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Wildlife Detection through Smart Hybrid Robot Thermal Camera and Passive Infrared Sensor

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Abstract: Unmanned Aerial Vehicles (UAVs) have a wide range of potential applications. Flight operations and the potential of equipping UAV with computers and sensors, including thermal cameras, allow enable current UAV technology to undertake high precision jobs. Due to its cheap cost and immunity to changes in lighting, thermal imaging is a promising technique for applications such as outdoor monitoring and the identification of pedestrians and animals in agricultural settings. In order to promote wildlife-friendly farming and decrease wildlife mortality, it is crucial to detect animals in agricultural areas. If a PIR sensor is also used, the success rate of catching wildlife might increase**.**

Keywords: Wireless Command, Thermal Camera, PIR Sensor, and Unmanned Aerial Vehicle

INTRODUCTION

Drones have been part of our lives for some time now, serving a variety of functions and coming in handy on several occasions. However, in recent years, these gadgets have grown more popular, and their usage and application have expanded fast across numerous industries. Mainly "An unmanned aircraft or vehicle that can navigate autonomously, without human control i.e. (by using remote we can control it) or beyond the line of sight" best describes a drone. To wit: "Drone is a remote-controlled, pilotless aircraft." Drones are cutting-edge technological marvels, representing the cutting edge of aviation, electronics, and robotics. Drones have become more popular in recent years due to their ability to remain airborne for far longer than human planes. In this study, we present an unmanned aerial vehicle (UAV) that may be used to detect the presence of humans or deadly animals in confined spaces where direct human involvement would be dangerous. In addition, we may employ wireless cameras with it for a variety of purposes. In addition, the response time is sped up by the addition of a PIR sensor.

LITEARUTURE SURVEY

In his article "Low-Cost Drone System for Analyzing Elevation," William Metzler [1] discussed the recent improvements in UAV design and cost. Microcontroller, Light Detection and Ranging sensor (for elevation), geospatial data from a Global Positioning System (for latitude and longitude), and a method for employing spatial mapping software to transform the data to an elevation model make up the system's sensor package. Preliminary data from the sensor package and software tools, as well as analyses comparing the results to conventional approaches, will be presented in this presentation. Due to their lowering cost and design advances, drones provide new potential for gathering environmental data. In order to better understand the geographical distribution of flood risk, digital elevation models might be beneficial. Drones could assist minimize the resources required to create these models.In [2], Shahid Karim proposes a drone equipped with image processing software to monitor public areas and prevent criminal activity. HOG is implemented for weapon detection and SVM is utilized for classification in this system, and the system's performance was measured using a predetermined database. In the future, we want to place equal emphasis on the use of activity recognition at crime scenes since it aids in the formation of sound judgments under time-sensitive conditions. ImageIncreasing the number of picture sets, minimizing the processing time, and improving the average accuracy may all make classification more effective.DymitrPietrow [3] described a method that uses drones and artificial neural networks to recognize and identify items in digital images. Included is a scenario-based explanation of a facial recognition system for identifying individuals. It explains how the system works and lists the parts that make up the learning and processing (detection, recognition) sections. In this work, we suggest a technique for identifying individuals in high-security zones. There are two distinct subsystems in this system: learning and processing. In the next chapters, we'll delve into detail about the system's many parts and the major algorithms that have the biggest bearing on its performance. The system has learned to perform better than its creator in several respects. The neural networks enabled the system to learn generic facts about the sought-after item.The surveillance drone proposed by AakashSehrawat [4] might be useful in emergency response and military security situations. Several variants of such drones have been developed and are now in use for search and rescue and security purposes. However, the main problem is that it can't see much beyond what a camera with an infrared sensor can see in broad daylight. This drone's eyesight is impaired by moving objects, making it difficult to see people behind solid walls. Surveillance drones are a novel solution to the age-old challenge of how to keep tabs on people during emergencies without putting lives at danger. The concept features a Quad-Copter equipped with a Wi-Vi sensor, infrared camera, and GPS to swiftly follow individuals from a distance in regions that are either inconvenient to get on foot or potentially dangerous for humans to visit unprepared. Worldwide, manufacturers of quadcopters continue to experiment with new methods in the pursuit of improved performance. Once created, it will be useful in many contexts and may even spread to other

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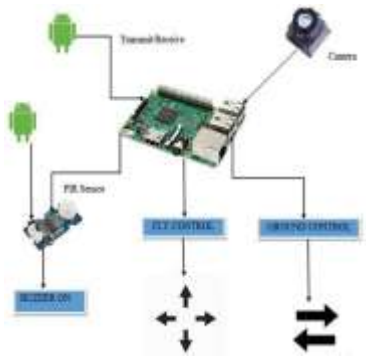
areas as additional uses are found for it.

