

IOT Based Forest Fire Detection Using Raspberry Pi And GSM

Aachal Ramteke¹, Prof Rahul Dhature² Prof Nagma Sheikh³

¹Dept of Electronic and communication

²Professor, Dept of Electronic and communication

³HOD, Dept of Electronic and communication

^{1, 2, 3}TGPCET Nagpur, India 441108

Abstract- Image processing is a type of processing in which the input image is transformed into another image as output with certain techniques applied to it. In this concept, we will create a fire detecting device using a USB camera and a Raspberry Pi and apply the concepts of IoT and Image Processing to get real time fire detection results. When the device is switched on, it continuously monitors the area in front of camera for fires. This is done by using HAAR Cascade Classifier Algorithm. Once detected the system could be hooked up with either fire extinguishers to make them work independently or it could just set an alarm or send a notification to the users mobile device via GSM. The after processing possibilities are endless.

Keywords- Fire detection, Image Processing, OpenCV, Python, IoT, Raspberry Pi

I. INTRODUCTION

As we all know, nowadays the occurrence of disasters are increasing day by day. One of the major disasters include Fire starting in homes/offices, etc. The current fire-fighting technology includes use of manual work, i.e. Fire Extinguishers. Till the time someone goes to cease the fire, it has already been spread out. In our concept, we are planning to make an automated fire extinguisher system, which would activate as soon as a fire starts.

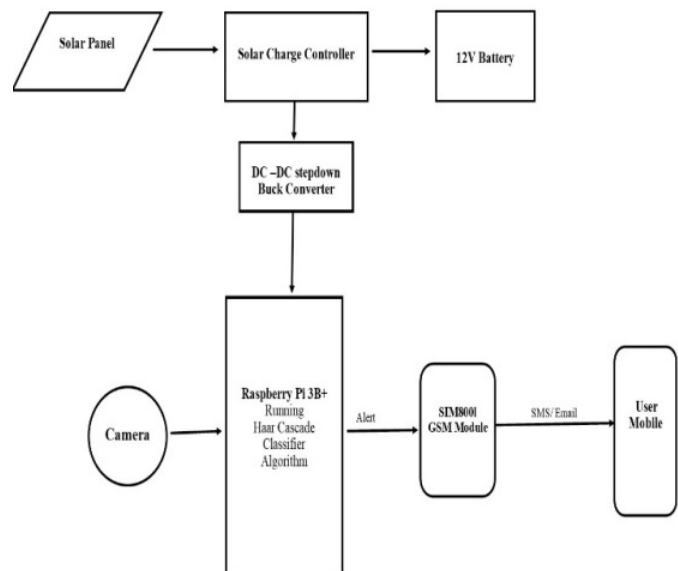
To put out fire, traditionally use of Fire Extinguishers is done. The user goes to the area effected, and manually uses the fire extinguisher there. The time required the user to reach the place may result in increase in the intensity of fire or spreading of fire around the place. The project aims at creating an advanced device based on Image Processing to cease the fire as soon as it starts. The system would be fully automated and hence no need of any human interference is required.

Some of the reasons for fire breakout are as follows:Low ceiling heights. No short circuit protection in household wiring. No safety equipments kept available for emergencies. excess amount of flammable objects like wood,

paper, plastic stored at one place.No Fire prevention measures are taken.

II. OBJECTIVE:

The main purpose of this project is Haar Cascade Classifier, which is a method for detecting objects in an image easily. The Haar Cascade Classifier is an object detection method developed by Viola & Jones. This method is based on Haar-like features, combined with the classifier which results in the cascade becoming strengthened. Haar-like features are features that are widely used in detection of objects, offering rapid extraction process and are able to represent a lower resolution image. This method has been successfully applied in many object detection applications.

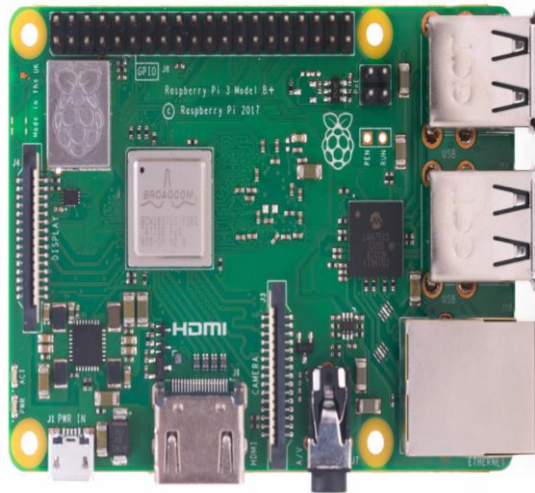


III. WORKING

The working of this project is First the camera is set up with raspberry pi. Image from the camera would be processed in the pi with the HAAR Cascade, and if the image contains fire, the system will recognise the fire and will give the output as fire detection. The fire is detected by using haar

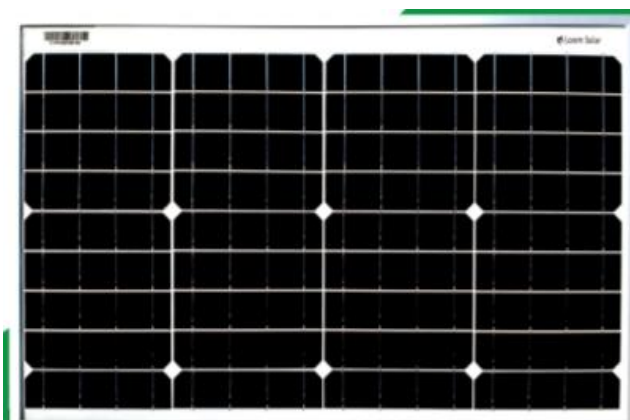
cascade classifier. The raspberry pi is used in this project and also the gsm module as shown in the above block diagram is used in this project. The dc to dc step down buck converter is used in this project as it is shown in the above block diagram. The solar panel and solar charge controller is also used in this project. The python programming language is also used in this project.

