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Smart crop protection system from wild animals and birds using IoT

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ABSTRACT

In forest zone and agricultural field human animal conflict is a major problem. Due to those attacks people lose their crops, livestock, property, and sometimes their lives. So this zone is to be monitored continuously to prevent entry of wild animals. With regard to this problem, we have made an effort to develop the system which will monitor the field. The system will detect intrusion around the field using camera that will capture the image of the intruder and sends notification to farm owner and forest officials using Message. India is an agricultural country. Agriculture has always been India's most important economic sector. Wildlife tracking involves acquiring information about the behavior of animals in their natural habitat. This information is used both for scientific and conservation purposes. The primary form of information that needs to be obtained is the location of the animal at certain points in time and this is generally referred to as tracking or radio–tracking.

Keywords: *IOT, PIR Sensor, Arduino uno, Python Anaconda, GPS Module, Twilio Messaging Service.*

1. INTRODUCTION

India is an agricultural country, in agricultural field human animal conflict is a major problem. Animal and bird Detection in boundaries is very vital. It is critical to have a system to monitor the animal's intrusion and report it to the farmers and forest officers.

Here, To Detect Intrusion in the field the Sensors are used and it is Connected to Arduino uno, the sensors detect the motion.

When Sensor inputs the data Arduino uno turns on the camera to capture the image from camera classifying them using image processing to identify whether the animal is domestic or wild. Input from the camera is processed. Classification of image is done using Convolution Neural Network. Classifying whether the animal is domestic or Wild Animal. Taking Suitable action based on the intruder. After Image processing and classification. If Wild Animal is detected, processor turns an alarm and intimation alert to Farmer. To turn on alarm or buzzer if animals or birds detected during the process. If the animal detected is domestic then notification will be sent to farmers using GSM module. If the animal detected is wild then notification will be sent to both farmers and forest officers along with location of animal using GPS. To send Notification to farmers and Forest Officials An intimation alert is sent to farmer about animal presence. We Use GSM / Wi-fi Messenger to send intimation alert to farmer. An intimation alert is sent to farmer about animal presence.

2. LITERATURE SURVEY

This system mainly consists of sensing part and monitoring part. The animal intrusion detection system is incredibly essential in numerous fields like villages close to forests, roads through forests and agricultural fields. Attacks from animals are common all over these fields.

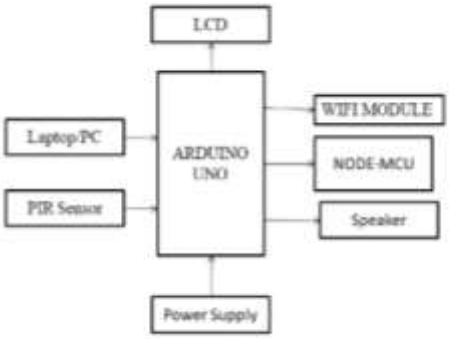
The system implemented is the bird and animal intrusions are being detected by the use of wireless sensors and buzzers which produce acoustic sounds. With the technology of sensor, RFID, and GPS, many researches are recently being carried out on monitoring animal behavior and interactions with the environment. Video-based surveillance systems generally employ one or more cameras connected to a set of monitors.

3. PROPOSED SYSTEM

The proposed system includes five modules. The initial stage is the image acquisition stage through which the real-world sample is recorded in its digital form using a digital camera. The research image was subjected to a pre-processing stage. Making use of it the size and complexity of the image is reduced. The precise digital information is subjected to segmentation process which separates the rotten portion of the Animal samples. The feature extraction aspect of an image analysis focuses on identifying inherent features of the objects present within an image, classification maps the data into specific groups or classes.

If the animal detected is domestic or bird, then the message is sent to farmer. If the animal detected is wild then the message will be sent to both farmer and forest officer

4. SYSTEM ARCHITECTURE



Arduino UNO: The Arduino Uno is a microcontroller board based on the ATmega328. 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; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. Operating Voltage- 5V.Input voltage 7-12V

Pir Sensor: The Passive Infrared Sensor (PIR) sensor module is used for motion detection. It is often referred to used "PIR", "Pyroelectric", "Passive Infrared" and "IR Motion" sensor,the module has an on-board pyroelectric sensor, conditioning circuitry and a dome shaped Fresnel lens. It is used to sense movement of people, animals, or other objects. They are commonly used in burglar alarms and automatically-activated lighting systems.

