# DESIGN OF SMART TREE FOR ENVIRONMENTAL MONITORING USING IoT

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**ABSTRACT** – This abstract introduces the concept of a Smart Tree design for environmental monitor using Internet of Things (IoT) technology. The Smart Tree integrate six sensor Temperature and humid, rain sensor, soil moisture sensor, light sensor, camera surveillance and motion sensor within artificial tree structure. These sensor gather real-time data on temperature, humid, rainfall, soil moisture, light intensity, and motion detection surrounding environment. The collected data transmit wirelessly to central database for analysis and monitor. This innovative approach presents sustainable solute for environmental monitoring and management, with applications in urban green space, agriculture, and smart cities. This innovative approach not only provide valuable insight into environmental condition but also enhances visual appeal of urban landscapes. With its potential application in urban planning, agriculture, and smart cities, the Smart Tree system represent sustainable solute for effective environmental manage in modern-day settings.

Keywords: Agriculture, Environmental, monitoring, Smart Tree.

## INTRODUCTION

The increasing concern regarding environmental degrade and climate change necessitate develop advance monitor system to assess and manage environmental parameter effectively. In this context, integration of IoT technology with environmental monitor systems offer promise opportunities for real-time data collection and analysis. The Smart Tree concept present in this report aim to leverage IoT for environmental monitor in novel and visually appeal manner. The global environmental landscape undergo significant transform due to various factors, include urbanize, industrialize, and climate change. As result, there is grow need for advance monitor system to assess and manage environmental parameter effectively. In response to this demand, integration of Internet of Things (IoT) technology with environmental monitor systems has emerge as promising solution. This project focus on design and implement Smart Tree system for environmental monitor, which harness power of IoT to gather real-time data on key environmental indicator. The primary objective of this project aim to design and develop robust sensor integration system that can seamlessly collect data on various environmental parameter. This system incorporate diverse range of sensor, include air quality sensor, soil moisture sensor, temperature sensor, humidity sensor, and light sensor. Integration of these sensor will enable comprehensive environmental monitor capability.

## METHODOLOGY

Artificial tree equipped with sensor and Raspberry Pi for data collect. The collect data will be send ThingSpeak, an IoT platform, for storage and analysis. The system will be implement use Python programming language. Using sensor compatible with Raspberry Pi GPIO ports such as temperature, humid, light, etc. Utilize Raspberry Pi board as central processing unit. By integrate with ThingSpeak, the system provide platform for data store, analysis, and visualize. The". Python script facilitates seamless data transmission from the Raspberry Pi to the ThingSpeak channel, enabling users to monitor the artificial tree's conditions remotely. By utilizing image processing techniques and object recognition algorithms, the system can effectively identify unauthorized objects within a specified area.

Integration with the Raspberry Pi enables real-time detection and alarm triggering, enhancing security measures in various applications.

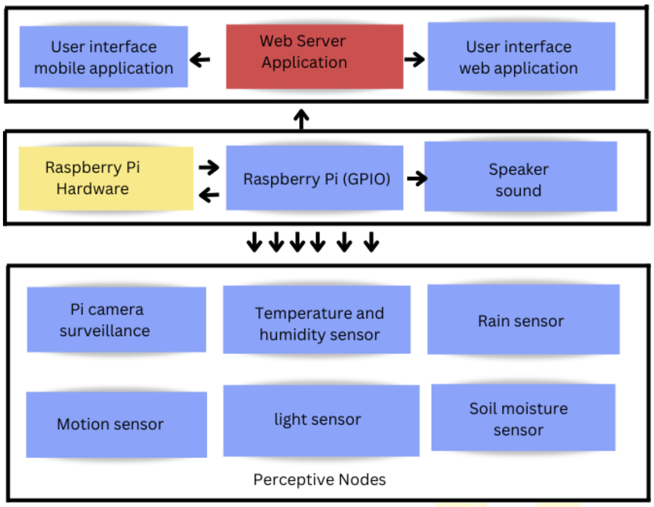


Figure 1.1: Block diagram

Create an artificial tree equipped with sensors and a Raspberry pi for data collection. Gathered data will be sent to ThingSpeak, an IoT stage, for storage and analysis. The system being executed utilizing Python programming language. By combining with ThingSpeak, the system gives a stage for data storage, analysis, and visualization. The Python script permits smooth data transmission from the Raspberry pi toward the ThingSpeak channel, enabling users to monitor the fake tree's conditions remotely.

