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Forest Fire Prevention using IOT

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***Abstract*— An investigation showed that 80% of the losses caused by a fire would have been avoided if the fire had been identified early. No less than half of all forest fires are due to carelessness: a badly extinguished cigarette butt thrown on the ground, a poorly controlled barbecue, ... This is why instructions on dangerous actions are regularly distributed among the population, particularly in high-risk regions. Another cause of fire that should not be overlooked is a source of heat that can be caused by the reflection of sunlight from reflective objects such as broken glass. In this article we propose a technique used for the detection of these fire sources.**

***Index Terms*— GPS,3G shield , Ethernet, LDR, Forest fires, drone**

I. INTRODUCTION

Forest fires are uncontrolled fires that occur in forested areas. It is important to distinguish these types of flames as early as possible in order to minimize damage to the biological framework and why not try to detect the sources that can create these flames. The land where the woods are located is burnt, making it difficult for vegetation to develop, due to the soil's tendency to become water-repellent and no longer contains water. According to the Global Warming Report 2008, the rapid spread of fires is one of the main factors and the real reason for the increase in the Earth's temperature. CAMS reveals that approximately 6,375 megatons of CO2 were released into the atmosphere between January 1 and November 30, 2019. Many of these have made headlines around the world, including fires in the Amazon, fires in Indonesia, forest fires in the Arctic and bush fires in Australia. But some lesser-known fires have also had significant effects on the environment and air quality, notably in Colombia, Venezuela, Syria and Mexico. Huge clouds of smoke plumes covering millions of square kilometers have been observed on satellite images from fires across the western Amazon. 2019 was a record year for forest fires. The frequent causes of fires are lightning, extreme heat and dry climate and human carelessness. The use of a wireless sensor in this article introduces one of the methods for early forest fire prediction.

II. LITERATURE SURVEY

Generally, the video surveillance system is the most widely used for the identification of forest fires. [1]. There are four classifications: sensitive video cameras in the unmistakable light range of smoke recognition in the middle of the sun and fire flames at night, infrared (IR) thermal imaging cameras to discover the heat transition of the fire, an IR spectrometer that extraordinarily distinguishes smoke gases and the Light Detection and Ranging System (LIDAR) that measures the laser light backscattered by the smoke particles.

The limitation of these systems was the high rate of false alarms resulting from climatic conditions, e.g., proximity to fog, shadows, clean particles, etc., which could cause false alarms.

Another strategy is to use visual cameras that take pictures of the forest to identify the fire. These cameras were mounted on the highest connecting towers [2,3]. A rotating engine is introduced to give a complete view of the forest.

Predicting and simulating the spread of forest fires is an important problem from a computational point of view because of the complexity of the models involved, the need for numerical methods and the resources required for the calculation.

Forest fires are a great environmental risk. The main approaches that have been used to solve this problem start with fire detection [2] where different techniques have been applied. Once the fire is detected, it is important to generate forecasts that should help in making a decision in these emergency response situations [3]. Finally, there are complex models that address the forest fire problem by trying to predict its evolution and minimize its associated risks [4]. Other hybrid artificial intelligence systems [1], [2] are applied to generate predictions on the evolution of forest fires.

There are fire prediction systems that use the CBR technique, the case-based reasoning [5] that originates in knowledge-based systems. CBR systems solve new problems by acquiring the necessary knowledge from previous situations [6].

The main element of a CBR system is the case base, a structure that stores the information used to generate new solutions.

The learning capabilities of CBR systems are due to their own structure, consisting of four main steps [7]: recovery, reuse, review and storage. The first step is called recovery, and consists of finding the cases (from the database) that are most similar to the new problem. Once a set of cases is extracted from the case database, they are reused by the system. In this second step (reuse), the selected cases are adapted to fit into the new problem. After applying the new solution to the problem, the solution is reviewed to verify its performance. If it is an acceptable solution, it is then stored by the system and could possibly be used as a solution for future problems.

As a methodology [5], CBR has been used to solve a wide variety of problems [8], [9].

III. SYSTEM DESIGN

Detect the causes of forest fires as early as possible by measuring the reflection of light from the ground.

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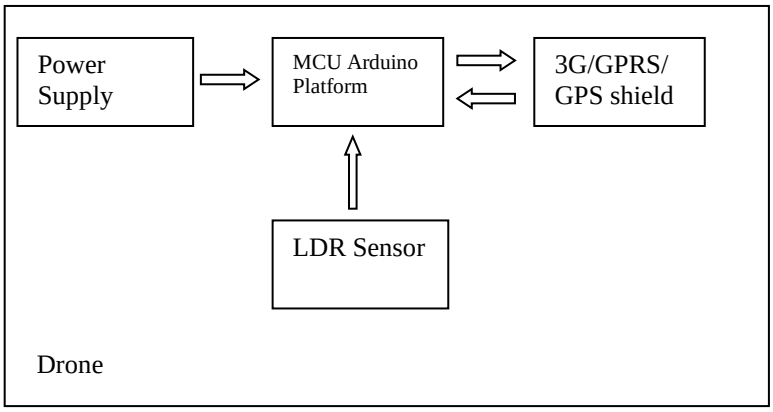