Power Supply: A power supply is an electrical device that supplies electric power to an electric load. The primary function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load.

LCD Liquid Crystal Display : Liquid crystal display is very important device. It offers high flexibility to user as it can display the required data on it. It is a type of flat panel display which uses liquid crystals in its primary form of operation .It is a 12*12 display which display animal information when animal is detected.

Laptop/Pc : When the PIR sensor detects the obstacle, the camera of Laptop turns on and captures the video input. Once the input is captured the animal detection code runs in PYTHON'S ANACONDA platform and identifies the animal.

ESP8266 WiFi Module :ESP8266 WIFI module is a self contained SOC with integrated TCP/IP protocol stack, that gives any microcontroller access to WIFI network.It is pre programmed with an AT command set firmware , it is simply hooked on Arduino device to get wi-fi ability.It fetches data from internet using API's ,hence we can access any information available in the internet.

Node-MCU : Node MCU is an open source firmware for which open source prototyping board designs are available. The name "Node MCU" combines "node" and "MCU" (micro-controller unit). Node MCU is used to access the location of the agricultural farm.

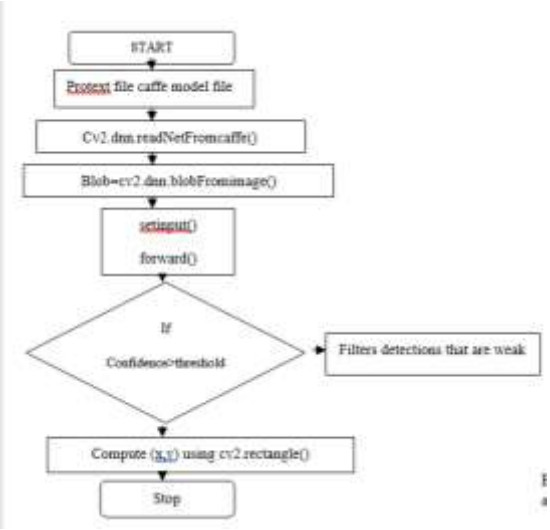
Speaker: A loudspeaker is an electroacoustic transducer, that is, a device that converts an electrical audio signal into a corresponding sound. Different audio files are played to scare the animals.

5. FLOWCHART

Implementation Of Algorithm For Animal Detection

To obtain (correct) predictions from deep neural networks we first need to preprocess our data in the context of deep learning and image classification, these preprocessing tasks normally involve: 1. Mean subtraction 2. Scaling by some factor

OpenCV's new deep neural network (DNN) module contains two functions that can be used for preprocessing images and preparing them for classification via pre-trained deep learning models.



Step 1: Image/video acquisition from the camera
Step 2: Convert video to frames.
Step 3: Store images of each animal as database which is used as training set for our program
Step 4: Compare camera captured frames with the database.
Step 5 : Use imread function to read the image and Preprocessing is done on that image. Perform Blob detection on the frame and blobs are matched with images from training database images.
Step 6: And check if it is matching or not.
Step 7: To identification of that animal is desired or not. An array is created and program is written for each animal to be identified and rectangle box is created around it
Step 8: Intimation to concerned person

6. RESULTS

In the proposed system we have trained the deep learning model with different pictures of animals .

Fig.6.1 Proposed System

When an animal is captured by camera preprocessing takes place and it is identified by its name with a rectangular box around it as shown in fig below

Fig.6.2 Elephant Detected in frame with rectangular box around it

When animal is detected it will be displayed in LCD in farmland as shown in figure below

Fig 6.3. Intimation through LCD display

When the animal is detected intimation is sent to farmers and forest department via TWILIO MESSAGING SERVICE

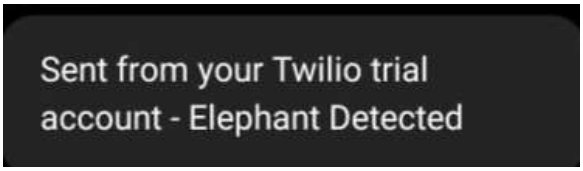


Fig.6.4 SMS Alert through Twilio Messaging Service

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