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FOREST FIRE DETECTION USING LoRa BY EXTENSION OF IOT

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ABSTRACT: It is a fire detection and alert system based on IOT. Here a specific environment is monitored 24x7 and the user is alerted in case of any fatal situation. This can be implemented using a nodemcu and a number of sensors for detecting different physical parameters that can go high during a fire related accident. Nodemcu is an IOT based controller board with an on board WIFI module called ESP8266. Here two parameters are being monitored continuously temperature and presence of smoke. For sensing temperature LM35 temperature sensor is used. For sensing presence of smoke a gas sensor called MQ6 is used, this sensor can detect and measure any carbon based gas smoke produces CO2 this makes it possible to detect smoke using MQ6. Also a PIR sensor is used for detecting presence of any human. Both gas and temperature sensor is analog so cannot be connected to a digital pin but an analog pin that is input to an ADC (analog to digital converter). Also forest area can be monitored through a camera using this camera fire can be detected using image processing. For this we can run a python program from PC and using opencv library fire can be detected. This can be used as a contingency system if the sensors malfunction. If any fire is detected then a water sprinkler will be turned on to prevent fire also an alert is sent to concerned personal for further

Keywords: LoRa module, Sensors, Messaging alert, PC, Arduino Board.

INTRODUCTION

Fire accidents are common incidents all around the world most of the time this ends up in human life loss. This accidents can happen in any environment such as home, industries, cinemas etc. If accident occurs in an industrial environment the fatality of the situation is very high. This can be solved by designing a general system to monitor any type of environment remotely or locally. Wildfire is an uncontrolled fire cause significant damage to natural and human resources. Once the fire starts ignited it rapidly spreads all over the forest and results in massive destruction. Over the past decade there is a enormous destruction in forest, in which the majority of those accidents where caused by forest fire. Based on the forest survey on India's data on forest fire it is stated that around 50% of the forest areas as forest prone. Based on the forest inventory records, 54.40% of forest in India are exposed to occasional fires, 7.49% to moderately frequent fires and 2.405 to high incidence levels while 35.71% of India's forest have not yet been exposed to fires of any real significance. Between January 1, 2019, and February 26, 2019, a count of 558 forest fire occurred in India. This incidents shows that forest do not have proper fire prevention system. In this project, we designed an IoT based LoRa module used for forest fire detection system to detect fire as soon as possible, before the fire spread over the large area. The system will be integrated with several sensors to detect fire and motion. The device will be placed on proper places after doing surveys. Several types of sensors used in the system are Humidity sensor, Smoke sensor, PIR sensor.

LITERATURE SURVEY

Fire Alerting System With GPS Co-ordinates Using IoT

Jayaram K, Janani K, Jeyaguru R, Kumaresh R, Muralidharan N proposed that in the advancing world, it is very crucial to protect our environment. Many incidents of man-made and natural disasters were happening around the world. Forest fires are one such catastrophe for environment. Once the fire inside deep forest starts, it burns and destroys everything and spreads everywhere within the forest. Fire spreads on hot days destroys trees and grasses due to drought conditions peaks in a forest region. Such forest fires disasters should be curbed in order to protect fauna and flora habitats in the forest. They have tested in forest like conditions, but real hardship which we may face is during implementation in large area in real time.

Forest Fire Detection System Reliability Test Using Wireless Sensor Network and OpenMTC Communication Platform

Anton Herutomo, Maman Abdurohman, Novian Anggis Suwastika, Sidik Prabowo, Catur Wirawan

Wijiutomo proposed that Machine to Machine (M2M) communication system has started gaining its real world momentum by the introduction of Internet and mobile technology into this system. Several works have come up to use this integrated system into many different vertical solutions and tried to bind one solution platform for many monolithic systems. One recent innovation is to use HTTP REST architecture as communication platform. This work tackles the first step of implementing OpenMTC as M2M and IoT communication platform. Involved sensors are carbon monoxide gas concentration, temperature, and humidity, combined with Zigbee and Arduino microcontroller to make up 2 Device Application components (or DAs, as proposed by ETSI M2M standard) connected to OpenMTC GSCL.

Suggestions for further researches are: to conduct further reliability test by measuring overall transmission time from sensor to GSCL (over the Internet). Where the number of sensors or gateways is still not sufficient for load test, further research is also possible to develop a testing tool to simulate connections from sensors to gateways and platforms

Forests Smart fire detection service

Guilherme Borba Neumann, Vitor Pinheiro de Almeida and Markus Endler has proposed Smart Forest is a concept derived from the Internet of Things (IoT) and defines sections of a forest where remote sensing is applied to collect data about environmental conditions. One of the main objectives of Smart Forests is to detect wild fire at early stages. However, the required technology for such monitoring usually demands a complex and expensive sensor and network infrastructure and requires central processing capabilities for analyzing data from several thousands of sensors. The goal of this work is to propose a solution focused on Edge Computing, using the concept of Mobile Hubs (M-Hubs). In this case, the mobile hub that detected fire could notify close mobile hubs about the current event - besides notifying the Smart Forest Server-, to better control the incident