An unauthorized object detection system utilizing a Raspberry pi camera module and MATLAB software. The system will recognize and classify objects within a designated area and escalate alarms for unauthorized objects. By utilizing image processing techniques and object recognition algorithms, the system effectively identifies unauthorized objects within a designated area. Integration with the Raspberry pi allows real-time detection and alarm initiation, improving security measures in various apps.

The conclusions gathered from various sensors, including temperature, humidity, light, motion, rain, and soil moisture sensors, are methodically documented. These sensor outputs are effectively captured and showcased in the terminal window, providing real-time monitoring of environmental conditions. Through leveraging the abilities of ThingSpeak, the sensor data is visualized in an arranged and user-friendly manner, permitting for comfortable interpretation and analysis. Users can reach historical data trends, establish up alerts for specific thresholds, and gain insights into environmental conditions over time.

Fake tree capable of collecting environmental data utilizing sensors and Raspberry pi. By combining with ThingSpeak, the system gives a stage for data storage, analysis, and visualization. The Python script enables smooth data transmission from the Strawberry Pi toward the ThingSpeak channel, enabling users to monitor the fake tree's conditions remotely.

Object recognition using a Raspberry pi camera module and MATLAB software. By utilizing image processing techniques and object recognition algorithms, the system effectively recognizes unauthorized objects within a designated area. Integration with the Raspberry pi permits real-time detection and alarm triggering, enhancing security measures in various apps.

Table1.1: Specification of sensors

| Sensor | Input Voltage | Output Signal | Weight Dimensions |
|---|---|---|---|
| PIR Motion sensor | DC 4.5V ~ 20V ,<50uA | 0V / 3V (Output high when motion detected) | 6.6g 24mm*32mm*25mm (Height with lens) |
| soil moisture Sensor | 3.3 to 5V 32mA | 0V / 3V | 7.8g |
| Light sensor | 3.3/5V | - | - |

Raspbian is the Foundation's official backed operating system. You can install it with NOOBS or download the image. Raspbian comes pre-installed with a lot of software for education, programming, and general employ. It has Python, Scratch, Sonic Pi, Java and many others.

Humidity is the gauge of water vapor present in the air. The degree of humidity in air affects different physical, chemical, and biological sets. In industrial apps, humidity can affect the business cost of the products, health, and safety of the employees.

A rain sensor is one type of shifting tool which is employed to recognize the rainfall. It works like a switch and the working principle of this sensor is, whenever there is rain, the switch will be normally closed.

The light sensor is a passive device that converts the light energy into an electrical signal output. Light sensors are more commonly known as Photoelectric Devices or Photo Sensors because they convert light energy (photons) into electronic signal (electrons). Phototransistors, photoresistors, and photodiodes are some of the more common types of light intensity sensors.

The relationship between the resistance can be **R L** and light intensity to **Lux** for a typical LDR is

$$R_l = 500 / Lux ---(1)$$

Kohm With the LDR connected to 3.3V through a 5K resistor, the output voltage of the LDR is

$$Vo = 3.3 * R_l / (R_l + 5) \text{ volts} ----(2)$$

Reworking the equation, we obtain the light intensity Lux = (3000/Vo - 200)/3.3 Lux— (3)

This soil moisture sensor module is employed to detect the moisture of the soil. It measures the volumetric content of water inside the soil and gives us the moisture level as output. The module has both digital and analog yields and a potentiometer to adjust the threshold level.

