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[ICITAIC-2019]
ISSN 2348 – 8034
Impact Factor- 5.070
GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES

FLAME DETECTION

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ABSTRACT

This paper proposed on internet of things (IOT) based fire detection alarm and monitoring system best suited for industrial and home, surrounded places applications.Caused due the fire would have been avoided if the fire was detected immediately. In the project ,we have built a fire detector using Arduino UNO which is interfaced with a temperature sensor.The temperature sensor is senses the heat and smoke sensor sense any smoke generated due to burning or fire.Buzzer connected to Arduino gives us alarm indication. Whenever fire triggered it burns object near by and produces smoke.Also,whenever heat intensity is high then also the alarm goes on . Buzzer or alarm is turned off whenever the temperature goes to normal temperature and smoke levels reduce with the help of IOT technology.

KEYWORDS: *Internet of Things,Fire Detection sensors, Arduino, micro controller sensor, Temperature sensor.*

1. INTRODUCTION

IOT (internet of things). It is a net working of physical objects. Which contain electronic devices with in their architecture in order to communicate to each other and with respect to external environment. Internet is impact of many ways like education, business, science, government and humanity.(IOT) internet of things is the most important and is the most powerful thing and most favourable to every one and to the smart life. The term of IOT was first coined by KEVIN ASHTON . and (IOT)started in the year in 1999 and IOT became a popular in the auto ID center. Automatic identification center is established in MIT global research network of academic laboratories. At that time global research network of academic laboratories are there are researching on radio frequency identification (IOT).MQTT was invented by Dr.Andy Stanford-Clark of IBM. And Arlen nipper of arcom (new euro tech) in the year 1999. Arlene Nipper first time introduced a machine to machine protocol INM connector devices. In IOT machine to machine is most important. In 2010 blue tooth low energy was introduced. Now- a-days with out internet the people can't live even one day.

A flame detector is a sensor designed to detect and respond to the of a flame or fire, allowing flame detection. Responses to a detected flame depend on the installation, but can include sounding an alarm, deactivating a fuel line, and activating a fire suppression system. When used in applications such as industrial furnaces, their role is to provide confirmation that the furnace is working properly, in these cases they take no direct action beyond notifying the operator or control system.A fire is a chemical reaction of carbon based material that mixes with oxygen and is heated to a point where flammable vapors are produced. These vapors then come in contact with something that is hot enough to cause vapor ignition and results in a fire and its occurrence is random. Industry, home offices, hospitals etc. are very much vulnerable to fire that has the potential to cause harm to its occupants and severe damage to property .

The rest of thesis is divided into 8 parts.Following this introductory part, which describe the information of advantages, disadvantages and applications. Chapter 2 depicts the relevant work on IOT sensors for fire of thesis.The rest of thesis is flame detection. Chapter 3 shows the software used in project and also describes the packages we use.Chapter 4 shows the hardware components such as sensors and Arduino which we use.Chapter 5 discuss about the proposed architecture.Chapter 6 describes the implementation part.Chapter 7 is concluded by the result and conclusion.And the finally, followed by references.

2. LITERATURE SURVEY

The Ondrej Krejcar [1] describes a set of motion features based on motion estimators. The key idea consists of exploiting the difference between the turbulent, fast, fire motion, and the structured, rigid motion of other objects. Since classical optical flow methods do not model the characteristics of fire motion (e.g., non-smoothness of motion, non-constancy of intensity), two optical flow methods are specifically designed for the fire detection task: optimal mass transport models fire with dynamic texture, while a data-driven optical flow scheme models saturated flames. Then, characteristic features related to the flow magnitudes and directions are computed from the flow fields to discriminate between fire and non-fire motion. The proposed features are tested on a large video database to demonstrate their practical usefulness.

Y Dedeoglu in his thesis[2], presents a smart visual surveillance system which is capable of detection real time motion in the scene, as well as it is capable of classifying the objects based on its shape, The system is also includes object's tracking capabilities. The smart system is highly effective at it is able to adjust against the changing illumination conditions and works well with indoor and outdoor environments. Other work that has been carried mainly focus on reducing the cost as well as area of the hardware implementation and at the same time increase the performance of the hardware implementation.

Saad et al. [3] presented an FPGA based implementation based on temporal difference algorithm. The implementation is capable of processing frames at very high rate (around 1130 fps) in a single low cost FPGA chip which suits majority of the real time motion detection application.

