy home gadgets in the created world, some gadget producers have embraced the utilization of the Internet. A considerable lot of these frameworks likewise give a UI to gadget the executives. This paper exhibits the sensor and MAT Lab based flame identification robot alarm and control framework.

## II. LITERATURE SURVEY

This report incorporates measurements on numbers and rates of flames, passings and wounds because of flames, and on-obligation fireman passings and wounds whether continued at flames or not. The report additionally incorporates insights on quantities of non-fire crisis reactions, by real kind of occurrence, and numbers and rates of firemen, fire administration mechanical assembly and stations. The flame and misfortune insights for 2011 depend on information from 33 nations and 35 of the urban communities on the planet. Information on flames and misfortunes during 2007-2011 are given from 40 nations that have provided information for at least one of the five years in 2007-2011. In each table, the quantity of nations with information indicated differs relying upon the quantity of nations that have detailed information for the shown insights whenever in 2007-2011. What's more, measurements on assets of the flame administration are exhibited for 50 nations [1] Flames in abodes represent most of life misfortune because of flame. Information propose that roughly 80 % of all flame fatalities worldwide are the aftereffect of flames that start in a private inhabitance. Abiding flames speak to roughly 30% of all fires.[1] Research by NIST[2], NRCC [3,4] and UL[5] has illustrated, that in any event in North America, changes in materials utilized for goods, building materials and segments, and development techniques have brought about the potential for an expanded degree of peril from an incidental dwelling fire. So as to decrease the death toll from private flames the Society of Fire Protection Engineers bolsters the utilization of built segments, frameworks and innovations, for example, smoke cautions, fire sprinklers, improved wellbeing controls on cooking and warming machines, and improved fire safe material advances to lessen the fire danger inside private structures and accordingly diminish the death toll from private fires Fire identification frameworks situated in flying machine load compartments are as of now dependent on smoke alarms. They create around 200 false alerts for each year for US enlisted airplane. The quantity of false cautions is developing as more planes are furnished with smoke alarms and air travel grows. In addition, the survivability of an air ship in a flame situation relies upon the early recognition of the flame. A flame location framework is created dependent on the concurrent estimations of carbon monoxide, carbon dioxide, and smoke. The mix of the rates of ascent of smoke and either carbon monoxide

or carbon dioxide focus gives a potential alarm calculation to expand the unwavering quality of flying machine smoke alarms, and to diminish an opportunity to caution. The flame discovery framework with the alert calculation recognized fires that were not frightened by smoke sensors, and frightened in shorter occasions than smoke sensors working alone.[4]

This section are examining about an examination on the past task dependent ablaze identification robot venture and proposal. The whole venture had been examined and broke down their standards, strategy and applications. Robot is a machine that resembles a person and performs different complex assignments. Presently, how about we have a decent take a gander at existing firefighting robots. Computer generated Reality Simulation of Fire Fighting Robot [9] (Indonesia) is a virtual adjustment of rivalry robot, that participated in Panitia Kontes Robot Cerdas Indonesia rivalry in 2006. This framework was created in Simulink with the assistance of «Virtual Reality Toolbox» module. It is situated for introductory testing of controlling calculations. Its essential to see, that even the robot itself needs more degree of usefulness, in light of low-point by point formalization of condition. The robot could work just in passageway room condition, without abnormal articles. Just one flame source is implied and there are helper stamps on floor, that mean for instance room entrance. Pokey the Fire-Fighting Robot [10] (USA) is the firefighting robot, that advanced out of rivalries, and turned out to be increasingly "genuine" than different frameworks. In [10]there are definite portrayal of utilized hardware and essential calculations of working. Robots working condition is a structure, so the robot is outfitted with vital sensors, for instance, with a line sensor, that could be un-valuable in states of thick smoke. The fundamental preferences of robot are: utilizing of two sorts of flame sensors, working in various ways; utilizing of complex firefighting instrument; Fire Protection Robot [11] (USA) – another challenge venture, produced for «15th Annual Trinity College Fire Fighting Robot Competition». Robot has progressively complex association, than one, appeared and is arranged for explaining bigger assortment of errands. The fundamental framework's focal points are: increasingly intricate calculations, utilized for flame detection, using of sound sensor for enacting and nearness of some extra route sensors. The arranging minimal effort is a framework's primary favorable position. In extraordinary request it's important to see firefighting robots, incorporated into Russian Ministry of Emergency Situations. Among them are "ABR-ROBOT", "El-4", "El-10". These models are far from rivalry ventures, they outfitted with a genuine reinforcement and firefighting instruments, yet their principle impediment comprises in remote controlling. They aren't self-sufficient.

