



IoT Based Automatic Fire Alarm System

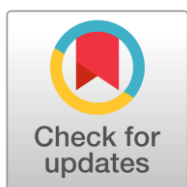
A.T. Jeevanandham ^{a,*}, P. Sivamurgan ^a

^a Vel Tech Rangarajan Dr Sagunthala R&D Institute of Science and Technology, Chennai, Tamil Nadu, India.

* Corresponding Author: atjeeva18@gmail.com DOI: <https://doi.org/10.34256/bsr2015>

Received: 19-02-2019

Accepted: 07-04-2020



Abstract: In industry's mishap is a spontaneous and uncontrolled occasion wherein an activity or response of an item, a substance, an individual, or a radiation brings about close to home damage. There are a few mishaps occur because of fire. Fire identifiers are utilized to recognize the fire or smoke at a beginning time and can help in sparing lives. Right now, IOT based alarm has been planned utilizing temperature and smoke sensor. It would not just flag the nearness of fire in a specific reason yet will likewise send related data to portable through IOT. By utilizing the temperature sensor, smoke sensor and there is a simple to advanced convertor, which changes over the simple signs got at the sensor end to computerized and afterward transmits them to a smaller scale controller and to the Arduino. The small-scale controller is modified to turn on the ringer, when the temperature and the smoke arrive at an edge esteem. Simultaneously, Arduino sends the information to the Wi-Fi module ESP8266. ESP8266 will then the accompanying information to the IOT site, where, approved individuals can take fitting measure so as to check the fire. The gadget id is the one-of-a-kind id given to a gadget, which would enable the work force to get data identified with the area, where the fire is detected. This paper can urge numerous new specialists to do investigate in the forthcoming space of IOT.

Keywords: Internet of things, Smoke sensor, GSM networks, Arduino controller.

1. Introduction

A fire is a condition of consuming that delivers the blazes and warmth. The fire can possibly make hurt its inhabitants and serious harm to the property. Mechanical security survey magazine expresses that there are 25,000 people passed on because of fire mishaps in India in the time of 2001-2014[1]. The harm of structures and loss of human life can be occurred because of fire mishaps in the enterprises. This present examination endeavours for to discover the staff characteristics of business factors and work factors that include which prompts fire mishap in the business. Counteraction of fire mishap

and fire hazard level control trouble are expanded step by step. Putting out fires and observing circumstances are intense today. They concentrate on improve the science and innovation in opposing fire debacles. They are worried about the use of new innovation, for example, IOT and remote sensor arrange in putting out fires and observing field. IOT is truly appropriate for putting out fires with wide degree alongside remote sensor network [2].

A key part of fire insurance in the business is to build up the wellbeing framework by utilizing alarm sign to the association by

methods for IOT innovation to the encompassing territory in the business. The conceivable weighty harms and bothersome expenses on both condition and network calls for additional improvement of wellbeing methodology and selection of proper techniques in taking care of dangers in industry and fast activity on standard working strategy if there should be an occurrence of arrival of risks detected. The fire mishap from Hong Kong shipyard is a significant episode which passed on to look for regard for the unfathomable capability of perils like fire blast in term of ruin of human life, their wellbeing and resources and enduring effects. The forest fire can be controlled by using IOT based alarm framework is utilized in all the businesses to keep from the fire mishaps[3].

A fire mishap has wounds offers to the laborers removed remove an unfortunate casualty's personal satisfaction to a critical degree. Second and severely charred areas regularly leave awful scars, and in the event that these scars are promptly clear, at that point the settlement will for the most part be higher because of enthusiastic harms. Consume wounds can leave an injured individual with interminable agony or loss of portability too, the two of which will require progressing exercise based recuperation.

It is huge to know the issue condition of fire danger in the business present to the seriousness of mishap and impact the official measures to control. The impacts will be experienced if fire will make change state to stifle themselves due any human or mechanical disappointment causes and straightforwardly influence the human life close by and working condition.

The point of this examination about peril present in condition which can be lead to fire mishap in the association. The fire mishaps happened in ventures ought to be distinguished by utilizing this philosophy and reasonable activities in required to control the fire mishap in the enterprises are should be created. The

forest fire risk have to be identified and provide the solution for fire fighters using the IOT technology the wildlife santituary and the animal lives in the forest is to be saved [4].

2. Methodology

lot must be self-contained for search operation, decision making based on the real-time data or current condition (object detection), intelligent decision (software program) for the immediate surrounding environment or condition is to perform the task or mission.

3. Design of lot

IoT systems combine physical and digital components that collect data from physical devices and deliver actionable, operational insights. These components include: physical devices, sensors, data extraction and secured communication, gateways, cloud servers, analytics, and dashboards [5].

