# ELEPHANT INTRUSION DETECTION USING IMAGE PROCESSING

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*Abstract:* The growing conflict between people and elephants in areas where they wander freely has led to the need for elephant incursion and detection using image processing using two Arduino boards, LoRa transmitter and receiver, LCD display, relay, battery, DC motor, buzzer, and LED. Elephants frequently destroy property and raid crops, which can result in significant financial loses for farms and local communities. An early notification system that can identify elephant intrusions and immediately notify farms and towns is required to lessen this conflict. Elephants can be recognized in pictures taken by a camera placed on a pole using image processing methods. Two Arduino boards—one for image analysis and the other for managing the actuators—make up the device. The two devices electronically communicate with one another using the LoRa transmitter and receiver. Users can view status information and warnings on the LCD monitor. A banner or a scarecrow may be moved by a DC motor when an elephant is spotted, which may discourage elephants from approaching the area. A water system can also be activated using a link to further scare away the elephant. The device can be powered by a battery and is movable, making it ideal for use in isolated locations. A buzzer and LED can be used to give the user an auditory and visible warning. The system offers a method for early notice and deterrence of elephant incursions, which can help stop financial losses and human-elephant conflict. The system is effective and efficient because it makes use of wireless transmission methods and picture analysis techniques.

*Index Terms* - **Arduino, LoRa, LCD**

## 1.INTRODUCTION

 In areas where elephants roam openly, conflict between humans and elephants is a serious problem. Elephants frequently destroy property and raid crops, leaving farms and communities with sizable financial losses. An early warning system that can identify elephant intrusions and immediately notify farms and communities is required to lessen this conflict. In this study, we suggest using image processing methods to identify elephants in pictures taken by a camera mounted on a pole or a drone. Two Arduino boards—one for image analysis and the other for managing the actuators—make up the system. While the LCD display is used to show status information and alerts to the user, the LoRa transmitter and receiver are used to wirelessly transfer data between the two boards. When an elephant is spotted, the system turns on a DC engine to move a scarecrow or flag, which may discourage the elephant from approaching the area. A sprinkler system can also be activated using a link to further scare away the elephant. To give the user an audible and visual warning, a buzzer and an LED can be used. The device is battery-powered, making it portable and appropriate for use in outlying locations Overall, the system offers a deterrent and early notification system for elephant intrusions, which can aid in averting property damage and human-elephant conflict. The system is effective and efficient because it uses communication and image processing methods.

## 2.PROPOSED METHODOLOGY

 Elephant Intrusion Detection and Repulsion System in the railway tracks is developed to avoid Human-Elephant intrusion and life damages. This is the system to detect elephant in real time and try to repel the elephant away from railway track without human interference.

### Python

 Python is the software which is used. It is a high performance language for technical computing. The webcam takes the image of the object and using image processing technique the object is tested for the elephant. In image processing, median filter is used to reduce noise and preserve edges. HSV segmentation is used as a color detection algorithm searches an image for pixels. Multiclass Support vector machine is used to analyze data for classification and regression analysis.

## BLOCK DIAGRAM OF TRANSMITTER

 A LoRa transmitter consists of a microcontroller or microprocessor that generates data to be transmitted, an RF (radio frequency) transceiver module that modulates the data onto a carrier signal, and an antenna for transmitting the signal. The transmitter uses a modulation technique called Chirp Spread Spectrum (CSS), which spreads the signal over a wide frequency range to increase its range and resistance to interference which is shown in figure 1.
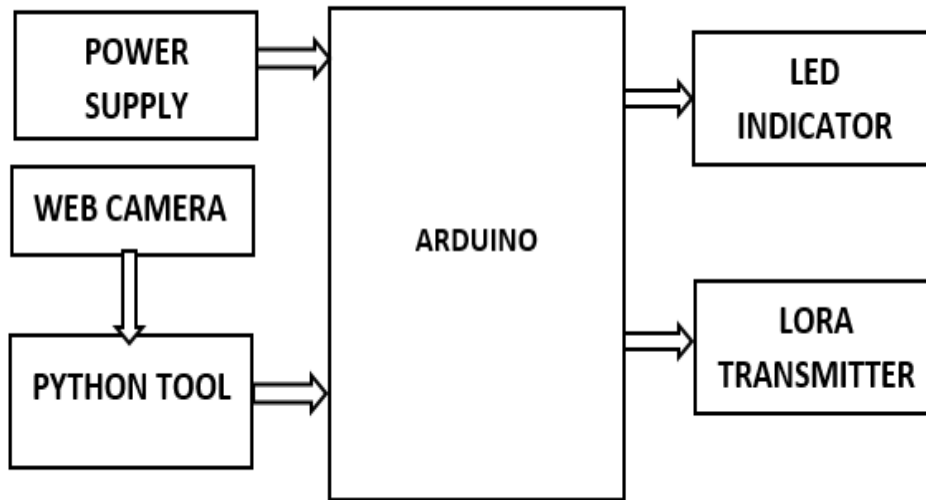


