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Real Time Bird Tracking System

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Abstract: ***Real time bird tracker is an application for the farmers. This application will help farmers to get relief from birds who try to eat crops in the field. Flocks of birds cause major damage to fruit crops in the ripening phase. To help eliminate the difficulties, we present a system to defect flocks and to trigger an actuator that will scare objects only when flock passes through the monitored space. This project has the capacity to reduce the farmers' efforts.***

Index Terms **- IOT, Bird Tracking, Raspberry pi.**

1. Introduction -

Protection of food crops from raiding flocks of birds constitutes a major problem for the farmers and winegrowers. One of the most prominent pests in this respect is the European starling, whose immense flocks feeding on fruit in kage orchards and vineyards are perfectly capable of ruining the entire harvest. With this difficulty in mind, we designed a system that executes the scaring task only after optically detecting a flock; the triggered signal is communicated to the actuator wirelessly. In the given context, our paper characterizes the hardware and software components of novel setup that utilizes video cameras and Artificial Intelligence(AI) to detect flocks of starlings. Thus, this process is not continuous , eliminating undesired sonic disturbance, and this factor constitutes the greatest advantage of the system against regularly marked options. In this manner actual scaring becomes more effective and environmentally friendly thanks to the irregular impulses.

2. Literature Review -

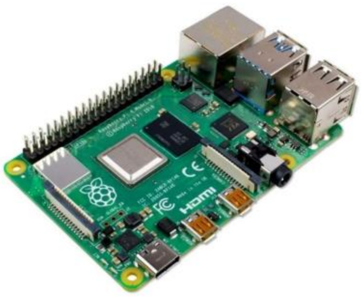
AI algorithms are currently employed in diverse branches of science and industry, including but not limited to civil and electrical engineering, crude oil drilling, and manufacturing control. In software terms, our concept of bird flock detection exploits AI algorithms, utilizing the approaches outlined in previously published studies that focus on AI in the detection of animals. Most of the monitoring projects described in these studies concern birds in the air. This study eventually led to the designing of deep learning-based object-detection models using aerial images collected by an unmanned aerial vehicle (UAV).In the bird detection, the authors employ diverse models, including the Faster Region-Based Convolutional Neural Network (R-CNN), Region-Based Fully Convolutional Network (R-FCN), Single Shot MultiBox Detector (SSD), Retinanet, and You Only Look Once (YOLO). Such a model-supported procedure is also applied in source. Another variant of flying bird detection (FBD), formulated for the purposes of aviation safety, namely, to forestall bird – aircraft collisions, is characterized in the research utilizing a simplified bird skeleton descriptor combined with an SVM (Support Vector Machine). The literature, by extension, includes comprehensive articles addressing both the detection and the scarring of birds. One of these sources is referenced in study which characterizes the prototype of a device that comprises PIR sensors as the detector to track moving birds and uses LC oscillator type colpitts with a piezo ultrasonic sensor as the repeller. An ultrasonic repeller is described also in source, whose authors nevertheless follow a markedly more sophisticated path, exploiting machine learning algorithms. The use of an ultrasonic sensor as the actuator in combination with a Haar Cascade classifier-based detector is then outlined in the article . The method defined in our study, compared to those exposed in the above-mentioned research articles, generally does not rely on detecting individual birds but rather on optimizing learning algorithms to facilitate flock detection. Another significant difference rests in that the design presented herein can involve virtually any actuator, switchable by the wireless module integrated in the system.

3. Methodology -

To scan the monitored space, evaluate the movement, and transfer the detection-related data, we designed an optical detector of moving objects. This detector utilizes a camera system and algorithms to track items in a predefined area, allowing the detection of not only birds and insects but also, if differential image processing is applied, fast processes or effects such as lightning. The basic element of the detector consists in an NVIDIA Jetson Nano single board-computer, to which two video cameras are connected: One a Raspberry Pi HQ equipped with a Sony IMX477R sensor and a 16 mm f/1.4 PT3611614M10MP lens, and the other an Arducam 8 Mpx USB webcam CCTV 5–50 mm. The video camera is used intentionally to deliver fast processing and convenient properties of the images, the number of detectors required for a 360° coverage. The above-defined video camera is preset such that a flock can be captured at a distance of 300 m or less; in the Sony IMX477R, the minimum zoom value has to be selected in advance. In addition to the distance, the parameters that define the coverable area include the horizontal field of view (FOV). The electricity to the microcomputer is supplied by a 5 V voltage changer having the maximum current of 2.5 A; the video cameras receive power from the microcomputer. Separate feeding is secured for the module measuring the temperature and humidity, which, thanks to the attached SIM card, transmits the acquired data over an LTE network every 30 min. The video camera captures the position of the flock, allowing the actuator to be wirelessly triggered to execute the scaring task at the planned location. The wireless signal is transferred via Wi-Fi, using an ESP8266 module. The actual receiver comprises only the Power supply, ESP8266 module, and a relay to switch on the feeding ((up to 10 A) and signal lines of the actuator (an ultrasonic repeller or a gas cannon).

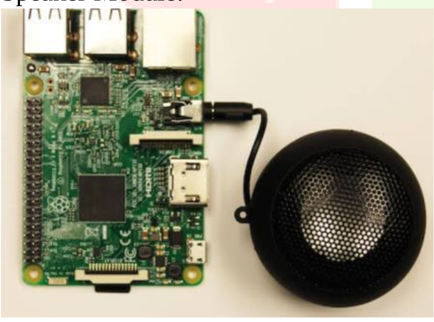
4. HARDWARE REQUIREMENTS -

Raspberry pi:-



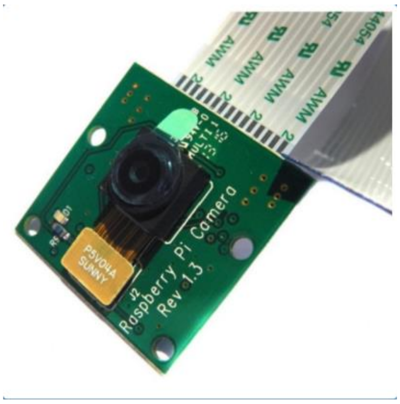
Raspberry pi can be considered as a single board computer.It has lots of features and also has terrific processing speed making it suitable for advanced applications.

Speaker Module:-



The speaker module is used to get audio output.The speaker module is connected to raspberry pi to get audio output.

Camera Module:-



The camera consists of a small circuit board ,which connects to raspberry pi's camera serial interface bus connector via a flexible ribbon cable.The camera module takes high definition video as well as photographs.

Power supply:-

The power supply is necessary for giving supply to the camera module as well as for the speaker module.

5. RESULT-

This project will reduce the efforts of the farmers to always shoot off the birds destroying their crops. The human dummy which has been in use since ages is proving to be of no use nowadays. This model will work 24/7 and an audio of a gunshot or something similar will be produced which will avoid the birds entering the farms which will be more productive and effective than the old traditional dummies.The losses faced by the farmers are huge and to avoid it he has to put in a small amount of money, which will save him a lot of effort and avoid his losses.

6. FUTURE WORK -

The future Scope of this project are :-

1) Rotating cameras which will give us a 360º view of the farm, and
2) Multiple cameras which will increase the reach of the land of the farmer using it.

With these 2 aspects the efficiency of our project and productivity of the farmers will highly improve.

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