4. Module Description

There are two mainly components available namely hardware and software components in the lot based fire alarm system.

4.1 Smoke Sensor

The MQ-2 smoke sensor can identify or quantify gasses like LPG, liquor, propane, hydrogen, carbon monoxide and even methane (see fig 1).



Fig1. Smoke Sensor

The module form of this sensor accompanies a Digital Pin which makes this sensor to work even without a microcontroller and that proves to be useful when you are just attempting to identify one specific gas.

4.2 Lcd Screen

A LCD screen with 16 x 2 display used to show the temperature level. A symbol of 5x7 pixel will be displayed in the screen. A 16x2 means 16 column which shows the symbols and a display lines of 2 rows. It has a 2-register namely data register and command register. It also measures the temperature when the heat is exhausted from the industry when the fire accident happens [6]. It is commonly used module and mostly preferred because of its easy programmable, economical and display many special characters (see fig 2). Arduino board is an astonishing platform for prototyped to interface with sensors, LCD, etc.



Fig 2. Lcd Screen

4.3 Temperature Sensor

A DHT 11 is the Sensor use in detecting the flame around the region. The heat wave is generated due to the abnormal temperature got sensed. DHT11 temperature Sensor comprises of four pins namely, supply VCC for power input, a pin with Data Out through which data sensed is transferred, Not Connected (NC) and GND is a pin used to discharge the excess current (see fig 3). The VCC pin to operate within the voltage range of 3.5V to 5.5V.

It is advisable to use 5V to achieve required efficiency. The connection for the communication between microcontroller and

temperature sensor can be instituted using a lone wire.

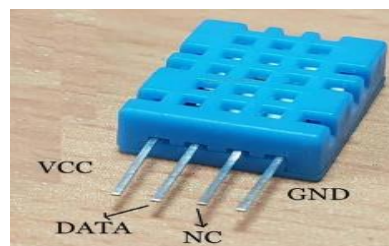


Fig 3. Temperature Sensor

4.4 Arduino Uno Board

An open source stage arduino which is effectively programmable utilizing scripting languages is most generally utilized and favored for ventures. It involves microcontroller a genuinely programmable gadget IDE (Integrated Development Environment) that performs on the PC, used to compose the program and transfer predefined PC code to microcontroller [7].

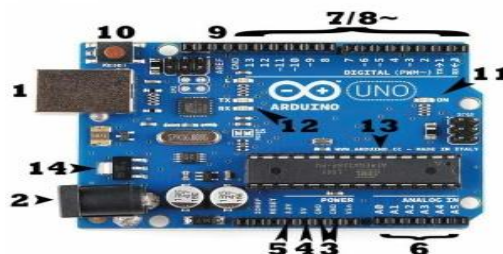


Fig 4. Arduino Uno Board

Arduino Uno can identify the environmental factors from the information (see fig 4). Here the information is an assortment of sensors and these can influence its environmental factors through controlling engines, lights, different actuators, and so on. The ATmega328 microcontroller on the Arduino board can be modified with the assistance of an Arduino programming language and the IDE (Integrated Development Environment). In the picture over the part marked 1 is the USB (Universal Serial Bus) connection. It is prudent to consistently utilize the passable force go between 7-12V. Never

and ever utilize the force supply in excess of 20 V as on the off chance that the voltage controller will be warmed and thus decimate the Arduino board. Part marked 3 is GND signifies 'Ground'. There are in excess of a couple GND nails to the board, any of that can be utilized to sidestep the abundance supply to ground and spare the circuit. Part labelled 4 is for the 5v supply pin as a normal process, the 5V pin supplies 5 volts of power used.

The part named 5 is for the 12V pin supplies 12 volts of intensity. Named section 6 assign the ANALOG IN pin which comprise of pins from A0 to A5. Through the simple in pins the Arduino peruses the simple worth and utilizing ADC it changes over it into the computerized structure. Part with mark 7 is advanced pins from 0 to 13 in the board. The pins utilized for giving computerized input and accepting advanced yield.

4.5 GSM Module

GSM is a Global System for Mobile module is to be propelled improvement in the correspondence division which is without condition not at all like broadband. This GSM innovation had been consolidated to send SMS to the capable individual portable numbers, which is pre-customized. The module groups a one-of-a-kind distinguishing proof number and the scope of activity of the module is inside 900-1800 MHz groups which is normally utilized for correspondence reason through the instilled interface which licenses sequential correspondence from the Arduino [8] (see fig 5).



Fig 5. Global System for Mobile Module

4.6 Arduino Software

Arduino software is the most prominent in view of accessibility of all microcontrollers within it. Then it is easily programmable and can be understood the programme very simply. The modification is done to the programme done at an ease. The port command is used to allow for the lower-level and faster manipulation of the i/o pins of the microcontroller on an Arduino board. The arduino program is developed for the fire alarm system by using computer programming language to detect the fire accident in the industries and send the alert signal to the authorised person.