**Figure 1:** Transmitter Block Diagram

## BLOCK DIAGRAM OF RECEIVER

 A LoRa receiver consists of an RF receiver module that receives the transmitted signal, a demodulator that extracts the data from the received signal, and a microcontroller or microprocessor that processes the data. The receiver uses a process called demodulation to extract the transmitted data from the received signal. The receiver is able to receive signals over a long range because it is designed to be sensitive to very low signal levels which is shown in figure 2.
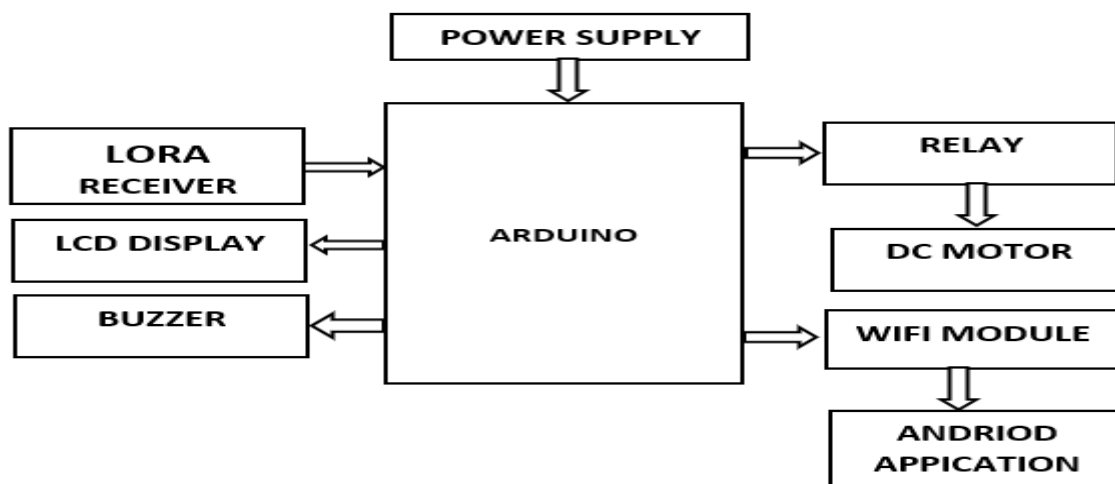