In [4] Osman Gunay, Behçet Ugur Toreyin, Kivanc Kose, and A. Enis Cetin, an EADF is proposed for image analysis . In this work assumed that several sub algorithms are combined to get the main algorithm for a specific application. Each of the sub algorithm yields its own decision to representing its confidences level. Decision values are combined with weights, updated online by using non orthogonal e-projections onto convex sets describing sub algorithms. This framework is applied to a real time problem of wildfire detection. The proposed adaptive decision fusion method uses the feedback from guards of forest which is a limitation for the system.

In [5] Kosmas Dimitropoulos, Panagiotis B armpoutis and Nikos Grammalidis, proposes a fire-flame detection to be used by an early fire detection and warning system.The first step is to identify candidate fire regions using background subtraction and color analysis. Then the fire features are model by using various spatio temporal features such as color, flickering, spatial and spatio-temporal energy. Dynamic texture analysis is used in each candidate region. The robustness of algorithm can be increased by estimation spatio-temporal consistency energy of each candidate fire region by comparing current and previous frames. The last step is to classify candidate region using SVM classifier.

In [6] Paulo Vinicius Koerich Borges, and Ebroul Izquierdo, proposed a new identification metric based on color for fire detection in videos. Also identified important visual features of fire, like boundary roughness and skewness of the fire pixel distribution. The skewness is a very useful descriptor as the frequent occurrence of saturation in the red channel of fire regions is identified . For newscast videos, model the probability of occurrence of fire as a function of the position, yielding an efficient performance.

The L.R.Patil, Divya Chopda, Mansi Borse, [7] presents a computer vision-based approach for automatically detecting the presence of fire in video sequences. The algorithm not only uses the color and movement attributes of fire, but also analyzes the temporal variation of fire intensity, the spatial color variation office, and the tendency of fire to be grouped around a central point. The extensive experimental results demonstrate that the system is effective in detecting all types of uncontrolled fire in various situations, lighting conditions, and environment.The Mr. Santosh P. Patange, [8] describes a set of motion features based on motion estimators. The key idea consists of exploiting the difference between the turbulent, fast, fire motion, and the structured, rigid motion of other objects. Since classical optical flow methods do not model the characteristics of fire motion (e.g., non-smoothness of motion, non-constancy of intensity), two optical flow methods are specifically designed for the fire detection task: optimal mass transport models fire with dynamic texture, while a data-driven optical

flow scheme models saturated flames.Then, characteristic features related to the flow magnitudes and directions are computed from the flow fields to discriminate between fire and non-fire motion. The proposed features are tested on a large video database to demonstrate their practical usefulness.S.D. T. Kelly, N. K. Suryadevara, and S. C. Mukhopadhyay,[9] chip based design for real time motion detection using a digital camera module is proposed. The paper suggests a one page comparison mechanism which reduces the memory as well as logic gates requirement of the underlying FPGA implementation. This mechanism requires a high resolution digital camera and the performance test results are satisfactory enough to complement the use of high resolution camera.

3. PROPOSED IOT MODEL

NODE MCU

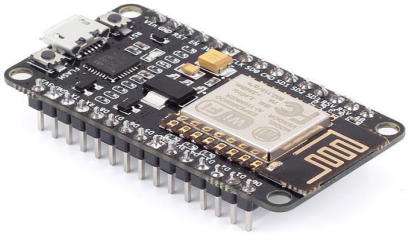

figure 1:Node MCU DEV 1.0 ESP8266

Node MCU is an open source IOT platform it includes firmware which runs on the ESP8266 Wi-Fi SOC from ES press if systems,and hardware which is based on the ESP-12 module.The term of Node MCU by default refers to the firmware rather than development kits.The firmware uses the Lua scripting language.It is based on the Lua project, a built on the Esperrif Non-OS SDK for ESP8266.It uses many open source projects.Node MCU developer is ESP266 open source community and where the type is single board micro controller which carries the memory was 128K bytes, and it can be store the 4M bytes.This Node MCU is connected with help of power in USB.The IOT involves extending Internal connectivity beyond standard devices, such as desktops, laptops, smartphones,and tablets to any range of traditionally dumb or non-internet enabled physical devices and everyday objects.Embedded with technology.These devices can communicate and interact over the internet and they can be monitored and controlled.

BASIC SHIELD

Figure2:basicshield

This Basic Shield can be interface with 5V or 3.3V logic micro controller boards like Arduino, AVR, PIC, 8051, ARM etc.Basic Shield is very popular shield for interface shield for interfacing of electronics components with micro controller like LED'S,variable resistor,push button, LDR,buzzer etc.All components are arranged in a proper manner so that you can use it with your micro controller to learn basic programming of micro controller in our projects.This shield help us how to deal with basic electronic components in our projects.
Technical Specifications:It contains 8 LED'S (5mm), 4 Push Button, 2 Potentiometer (102K), LDR(Light Detection Resistor), Buzzer. This shield is comfortable with 5V or 3.3V. DC power supply, and easy to fix on board.All components have separate pin so that you can use them in our projects.As per your project need.