## III. PROPOSED MODEL

Before you begin to format your paper, first write and save the content as a separate text file. Complete all content and organizational editing before formatting. Please note sections A-D below for more information on proofreading, spelling and grammar.

The microcontroller situated at the focal point of the square chart shapes the control unit of the whole venture. Implanted inside the microcontroller is a program that encourages the microcontroller to make a move dependent on the information sources gave. Many inserted frameworks have generously various structures as indicated by their capacities and utilities. In this task configuration, organized measured structure idea is embraced and the framework is mostly made out of a solitary microcontroller, LCD, RF Tx and Rx, RFID, GSM, smoke sensor, thermister, water siphon engine, zigbee, L293d and camera. The unwavering quality of a fire discovery framework enormously relies upon the sensors utilized and their capacity to enroll precisely the fire marks being checked. The choice to utilize more than one sensor is educated by the various advantages displayed by multi-sensor fire location frameworks over the customary single mark based framework. In this undertaking absolutely we have two unit first unit comprise of smoke sensor, thermistor and RF Tx. This unit present in terminated room and remaining segments present in robot area. At first whenever terminated distinguished in room RF Tx consequently trigger by smoke sensor and thermister. So data gotten by RF Rx. After the data gotten by RF Rx, robot will consequently begin to move for the terminated spot by recognizing RFID tag. Here we effectively chose the predefined spot utilizing RFID tag, in the event that that RFID tag recognizes, at that point just the robot will begin to move for the particular position. When it achieves the terminated spot, utilizing camera it catches the terminated picture and signal begin to blare to give ready data for encompassing individuals in the meantime water siphon engine turn over to pour the water for that terminated spot. The framework consequently reports them to the fire and salvage administration and furthermore advises the owner(s) through SMS informing on their mobile phones.

Renesas (RL78) is 16 bit engineering, it has 64 I/O stick (R5F100LE). It has 11 I/O ports, 64kB ROM, 4kB RAM,1 guard dog timer, I2C convention, 3 UART's, 10 bit ADC, 8 Timers, on chip troubleshoot work, fast on-chip oscillator.

A fluid precious stone showcase (LCD) is a level board show, electronic visual presentation, in light of Liquid Crystal Technology fluid gem show comprises of a variety of minor fragments (called pixels) that can be controlled to introduce data. LCDs are utilized in a wide scope of utilizations, including PC screens, TV, instrument boards, air ship cockpit shows, signage, and so on. They are normal in buyer gadgets, for example, video players, gaming gadgets, tickers, watches, number crunchers, and phones.

The yield of this procedure gives the flame status where a flame caution might be initiated. In light of the yield of the framework, a fire occasion is either dispatched to the electronic warning framework and house owner(s) or no move is made. To build up a correspondence channel between the fire recognition framework and the electronic warning framework, a SMS over GSM system was utilized. In most creating nations, the information organize inclusion given by most versatile system administrators is restricted to urban regions. This settles on SMS a superior decision. Fig. 7 demonstrates a review framework showing the progression of data.