Fig. 1. The system Design

A. *Hardware*

- Node Mcu
- RF MODULE(RECEIVER AND TRANSMITTER)
- LDR SENSOR(TEMT6000)
- 3G/GPRS/GPS SHIELD
- DRONE
- PCB(PRINTED CIRCUIT BOARD)
- TRANSFORMER
- VOLTAGE REGULATOR
- DRONE

B. *FlowChart*

The working of the system can be explained in 5 steps:

- The drone scans along a predetermined trajectory
- The light sensor is used to detect any light sources coming from the ground and sends it to the microcontroller.
- Once it reads the value of the light intensity, it compares it with a threshold value set according to a power that can cause a fire
- When the value is greater than or equal to the set threshold, the GPS coordinates of the detected point are recorded in a server database using IOT (3G Shield), for better exploration and to facilitate access to these places.

The transmission of this information by the transmitter :

On reception of the information by the microcontroller, the transmitter sends the information to a beneficiary SBGD server is enhanced for use. The microcontroller is the backbone of the equipment circuit; it controls and enables the operation of the entire circuit, here the transmitter circuit for this situation.

- A text message containing this locations details is sent to the Fire security group

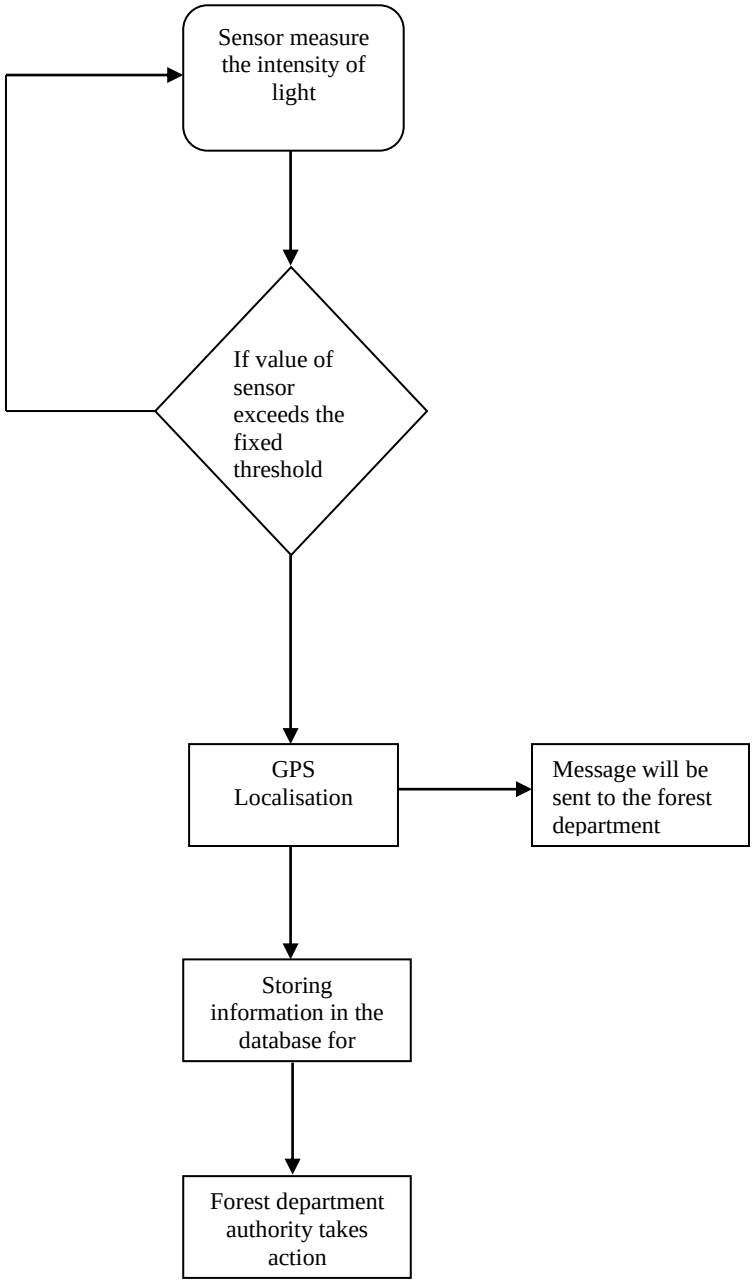

Fig. 2. FlowChart

C. *Stage of design*

The overall outline of this framework for locating and observing objects causing forest fires has been largely classified into four sections :

- Interfacing the sensors with the transmitter
- Interfacing and programming the module SIM808 GSM GPRS GPS partie GPS with Arduino
- Interfacing and programming the module SIM808 GSM GPRS GPS partie GSM (4G) with Arduino.
- Interfacing and programming the Collector and Transmitter with Arduino

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IV. CONCLUSION

Early prevention and quick reaction before a fire occurs are the main approaches to prevent incredible damage and adverse effects. Therefore, the most critical objectives in the observation of objects causing flames are the rapid and solid identification and restriction of the fire. It is much less demanding to prevent a fire before it starts . Data on the location of these objects is also very useful for managing the fire before it starts. Using this data, firefighting personnel can be guided on how to focus to prevent the fire before it reaches its social destinations and quickly extinguish it using the required equipment and vehicles...

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