ARDUINO UNO

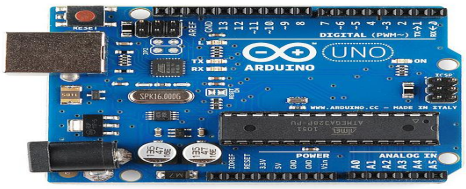

Figure 3:ARDUINO UNO

The Arduino UNO is an open source micro controller board based on the micro chip.At mega 328P microcontroller and developed by Arduino CC.The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansions boards (shields) and other circuits.The board has 14Digitalpins,6Analogpins,and programmable with the Arduino IDE(IntegratedDevelopmentEnvironment).It can be powered by a USB cable or by an external 9volts battery though it accepts voltage between 7&20 volts.
LED:There is a built in LED driven by digital pin 13 when the pin is high value.The LED is on, when the pin is low, its off.
VIN:The input voltage to the Arduino/Genuino board when its using an external power source (as opposed to 5 volts from the USB connection or other regulated power source).
3V3:A 3.3volts supply generated by the un-board regulator maximum current draw is 50MA.
GND:Grounded pins.
IOREF:This pins on the Arduino board provides the voltage reference with which the micro controller operates.A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translator on the outputs to work the 5V or 3.3V.
RESET:Typically used to add a reset button to shield which block due one on the board.
In addition some pins have specialized functions:

- Serial/UART
- External Interrupts
- PWM(Pulse Width Modulation)
- TWI(Two Wires Interface)
- AREF(Analog Reference)

ISSN 2348 – 8034
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FLAME SENSOR

Figure 4: flame sensor

A Flame sensor module that consists of a flame sensor(IRreceiver),resistor, capacitor,potentiometer,and comparator LM393 in a integrated circuit.It can detect infrared light with a wavelength ranging from 700nm to 1000nm.The far infrared flame probe converts the light detected in the form of infrared light into current changes.

Working voltage is between 3.3V and 5.2V DC, with a digital output to indicate the presence of signal.Sensing is conditioned by a LM393 comparator.Open the serial Monitor on your Arduino program.Move a flame in a out of the viewing angle of sensor.You should see an output.You should also see the red LED illuminate on your module and you should see also see the module LED connected to pin 13 of your Arduino light up.

3.1 PROPOSED METHODOLOGY

The main purpose behind this project is to reduce the loss in terms of life, cost when the fire accidents occurs this system specifies the time and location using to address the problem in times of fire.In this project the flame sensor detects the fire and it activates the GPS which finds the current location of fire accident area.The location is stored in the cloud and activating messages is send to the destination point by the GSM module. So that we can reduce the cost and we can save the human life before getting more damage.In generic cases we all finds that fire accident known when half or more lost is happened,so we can all reduce this lost by this project.

3.2 ARCHITECTURE OF NODE RED

- In the first select input node inject and give the name as per poject ,Go to starter kits and open nodered starter,given uniquec name as per our project to create for e node red applicatons. Now from the output node select the debug node and give the name as msg.payload.
- And the next goto claint and server model give a default name and next step is enter ‘http request’, when you entering is “http request” add that server and that server is dafault name.
- mqdt is publish&subscribe model.publish is one who as the data and publish the data subscribe the data publisher will publish the data with a topic name,subscriber the subscribe the topic .In protocol to manage the publish and subscribe will be having a broker

Now node red flow editor:

- The left side appear nodes every node red is have fuctionality. Particular fuctionality depends upon the node.js
- Node red has a drag and drop things are developing the application.

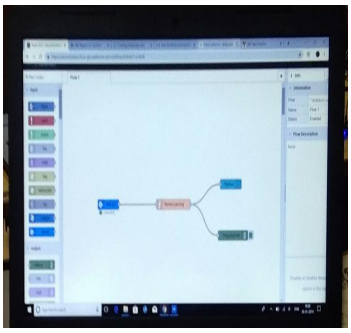

Figure 5:NODE RED flow 1

- Inject node is have particular fuctionality
- Induce the message into a flow either mannually
- This particular node injects the message sent some message either msnuually by trigging a button through
- Now see the message click on injet node
- It shows payload, payload it means is times stame is current time in millisecond. Right now payload configured to timestame of see deburg node just drag and drop deburg node on the base
- Click on arrow and open deburg messages
- Connect the timestame node output to input the deburg node
- Double click on deburg node it shows the payload. the payload is stands for msg.payload it means that whatever displays the messages. It directly connect to the ouput of times stame of input of deburg
- Click on the small wire click on that drag and join them and click on the deploye. Deploye for saving node.