The gadget comprises of a flame sensor suite, a microcontroller, and a GSM module. These two subsystems are interconnected utilizing the GSM foundation by means of SMS. Fire occasions sent from the gadget through SMS are directed to the application through a Kannel SMS entryway. Utilizing the Google Maps API, the flame notice frameworks give navigational data on-request to the fire team. A basic piece of a flame discovery framework is its capacity to advise individuals when a fire is recognized. The warning additionally transfers fire occasions to the flame and salvage administration and the proprietor of the structure continuously.
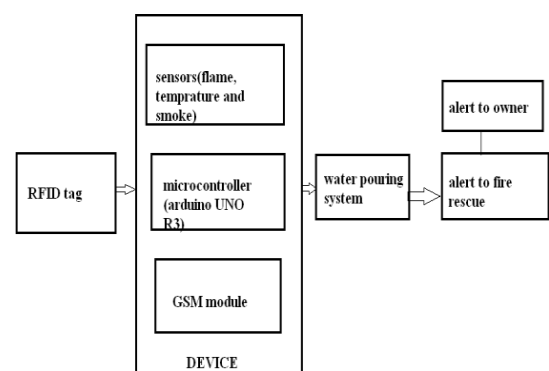
Fig: block diagram of fire detection system

*A. COMPONENT DETAILS:*

Hardware component used:

- Renesas microcontroller 64 pin

- ALCD

- RFID

- RF Tx and Rx

- Water pump motor

- Smoke sensor MQ-2

- Thermister

- GSM

- Zigbee

- L293d

- Buzzer Software used:

- Cube suite+

- Renesas flash programmer

- Embedded c

*B. System Requirements, Analysis, and Specifications*

The flame notice framework is an online application utilized for remote observing and the board of the fire location gadgets. To expand the reaction time of the flame and salvage group and house proprietors, continuous conveyance of flame alarms was finished utilizing SMS. To wipe out the navigational issues experienced by the flame and salvage team in achieving fire scenes, the fireNav module offers a guide helped route interface to help the flame and salvage group. With the supply of satellite and ethereal symbolism anticipated to increment by two- folds [19] sooner rather than later, the capability of this component is extraordinarily improved by its capacity to give point by point land data on a flame episode by utilizing subtleties of the cautioning gadget. For each flame scene, the framework additionally gives data on closest fire hydrants. With persistent use, a great deal of information gets produced, which is indispensable in impacting basic leadership ablaze issues. The framework, therefore, has a component to create reports dependent on the produced information.

*C. Design Considerations and Selection*

An Arduino improvement board was utilized for the gadget be-reason for its overall simplicity of programming and its reasonableness for quick prototyping. The discovery programming for the gadget was customized utilizing Arduino. To guarantee particularity, the framework was separated into a recognition module (fluffy rationale calculation) and a correspondence module that cooperates with the GSM module ready. The identification module possibly collaborates with the GSM module when a ready occasion is detected. A extraordinary element of a

flame recognition framework is its capacity to criticism immediately of its state. This is a need when a flame is recognized. The signal gave the gadget guarantees fire occasions result in capable of being heard criticism and remote cautions to whoever is concerned. Despite the fact that a straightforward caution on a flame episode would have gotten the job done, picturing fire flare-ups utilizing the area of the gadget and giving valuable data on the structure of flame gives more data. The decision of electronic application to play out the warning was educated by the cross-stage nature of web applications, remote access, and the capacity to expand web applications effectively through APIs, making them cell phone well disposed.

## IV. DEMO POINTS

- A prototype module will be developed for the project. It incorporates individual PCB boards for all interfaces as indicated by the square graph. Each PCB will be between associated with jumper wires.

- Smoke and thermister used to distinguish fire and smoke in a specific territory.

- RF Tx and Rx is utilized to send and get data from fire place to robot segment separately.

- Water pump motor is pour the water for the terminated spot.

- GSM is utilized to send ready message to house proprietor.

- Zigbee is utilized get fire recognition data from MAT lab to controller.

- RFID is utilized to distinguish fired spot.

## V. APPLICATIONS

- The robot can be utilized to direct the guests from the passage to the fundamental office.

- It can help specialists to convey prescriptions starting with one ward then onto the next.

- The fundamental design is to save the general population by quenching fire in a structure.

- Can be utilized in record keeping up rooms where fire can cause lose of profitable information.

- Can be utilized in Server spaces for quick activity if there should be an occurrence of flame.