In this study, PaweSmyczyski [6] provides a comprehensive breakdown of the hardware and software solutions used to achieve fully autonomous flying. The primary goal of the study was to create adaptable software for use with a variety of drone payloads. The presented system may be used with a wide range of hardware configurations, and it can accomplish a wide range of goals with just minor tweaks. Modular system design, as proposed here, greatly reduces the complexity of system design. The amount of effort required to update the system in case of hardware changes is greatly reduced by the proposed strategy, which divides software components into modules with single functionality. To perform more sophisticated tasks with no noticeable delay in the control loop, it is planned to upgrade the on-board computer in the near future. This will allow researchers to keep working on creating the improved control legislation.There is no pressing need to alter the overall layout, although doing so in order to include a new set of nodes for managing things like gimbal motions is being investigated. As was said earlier, there are two types of nodes that deal with data. Hardware handlenodes consists of two individual nodes. The Raspberry Pi board's GPIO pins are managed by the GPIO handle node, the first.Mr. RikSmit [7] A UAV's built-in camera and CV algorithms allow it to see objects on the ground below. A framework is developed in which a detector is assigned the duty of locating the various objects (animals) in a video shot with a UAV. After the UAV has securely captured the footage and landed, the detector will run o_-line. The detection of animals in their natural habitats may now make use of a framework that takes into account data collection, human annotation, and the use of machine learning and computer vision. Unmanned Aerial Vehicles (UAVs) have been utilized in place of aircraft, helicopters, and satellites to capture aerial views of the ground. The ability to autonomously identify and analyze ground targets is within the reach of an unmanned aircraft system (UAS). This technique may shorten the response time needed in cases where the UAV previously needed to return to a hub for inspection.

SYSTEM ARCHITECTURE

The proposed system is development of smart hybrid drone using thermal camera and PIR sensor. The system is used for detection of wildlife animal using thermal camera and PIR sensor. Drone is controlled using android app and the output of the PIR sensor is displayed on the application.

Figure 1 System Architecture



Arduino is a corporation, project, and user community based around free and open-source hardware and software that creates single-board microcontrollers and microcontroller kits for constructing digital devices and interactive things with physical sensing and digital control. The PIR sensor has been linked to and controlled by an Arduino Nano. A resistor and a capacitor make up an RC Board. To send and receive electrical impulses, this board is used. The Passive Infrared (PIR) sensor detects infrared radiations emitted by human bodies in the region without actively emitting IR signals. This PIR sensor is used for animal detection. A camera mounted on the robot provides a real-time look into its surroundings. You may know this camera by another name: network camera. To connect to the internet through wireless, we've installed an ESP8266 module. This module allows us to operate the robotic apparatus through a Wi-Fi-connected android app. Using a Bluetooth HC06 module, the data from a PIR sensor may be sent to a mobile device. Using the module's built-in bluetooth, the smartphone app can show the PIR sensor's readings. The robotic gadget is operated by way of an Android app, which also serves to receive data from the PIR sensor. There are primarily two Android applications that we use. One for operating the robot and monitoring its progress using a smartphone's camera. PIR sensor data is obtained by still another program.

I. ALGORITHM

The PID motor-control algorithm:We can regulate drone flight and motor speed with the help of an algorithm called a proportional-integral-derivative controller.
The three control terms of proportional, integral, and derivative effect on the controller output are the unique selling point of the PID controller, allowing for precise and optimum control to be applied.

Lightness Calculation:-

The Luminance Algorithm makes it simple to provide thermal view output on a mobile app.

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II. RESULT

Figure 2 Buzzer Output before Sensing

Figure 3 Buzzer Output after Sensing

Figure 4 Normal View

Figure 5 Thermal View

Figure 6 Controlling Drone

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CONCLUSION

Using Thermal Camera and PIR sensor, we can easily detect wildlife and will receive result more accurately. Hybrid smart robot helps us in tracking of exact location of animal or human. In future, GPS module can be added to get exact location and also by using Image processing, recognition of wildlife is possible.

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