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IoT based Anti-smuggling System for Trees in Forest

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Abstract: There have been several occurrences of smuggling of bushes such as sagwan, sandal, and so on, and these woods are extremely expensive and scarce. They are used in scientific technology, cosmetics, and so on, and a few preventative methods have been developed to limit their smuggling and safeguard forests across the world. To minimize and restrict such tree smuggling and conserve the woods while not preventing global deforestation, certain preventative measures such as global warming must be implemented. A WSN connects the trees to the main sensor unit. This task is also an attempt to spare you from woodland disasters and to cast off manual energy to the greatest extent feasible. The primary aim of this work is to develop an IoT framework to preventing trees from smugglers.

Keywords: IoT, Smuggling trees, Flex Sensor, Humidity sensor, Smoke sensor, Micro controller.

1. INTRODUCTION

Smuggling trees is the most uncontrolled occurrence that causes major disruption to the entire ecosystem and must be addressed by adopting WSNs technology. The following explanation is the impetus for doing this research in order to protect trees from smugglers. Human civilization has a tremendous impact on biological resources due to the presence of several other issues, which eventually leads to the loss of biological variety. There is a considerable need for forest management planning with effective instruments for the preservation of biological variety. India is a country with a diverse flora and wildlife. The deterioration of forests caused by smuggled trees and other activities has a negative impact on animals and constitutes a threat to habitat, which has been a source of worry. However, even protected places in a country are vulnerable to a variety of challenges. The most prevalent threat in a forest is wildfire, which drastically disrupts and destroys the environment and fauna. Wildfires are becoming more common throughout the world, posing a significant danger to global biodiversity.

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1.1 Indian Forest

The deterioration of forests caused by smuggled trees and other activities impacts species and constitutes a threat to habitat, which has been a source of worry. The most prevalent threat that occurs in a forest is wildfire, which drastically disrupts and destroys the environment and fauna. Wildfires are becoming more common across the world, posing a serious threat to the entire ecosystem. Human intervention in forests for the purpose of creating commodities results in the change of dense forests to dry grasslands and scrublands. It has also been discovered that as human forest usefulness has risen, so have observed wildfire incidents [8]. The woodland regions are being severely impacted by wildfires. The cause of substantial vegetation death is the flame of fire. Following wildfire events, the earth becomes more like a concrete surface for a brief period of time. When it rains, healthy trees and roots absorb the rainfall, but after a wildfire, the water has nowhere to go. The terrain might completely alter over time, with trees being replaced by shrubs and grasslands. Wildfires are normally an essential component of the regeneration cycle, but if they become more frequent, they represent a significant threat to the entire ecosystem. Forests play a key role in absorbing more greenhouse emissions and trapping carbon. The more smuggled trees that are burned, the more carbon are released and the rate of climate change accelerates.

1.2 Need for Preventing Trees

Forests are an important resource and an essential component of our ecology. Humans rely entirely on trees for their life, from the clean air we breathe to the natural goods we utilize. Smuggled trees endanger animals, and the emission of harmful chemicals during a fire can impact all lives. Every bears responsibility for preventing a forest fire calamity. Every year, millions of hectares of land are burned by fire, inflicting major environmental harm.

2. RELATED WORKS

Prema et al. [4] reported a multi-feature analysis of smoke particles for forest fire verification. For smoke detection from a video feed, an image processing technique is given. According to their method, smoke detection via video has a significant advantage over prior smoke detection approaches in that it covers a vast area and has a quick reaction time. They employed three different aspects in their research for false alarm minimization. Experiments based on their findings reveal that their strategy has a higher detection rate and faster processing than other existing strategies.

Bao et al. [7] give an essay on optimizing watch tower positions in forest fire monitoring. The right location of these watchtowers is critical in terms of lowering costs while still covering a vast region with fast reaction. Tower placements are evaluated using location allocation models. Their research finishes with three optimization models for meeting three primary requirements: coverage, cost reduction, and greatest coverage at the lowest cost. The experimental findings suggest that visibility analysis and incorporating location models can assist in more efficiently positioning watch towers for fire monitoring in a specific region.

SongLu et al. [8] extracted the region using backdrop modeling, and then utilize a mixed color space feature to detect the flame, and smoke detection is done using threshold segmentation. The outcome demonstrates the suggested system's accuracy in terms of accurate detection.

Barmpoutis et al. [5] suggested a real-time detection method based on Spatio-Temporal video analysis. The suggested architecture's technique consists of numerous parts. Background subtraction is performed in the first step, followed by fire categorization using colour analysis. When a fire is spotted, a few characteristics are computed before the categorization process begins. To distinguish true fire pixels from fire-like pixels, the authors applied innovative characteristics; as a consequence, the number of detection errors has decreased, and the system's performance has increased.