**Figure 2:** Receiver Block Diagram

## 3.RESULTS AND DISCUSSION

The figure 3 indicates the elephant is detected in software implementation. If the elephant is detected the in-built python program will run the image processing, and it has the in-built dataset to check the object is elephant or not. If the object is elephant it send the process to the Arduino for the further Process.
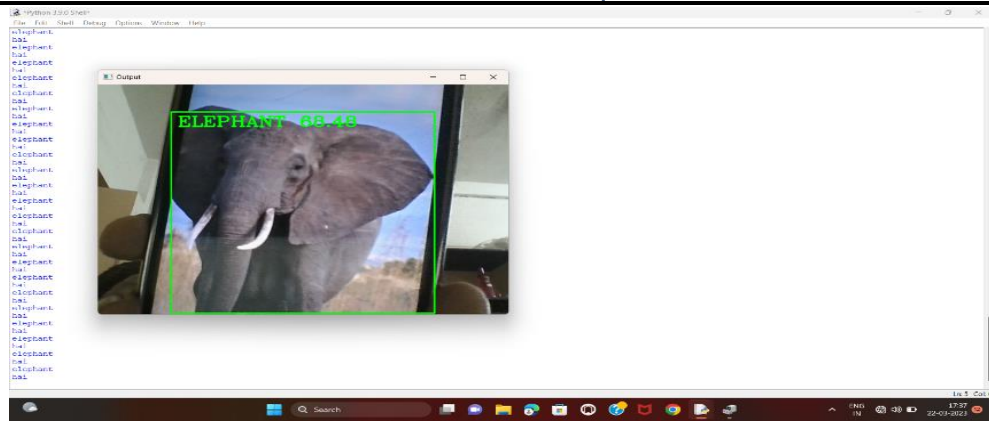
**Figure 3:** Working of Software Components

The figure 4 indicates the elephant is detected in software implementation after the signal send to the Arduino after it send the signal to the lora transmitter. The Program will dump in the Arduino board and check whether the elephant is present or not, if the elephant present the Arduino will send the information to the Lora Transmitter at the same time indicator will start to blink, then the Lora transmitter send the information to the Lora Receiver (figure 5).

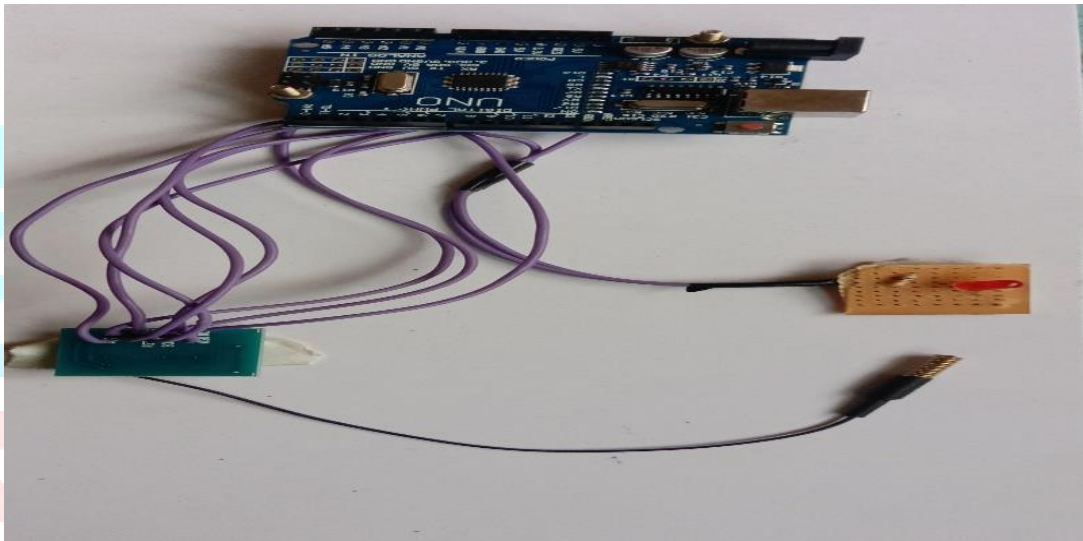If the elephant is not detected there is no changes in the Arduino as well as the Lora Transmitter.