5. Working

IOT Based Fire alert framework utilizes two sensors, to be specific, temperature and smoke sensors. There is an ADC convertor, which changes over the simple signs got at the sensor end to computerized and afterward transmits them to the small-scale controller and Arduino. The small-scale controller is modified to turn on the bell, when the temperature and the smoke arrive at a limit esteem. As the smoke is identified, the fumes fan is gone on to release the smoke out of shop floor territory. Simultaneously, Arduino sends the information to the Wi-Fi module ESP8266. ESP8266 is a chip which is utilized for associating the smaller scale controllers to Wi-Fi organize. ESP8266 will then the accompanying information to the IOT site, where, approved individuals can take proper measure so as to curb the fire.

The following data can be displayed in the lcd monitor to know about the details in the IoT based fire alarm system.

1. Temperature (in degree celsius)
2. Smoke Value (in percentage)
3. Device Id
4. Date and time stamp

Device Id is the unique id given to a device, which would help the personnel get information related to the location, where the fire is detected. The Pre-requisite for this IOT based fire alarming system is that the Wi-Fi module should be connected to a Wi-Fi zone or a hotspot. GSM module connected using UART of the arduino which makes passage of data via wires receiving cable and transmitter cable. The Serial AT command used for communicating between the arduino and GSM module. After the realisation of gas /smoke or fire the arduino directs the GSM module using AT commands. A SMS send to the registered mobile number which was predefined in the system for emergency.

prevent from the fire accidents in the industries and other hazardous places. The fire can be monitored in various places such as, industries, offices and homes. Prevention is better than cure, as the way by using the IOT based fire alarm system is suitable for detect the fire accident and save the human life.

6. Result and Discussion

The present paper offers a response for maintain a strategic distance from such disasters by checking the structure yet likewise talking about the proportional with IoT framework to kill the fire delivering operators and the chief control if there ought to emerge from an event of a spillage. Additionally, it establishes a caution similarly as establishes a connection with the authorities. A further progress can be as an abstaining from concealing sensor which will have the choice to identify the territory reliant on concealing coding. At the point when the temperature and gas is distinguished, the Iot based alarm produce the alarm sound and it tends to be checked by utilizing Iot server and a few sensor esteems are recognized it will be introduced on the web through the web of things.

7. Conclusion

In this project an attempt has been made for making IOT based fire alarm system to identify fire accident and pass on the alert message to the authenticated user in the industry. By analysing the literature review of various authors, this system is efficient to

References

- [1] Fire Incidents from 2001-2014, National Crime Records Bureau (NCRB), Accessed from: <https://ncrb.gov.in/>.
- [2] S.J. Liu, G.Q. Zhu, The Application of GIS And IOT Technology on Building Fire Evacuation, *Procedia engineering*, 71(2014) 577-582.
- [3] S.E. Morris, T.A. Moses, Forest Fire And The Natural Soil Erosion Regime In The Colorado Front Range, *Annals of the association of American geographers*, 77 (1987) 245-254 .
- [4] A. Alonso-Betanzos, O. Fontenla-Romero, B. Guijarro-Berdiñas, E. Hernández-Pereira, M.I.P. Andrade, E. Jiménez, T. Carballas, An intelligent system for forest fire risk prediction and fire fighting management in Galicia, *Expert systems with applications*, 25 (2003) 545-554.
- [5] B.U. Töreyn, Y. Dedeoğlu, U. Güdükbay, A.E. Cetin, Computer Vision Based Method For Real-Time Fire And Flame Detection, *Pattern Recognition Letters*, 27 (2006) 49-58.
- [6] M.S.A. Azmil, N. Ya'Acob, K.N. Tahar, S.S. Sarnin, (2015) Wireless Fire Detection Monitoring System for Fire and Rescue Application, *In 2015 IEEE 11th International Colloquium on Signal Processing & Its Applications (CSPA)*, IEEE, 84-89.
- [7] R.A. Sowah, A.R. Ofoli, S.N. Krakani, S.Y. Fiawoo, Hardware Design and Web-Based Communication Modules of a Real-Time Multisensor Fire Detection and Notification System Using Fuzzy Logic, *IEEE Transactions on Industry Applications*, 53 (2016) 559-566.
- [8] M.F. Othman, K. Shazali, Wireless Sensor Network Applications: A Study In Environment Monitoring System, *Procedia Engineering*, 41 (2012) 1204-1210.

About the License: © 2020 The Authors. This work is licensed under a Creative Commons Attribution 4.0 International License which permits unrestricted use, provided the original author and source are credited.