Dimitropouls et al. [10] suggested an automated fire detection method based on Spatio-Temporal modeling, texture analysis, and video analysis. Initially to remove non-fire moving colored zones from the map. Because of its efficiency and speed, background removal is the first step used by the adaptive median method to extract features. The color analysis is then performed in the following phase using RGB color distribution. For each identified fire candidate, the six separate characteristics are calculated. The categorization is completed in order to make decisions. The observed findings demonstrate the approach's performance in terms of accurate detection.

Celik et al. [11] described experimental findings demonstrate that the system reduces the number of false alarms; however there are no tests for performance validation. Because of background noise, the system generates a significant number of false alerts.

Ahmed et al. [15] described a robot-based architecture for fire detection and extinguishment. The authors employed temperature sensors to detect fires and robots as actors to extinguish them. Because of its association with graph theory, the authors employed VSM-SL to validate the system's accuracy. The experimental result demonstrates the system's accuracy in detecting fires. The design has one disadvantage: it is pricey.

3. SYSTEM METHODOLOGY

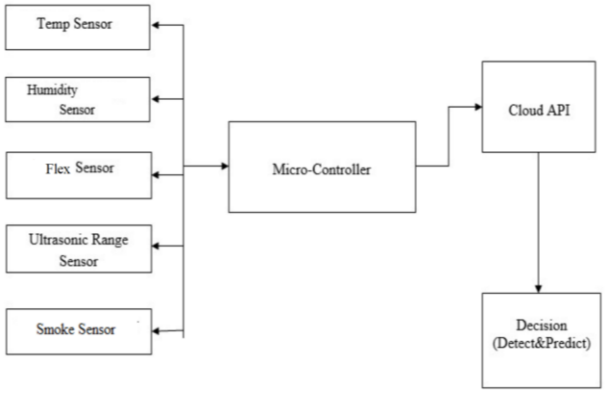

Figure 1 Block Diagram

3.1 Temperature Sensor

Temperature detectors are typically used to detect heat or cold in the environment. These temperature detectors are useful for calculating the amount of heat energy or coldness produced by or emitted by the system. It can sense and perceive any physical change in temperature, digital or analogue output. Two types of temperature sensors can analyze temperature changes. Heat sensors are classified into two types: touch and non-contact. The contact temperature probe must come into physical contact with anything that may detect fluctuations. The non-contact temperature sensor is excellent for sensing temperature changes in any range without requiring physical touch. The non-contact temperature sensor is excellent for sensing temperature changes in any range without requiring physical touch. The temperature range is determined by the type of sensor utilized. This is also a low-cost option. Temperature Sensor is shown in Figure 2.

Figure 2 Temperature Sensor

3.2 Humidity Sensor

Moistness is defined as the presence of water that can be seen all around. The amount of water seen all around may have an impact on human mitigation as well as various manufacturing processes in enterprises. A few physical, synthetic, and natural cycles are also influenced by the presence of water and air. Mugginess measurement in the backwoods is important because it might affect the venture value of the components and equipment, as well as the insurance of the forest and leaves. Moisture detection is now essential, explicitly in the administration structures for current procedures and human comfort. Controlling or regulating mugginess is critical in many mechanical and residential applications. Mugginess or moisture levels must be monitored, supervised, and evaluated at some point during wafer preparation in the semiconductor industry. Dampness the executive is required in logical applications for respiratory hardware, sanitizers, hatcheries, medicine handling, and natural things. The dampness executives are also important in synthetic fuel refining, dryers, stoves, film drying, paper and texture production, and feast preparation. In farming, the component of dampness is critical for estate assurance, soil dampness observing, and so on. Figure 3 shows the Humidity Sensor. This sensor near to straight voltage yield enables direct contribution to a regulator or other device.

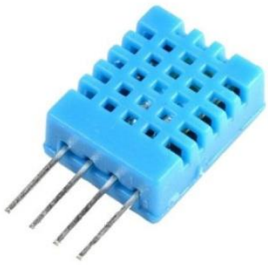

Figure 3 Humidity Sensor

3.3 Flex Sensor

A flex sensor monitors an object's deflection or bending. Typically, the sensor is attached to the surface at 90 degrees bend the tree and the value that shows the output of Direction X is Tree-1 fall/cut at 90-120 and Direction Y is Tree-2 Fall/cut at 120 and below. The flex sensor is depicted in the below resistance changes when it is bent. The resistance of the un-flexed sensor is 10,000 ohms, and when the sensor is bent to 90 degrees, the resistance climbs to 30-40 kilo ohms. Figure 4 illustrates Flex Sensor.