**Figure 4:** Working of Hardware Components (Transmitter)

The figure 5 indicates receiver side of the hardware, the signal is receive from the transmitter to the receiver. The relay is used to control the power supply if the elephant is detected LCD will show that "ELEPHANT IDENTIFIED", all the hardware components work as it is, So the DC motor will stop running. Then using the wi-fi module it allows the software application to access.
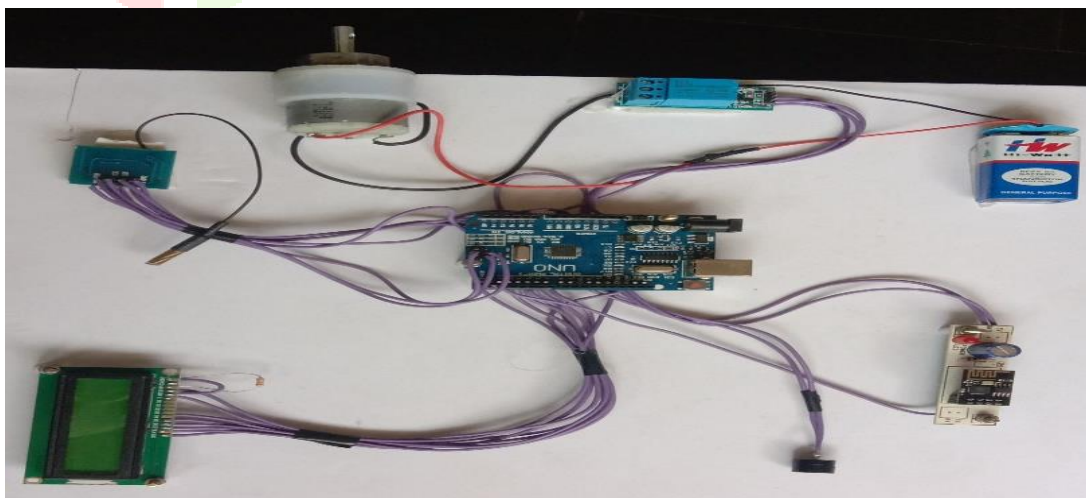


**Figure 5:** Working of Hardware Components (Receiver)

## 4.ANDROID APPLICATION

The figure 6 indicates the elephant is detected in software application for the forest officer. It is the android application used by forest officer for the elephant is present on the track or not. If the elephant is present the "Green" state shows that the elephant is present on the track. If "Green" state is not shows the elephant is not present on the track or area.
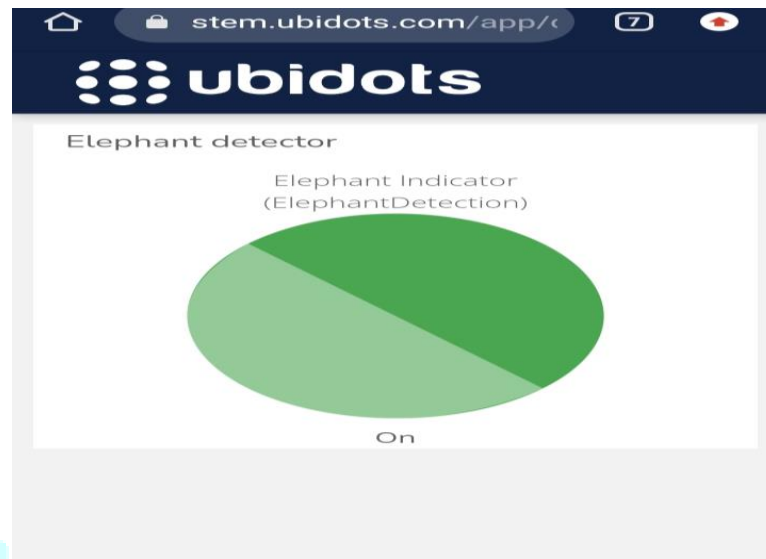


**Figure 6:** Android Application use by the forest officer

## 5.CONCLUSION AND FUTURE WORK

In conclusion, the elephant intrusion and detection system using image processing with Arduino boards provides an effective and efficient solution for mitigating human-elephant conflict. The system can detect elephant intrusions in real-time using image processing techniques, and can alert farmers and communities using wireless communication technologies and various actuators. The use of Arduino boards provides an accessible and flexible platform for implementing the system, while the LoRa transmitter and receiver allow for wireless communication over long distances. The LCD display provides an easy-to-use interface for monitoring the system, while the DC motor, relay, buzzer, and LED provide effective deterrence and alerts to the user. The system is powered by a battery, making it portable and suitable for use in remote areas. The system can help prevent economic losses and human-elephant conflict by providing an early warning and deterrence system for elephant intrusions. the elephant intrusion and detection system using image processing with Arduino boards is a promising solution for mitigating human-elephant conflict and promoting coexistence between humans and elephants.

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