RASPBERRYPI



The Raspberry Pi 3 Model B+ is the latest product in the Raspberry Pi 3 range, boasting a 64-bit quad core processor running at 1.4GHz, dual-band 2.4GHz and 5GHz wireless LAN, Bluetooth 4.2/BLE, faster Ethernet, and PoE capability via a separate PoE HAT. The dual-band wireless LAN comes with modular compliance certification, allowing the board to be designed into end products with significantly reduced wireless LAN compliance testing, improving both cost and time to market. The Raspberry Pi 3 Model B+ maintains the same mechanical footprint as both the Raspberry Pi 2 Model B and the Raspberry Pi 3 Model B.

SOLAR PANEL



Loom solar 50 watt mono panels are made of A grade mono per cell and ultra cleared tempered glasses that does not break easily and gives 20-25% higher efficiency even in low light and cloudy weather. Loom solar is only company in india that makes mono panels using per cell in 12 volt design. The additional feature includes 4 busbars, 36 cells and 25 years performance warranty. IP 67 rated junction box is given with MC4 compatible cable connector for higher module efficiency.



SOLAR CONTROLLER

The solar panel controller is only suitable for regulating solar modules. Never connect another charging source to the charge regulator.

GSM MODULE

SIM800L is a miniature cellular module which allows for GPRS transmission, sending and receiving SMS and making and receiving voice calls. Low cost and small footprint and quad band frequency support make this module perfect solution for any project that require long range connectivity. After connecting power module boots up, searches for cellular network and login automatically. On board LED displays connection state (no network coverage - fast blinking, logged in – slow Blinking)

CP1270



The rechargeable batteries are lead-lead dioxide systems. The dilute sulfuric acid electrolyte is absorbed by separators and plates and thus immobilized. Should the battery be accidentally overcharged producing hydrogen and oxygen, special oneway valves allow the gases to escape thus avoiding excessive pressure build-up. Otherwise, the battery is completely sealed and is, therefore, maintenance-free, leak proof and usable in any position.

DC -DC STEP DOWN LM2596 ADJUSTABLE VOLTAGE REGULATOR MODULE BUCK CONVERTER

The LM2596 regulator is monolithic integrated The Raspberry Pi 3 Model B+ is the latest product in the Raspberry Pi 3 range, boasting a 64-bit quad core processor running at 1.4GHz, dual-band 2.4GHz and 5GHz wireless LAN, Bluetooth 4.2/BLE, faster Ethernet, and PoE capability via a separate PoE HAT The dual-band wireless LAN comes with modular compliance certification, allowing the board to be designed into end products with significantly reduced wireless LAN compliance testing, improving both cost and time to market. The Raspberry Pi 3 Model B+ maintains the same mechanical footprint as both the Raspberry Pi 2 Model B and the Raspberry Pi 3 Model B. circuit ideally suited for easy and convenient design of a step-down switching regulator (buck converter). It is capable of driving a 3.0 A load with excellent line and load regulation. This device is available in adjustable output version and it is internally compensated to minimize the number of external components to simplify the power supply design. Since LM2596 converter is a switch-mode power supply, its efficiency is significantly higher in comparison with popular three-terminal linear regulators, especially with higher input voltages. The LM2596 operates at a switching frequency of 150 kHz thus allowing smaller sized filter components than what would be needed with lower frequency switching regulators. Available in a standard 5-lead TO-220 package with several different lead bend options, and D2PAK surface mount package.

PYTHON

- Python is an elevated level programming language for broadly useful programming. Python is profoundly decipherable .It gives clear programming on both little and enormous scopes.
- Python includes a powerful kind framework and programmed memory the executives. It guides numerous including object arranged, basic, practical and procedural, and has an enormous and extensive standard library.
- Python mediators are accessible for some OS.IDLE can be expand in a way such that Python's Integrated

Development & Learning Environment. Coded in 100% Python, utilizing the GUI toolbox cross-stage works for the most part the equivalent on Windows, UNIX, and Mac OS X

IV. FUTURE SCOPE

- Fire accidents can be controlled to a great extent in a place such as forest home colleges industries trains and some other public place.
- Fire accidents leads to death of excess of peopleby using this technique we can save those those life easily.
- To detect the chain smokers (which are hazardous to health)

V. CONCLUSIONS

- In this concept paper, A fire detecting system has been proposed which is more accurate and reliable way of detecting fires in small houses or office places, rather than conventional methods such as smoke detectors
- Our approach was limited due to the devices used and it can be improvised to be even more accurate than the system already is.
- Future scopes includes using this system along with fire extinguishers to make them automated.

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