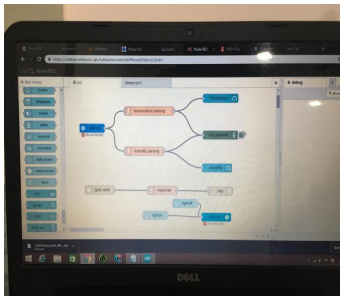

Figure 6:NODE RED FLOW 2

- Connect with node of ibm cloud of iot from the temparature passing and also humidity parsing for will flame is appears
- From the temparature parsing connect with the temparature node and msg.payload
- And also from connect humidity parsing node connect with the msg.payload. Msg.payload has two node connections they are paring of nodes
- And humidity parsing node is connect with humidity node
- And next is get data connect with response node it will be connected to the http node
- Next stage is light on,light off nodes are connected with the ibm of iot node for flame is appear or not.

Finally we get the node red of flame detector And this is the total connections of flow to make mobile applictaion.

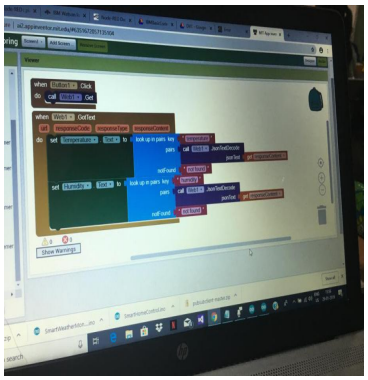

Figure 7: NODE RED MIT APP INVERTER

4. RESULT

Figure 8: code of flame

And this is the code for the flame detector, it explains about how to detect the fire and how to send the notification to recevier has mobile application.

within buildings,disasters safety through Web or mobile application services,and preventive actions for optimal disaster recovery.

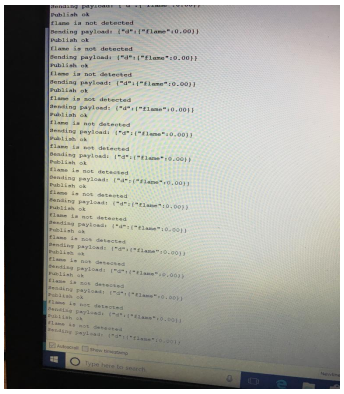

Figure9 : output of the flame

The above figure depicts the out put of the project at stage 1,when fire is not detected.so it shows that "flame is not detected"

If the flame is detect it will be shows that "flame is detected" then next it will be perform the next processes.

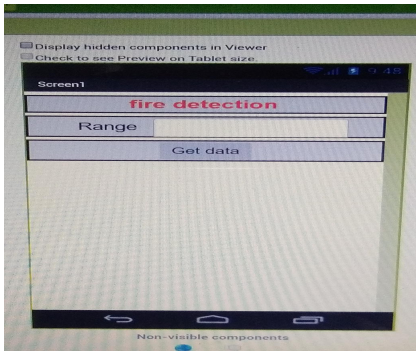

Figure10 :mobile application screen

Finally we get the application for fire detection ,So fill the labels and we will get the notified fire cases

5. CONCLUSION

The proposed IOT based smart fire emergency response system can reduce casualties by determining the point of occurrence of a disaster in a building to prevent directional confusion of the emergency lights and inappropriate evacuation guidance.The intelligent emergency evacuation system can also aid firefighting because if allows for a quick assessment of the exact location of the fire by integrating the intelligent and automated evacuation system with the central national emergency management agency.It reduces casualties and the time required for evacuation by building evacuees into dispered detours that by pass the location of the fire.

Future studies will focus on expanding the applicability of this system to not only building disasters,but also various fields such as ocean vessels and evacuation

Early warming and immediate response to a fire breakout are the only ways to avoid great losses and environment and cultural heritage damages.Hence the most important goals in fire surveillance are quick and reliable detection and localization of the fire.It is much easier to suppress a fire when the starting location is known and while it is in its early stages.Information about the progress of fire is also highly valuable for managing the fire during all its stages.Based on this information the firefighting

staff can be guided on target to block the fire before it reaches cultural heritage sites and to suppress it quickly by utilizing the required firefighting equipment and vehicles.

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