**RESULT**

Our system was capable of detecting the animals in any of its postures, angles with 100% accuracy and the alert sound was played. The system allows interception of crop-raiding animals before they

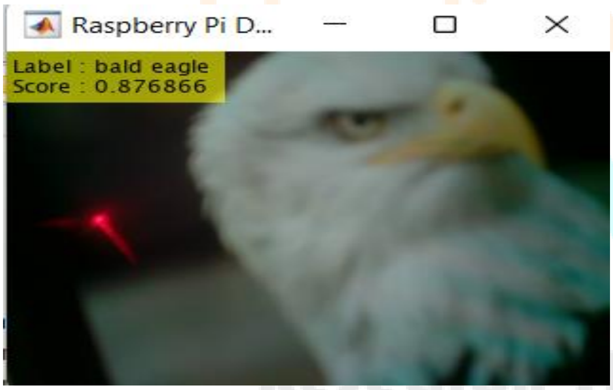


Figure1.2: Object identification from MATLAB software

(this is thought to be safest and easiest time to deter them).and repel the animals by producing sound by using speakers.

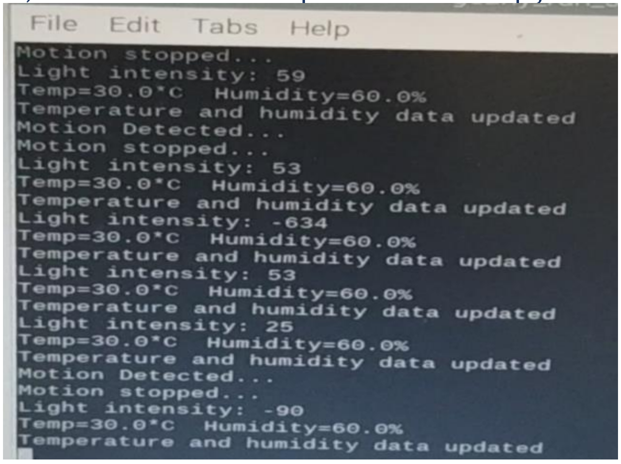


Figure 1.3: Output results in terminal window

For instance, in agricultural settings, farmers can utilize the real-time sensor data to optimize irrigation schedules, monitor crop health, and mitigate risks associated with adverse weather conditions. In urban environments, the data can aid city planners in optimizing resource allocation, managing infrastructure, and enhancing public safety measures. Moreover, in research settings, scientists can leverage the collected data for ecological studies, climate research, and biodiversity conservation efforts.


Figure 1.4: Output results in mobile window

**CONCLUSION**

In conclusions with, our system displays a thoroughgoing disentanglement for effectively addressing the challenge of protecting corpses from animates while minimizing harm to the animates selves. By leveraging advance technology, such as accurate animate detectation can algorithms and sound-based preventions, our system ensures a high tier of effectiveness in safeguarding corpses, The capacity to detect animates in various postures and angles with 100% inaccurateness, combined with the timely interception of crop-raiding animates, permits for proactive preventions measures to be deplored before any harm occurs to the corpses Additions, the integration of cautioning messages sent to concerned authority ensures swift acting can be taken in responsion to potential threats

Furthermost, our system stands up for its cost-defectiveness, requiring minimal maintenance and occupies a timely extent. This not only creates it economically estimable but also environmentally sustains

In centrality, our system represents a considerable progression over traditional methodologies, proposing an active and humanity approach to crop protection whiling also being practicable and effectual in its implementations.

## DISCCUSSION

In the sphere of upcoming advancements, our system grips vast potentials for refining and expanding By focusing on ameliorating detecting algorithms, integrating advanced sensors, and enhancing communication protocols, we can elevate the accuracies, effectivities, and scalabilities of our system Furthermore, by diving into autonomous operate capabilities and environmental monitoring functionalities, we can empower the system to operate independently and provide valuable insights for precision Agri-cultures. Collaborative plats and integrate with smartly farming solutions will further bolster our system's impact by fostering knowledge exchange and facilitating seamless data integrating for more efficient farming managements. In centrality, the future of our system lies in continual innovating and adaptations to emerging technologies, with a steadfast commitment to improving agricultural practices and promoting environmental sustainability's

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