- The potential use of the multifunctional

firefighting framework has been characterized as a gathering that incorporates the synthetic and oil industry, atomic plants, military storerooms, just as mine fields and risky substance transport

## VI. ADVANTAGES

- It saves time.

- Manual operation has been reduced to major extent.

- Less man power required.

- Efficient distribution system.

- Easy to use.

- Efficient and reliable.

My main motive is to eliminate the paper based records using smart phone

## VII. FUTURE SCOPE

This project has been inspired by the craving to structure a framework that can identify fires and mediation. In the current condition it can douse fire just in the manner and not in every one of the rooms. It very well may be stretched out to a genuine flame quencher by utilizing carbon-di-oxide bearer and by making it to smother flames of all the room utilizing microprogramming. This gives us the chance to pass on to robots undertakings that customarily people needed to do yet was innately hazardous. Fire identification is an undeniable contender for such robotization. Given the quantity of lives lost normally in Fire identification, the framework we imagine is sobbing for reception. Obviously, this task has just started to expose what's underneath. As in the structure rearrangements and the usage limitations in recommend, our task is especially a proof-of-idea. Specifically, a down to earth self-governing flame Fire recognition framework must incorporate a gathering of robots, imparting and collaborating in the mission; besides, such a framework requires offices for experiencing hindrances within the sight of flame, and capacity to get guidelines on-the-fly during an activity. Every single such concern were outside the extent of this venture. Be that as it may, there has been explore on a large number of these pieces in various settings, e.g., coordination among portable operators, procedures for identifying and keeping away from obstructions, on-the-fly correspondence among people and versatile specialists, and so forth. It will be both fascinating and testing to assemble this into a viable, independent putting out fires administration.

## VIII. CONCLUSIONS

A sensor and MAT Lab based flame recognition robot caution and control framework has been planned, created and sent effectively. In contrast to the current fire indicators, this framework utilizes a multi-sensor approach whereby the yields of three sensors detecting three diverse fire signature parameters (smoke, fire, temperature) add to the fire ready choice and subsequently produce a progressively solid fire recognition framework without false cautions. Test results gotten by presenting fire (utilizing flame), smoke (consuming a paper), and warmth (utilizing hair dryer) to the gadget demonstrates that the framework can successfully upgrade the unwavering quality of a fire recognition framework. At the point when a flame alarm is recognized, the framework consequently reports them to the fire and salvage administration and furthermore tells the owner(s) through SMS informing on their phones. The framework additionally furnishes the fire and salvage administration with a guide helped route framework to help find the location of a fire flare-up which is useful when there is poor house and road tending to framework in an area. Since the testing information in this examination was not on genuine structure fires, more outcomes from genuine framework establishments will be expected to approve the exhibition results revealed.
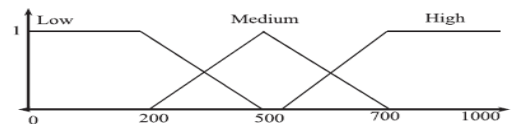


Fig. 2.     Fuzzy membership sets for smoke density.
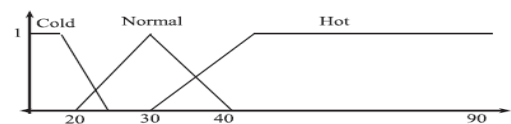
Fig. 3.     Fuzzy membership sets for ambient temperature.
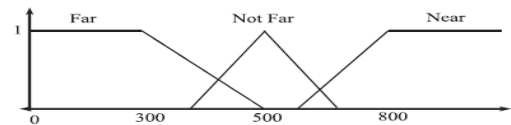
Fig. 4.     Fuzzy membership sets for flame intensity.
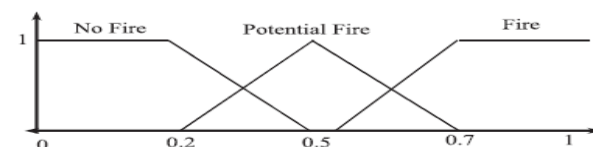
Figure: Graphs obtained from Multi-sensors



Fig. 5.     Fuzzy membership sets for fire status.

Figure: Waveform obtained with fire status on

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