Detecting and Reporting Forest Fire through Deployment of Three Dimensional Multi-sink Wireless Sensor Network

Moumita Ghosh, Rama Sushil, Kaushik Ghosh proposed that Forest fires are common in the winter months across the world. An apt forest fire detection technique is required to check the spreading of fire and reduce the degree of loss thereby. In this paper we have proposed an energy efficient forest fire detection and reporting technique through three dimensional deployment of multi-sink wireless sensor network. The scheme may be used in event driven, time driven or a proposed hybrid mode. The results of the proposed scheme have been compared with 3 dimensional versions of some of the very well-known routing protocols for sensor networks. As future scope, we have planned for real node deployment in the terrains of Mussoorie-Dehradun belt. By embedding our code in the nodes, we would like to measure the effectiveness of the proposed scheme.

An IoT based Weather Information Prototype Using WeMos

Ravi Kishore Kodali and Archana Sahu proposed that the Internet of Things (IOT) describes the interconnection of devices and people through the traditional internet and social networks for various day-to-day applications like weather monitoring, healthcare systems, smart cities, irrigation field, and smart lifestyle. IOT is the new revolution of today's internet world which monitors live streaming of the entire world's status like temperature, humidity, thunderstorm, earthquake, floods etc. that can stagger an alarm to human life. This paper proposes a low-cost weather monitoring system which retrieves the weather condition of any location from the cloud database management system and shows the output on an OLED display. The futures scope of this system Efficiency can be improved by using more accurate GPS receivers. There has to be a provision for intimating crew about any sudden attacks or natural disaster warnings from monitoring section

EXISTING MODELS

The existing system of the forest detection has the fire alarm system with buzzer and it also has the fire monitoring system with no continuous monitoring system. The major problem occurred by using the robots are the sensors are interfered with robots. Unmanned Aerial vehicle is used but it is expensive and high maintenance is required. The Unmanned Ground Vehicle Navigation requires network of cell phone as far as it surrounds. UGV will come to that spot and extinguish the fire it takes more time.

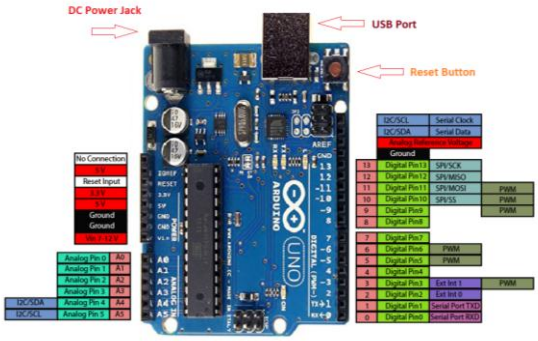
PROPOSED MODEL

The proposed system of forest fire detection has many functionalities for continuous monitoring method, if one of the system fails the another will give notification at appropriate time. The monitoring system by using various sensors and also for covering the long range.

HARDWARE REQUIREMENTS:

ARDUINO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; it can be simply connected to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P 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 expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable.



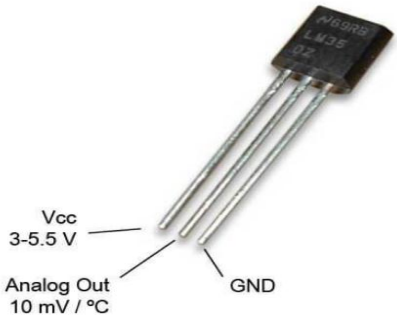
SENSORS

SMOKE SENSOR

Smoke sensor is used to detect the presence of smoke caused by fire. This unit can be easily incorporated into an alarm unit, to sound an alarm or give a visual indication of the LPG concentration. The sensor has excellent sensitivity combined with a quick response time. The sensor can also sense iso-butane, propane, LNG and cigarette smoke.

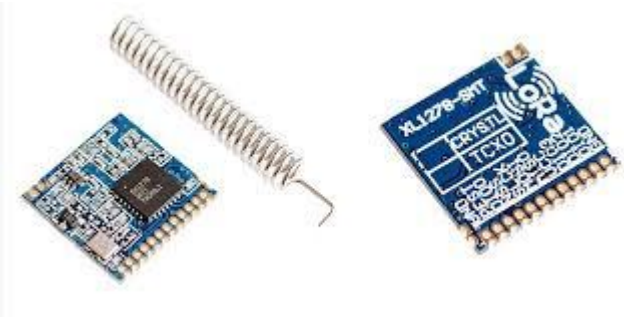
TEMPERATURE SENSOR

A temperature sensor is a device, usually an RTD (resistance temperature detector) or a thermocouple, that collects the data about temperature from a particular source and converts the data into understandable form for a device or an observer. Temperature sensors are used in many applications like HV and AC system environmental controls, food processing units, medical devices, chemical handling and automotive lunder the hood monitoring and controlling systems, etc.