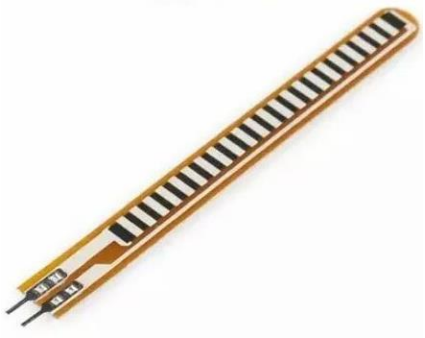

Figure 4 Flex Sensor

3.4 Smoke Sensor

A smoke sensor is a device that detects smoke, generally as a possible indicator of a fire. When there is no smoke, it produces zero yields; when there is smoke, it generates a yield signal based on the force of the smoke, which is conveyed to the microcontroller. The smoke sensor contains an internal warmer that ionises the smoke particles, which act as charge transporters and generate a voltage at yield. A smoke finder is a device that detects smoke, typically as a potential indicator of flares. Family cautions, alluded to as smoke alarms, normally identify adjacent tasteful security through the indicator without anyone other. Business-located wellness items are an indication to our fire security handle screen remembered for another flaring home security framework. Figure 5 depicts a Smoke Sensor.

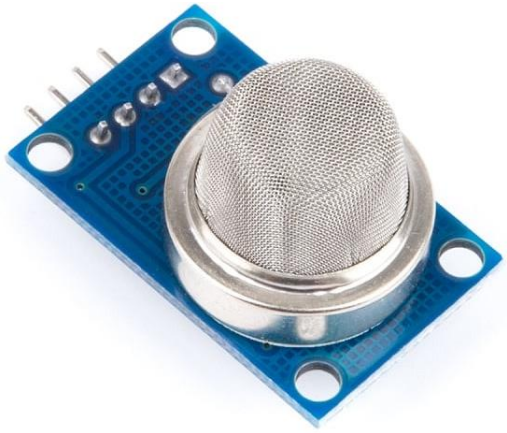

Figure 5 Smoke Sensor

3.5 WIFI Module for Communication

Unlike basic systems that release ports 2 or 3, GSM service and mobile communication devices are typically separated. Even though the aerosol cellular hardware, this track administration and storage second endorsement device might be SIM card. As a result, the mobile unit is made up of a mix of a SIM and telecom equipment. SMS is one of GSM's built-in functions, and it allows SMS to be sent to and from mobile terminals. The SMSC, which is the figure 3.5 task to be looked after by the hired GSM system to enable communication between the SMSC and the cell channels, is in charge of dealing with Text. Figure 6 depicts the WIFI Module.

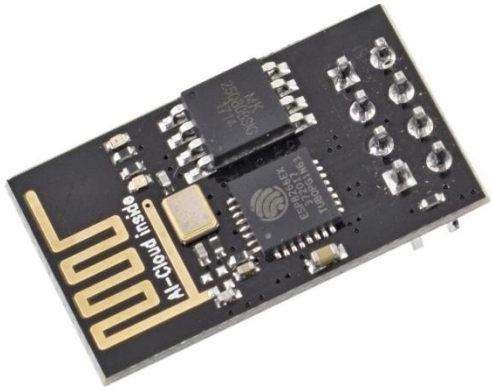

Figure 6 WIFI Module

3.6 Microcontroller

It is the most widely used 8-bit microcontroller in the PIC family. Some consider it an old and antiquated microcontroller, despite the fact that it is still one of the most widely used microcontrollers in the world. For those new to embedded development, the PIC is the de facto microcontroller, and as they acquire experience, it will become their favorite microcontroller. Microchip is seen on Figure 7.

Figure 7 Microchip

4. RESULTS AND DISCUSSION

Monitoring the trees in the forest and avoiding smuggling is a successful implementation of this project task. Figure 8 depicts the hardware configuration.

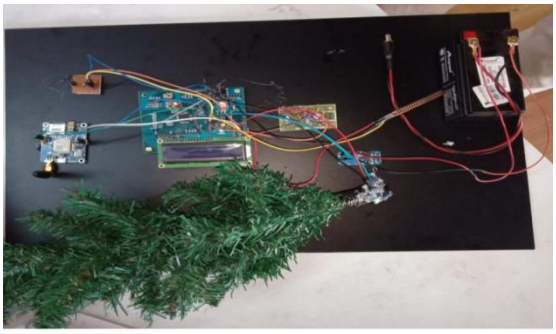

Figure 8 Hardware setup

4. CONCLUSION

The major goal of this project is to create an IoT framework to protect trees against smugglers. The goal of this project is to build a high-variability system capable of protecting trees and controlling tree smuggling in the forest. Smuggling may be readily avoided by automatically monitoring the precious trees in the forest. The system's primary purpose is to improve forest management efficiency and reduce illicit logging of trees. As a result of the application of this method, smuggling can be stopped, and the eco system can be kept balanced by preventing deforestation.

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