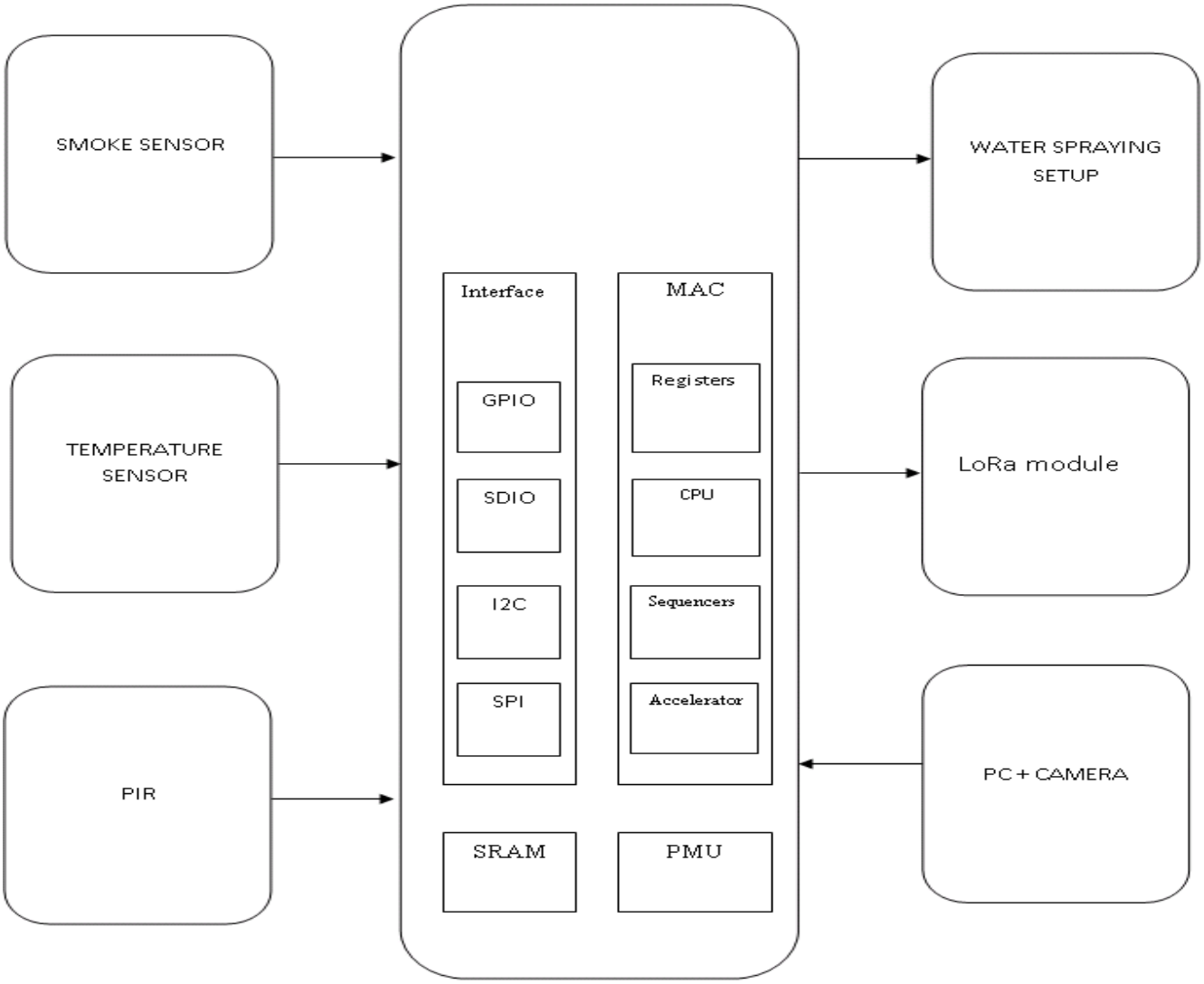


LoRa AND WATERSPRAY SETUP

LoRa WAN is a low power wide area network technology (LP-WAN) designed for Internet of Things (IoT) and smart sensor applications. As the name implies, long range transmission capability with less power consumption makes LoRa a significant player in IoT networks.



BLOCK DIAGRAM



CONCLUSION

This paper presented here a fire monitoring system that can alert the user remotely using IOT. This paper has been designed and implemented successfully. The system has been tested in deliberately created fire accident situation and response is very fast

FUTURE SCOPE

Efficiency can be improved by using more accurate GPS receivers. There has to be a provision for intimating crew about any sudden attacks or natural disaster warnings from monitoring section

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