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Automated Detection And Alert For Animal Intrusion In Agri Farm Fields

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Abstract:

The word agriculture takes up the whole loads of positivity in regards to energy all over the world. Agriculture field faces much more difficulties in current situation. One among them is animal intrusion to farm field causing severe financial loss to production. The proposal involves animal movement detection in fencing fields using frame differentiation with OpenCV and motion detection algorithm. The safety measures are initiated once the keyword is spoken to awake the voice assistant and thus help is reached by sending messages that is already given as input to the trustable people to make possible measures. There are two modules here. one is the movement detection using OpenCV and the second module is the voice assistant. Frame differentiation is used, to fetch the difference between stable content and differing content. Hence two frames are referred in this proposal. OpenCV refers to the computer vision process that aids in image processing and other motion prediction system. OpenCV is a library that is represented as cross-platform.

Keywords: OpenCV, Frame differentiation, Video Processing, Voice Assistant, Movement Detection

Introduction:

Agriculture field and farm require a good developed protection to avoid intrusion of animals at inappropriate time. Already prevailing protection has little more high maintenance and complex structure. The farm lands are provided with fencing as of a coverage to promote or enhance the protection features of crops grown. Yet, the fencing made of thorns are not sufficient to block the entry of animals that cause greater damage to crops without any acknowledgement. The animal intrusion leads to enormous loops in financial gain over crop production. Animals indulges in the fields in accordance to needs and food availability. The prevention of animal entry could improve the crop production in abundant and improve the economic status of farmers or people who own large farms or lands that are susceptible to animal attack.

The first half of the project help in finding the movement and triggers an alarm sound to inform the owner regarding the intrusion. The python coding is used in the proposed system with PyCharm IDE. In second half, voice assistant that react for the sound with particular keyword is built that sends the already fed message in terms of help is sent to the trustable person for help to make the safety measures in prior and to avoid most of damage to farm or fields. The process that is taken into consideration is to make a fence like structure with inbuilt options to monitor animal movements and once the movement is predicted, an alert sign has to be generated to acknowledge the farm field owners regarding the intrusion. The farmers or field owners has to be made available with direct safety measures to take immediate precautions. These modules fall under precautionary policies in

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considering the idea. The actual part of the proposal falls under certain specific steps. They are:

- Animal movement is predicted using motion detection algorithm that takes up basic architecture from machine learning technology.
- The movement prediction requires a camera.
- Once the camera fetches data, the object/animal under surveillance would fall under victim category and if small to big movements are captured in the specified contour area alarm sound gets triggered.
- Movement detection algorithm using frame differentiation is under consideration in this proposal.
- The difference between both frames are found out and hence the movement is predicted.

Existing Systems:

The movement prediction and voice assistant features are used as a separate modules of characters in many real-time applications. The voice assistant being used control robotic dogs for guidance purposes is found under consideration [1].

But still there is a particular limitation for sensing the vibration that is made once object detected in front and those systems are chosen for detecting static or constant objects that doesn't fall under moving category [1].

The modal for analyzing hand movements and the system responding to the hand movements with respect to the key actions used in a prevailing system [2]. The accuracy of predicting the hand motions may vary slightly. So that required help cannot be got on the perfect timing.
The voice assistant for visually impaired people with object intrusion detection using CNN also falls under the category [8]. The response time from detection of object may vary. So immediate attention is made in a fraction of delay.

Existing system for predicting hand movements to fetch mouse movements is under scrutiny. The system uses HCI (Human Computer Interaction). The proposed system uses Rapid Manual Tracking to avoid blur scale and to capture hand movements with a voice command module to get response on work [4]. Computer based vision technique for human endurance is on little weaker side. HCI is involved in gesture analysis process for considering motion detection. [4].

A robot to capture motion with voice assistant in a noisy environment while driving is one among the already existing system [3].
The noise is avoided by using outlier robust generalized side lobe canceller technique. The error with the technique is the heading angle [3]. The sum ups to overcome the error has also been made to fetch the obstacles in between the road journey.

Another proposal for detecting Bangla voice commands on noisy environment using already recorded signal comparisons are made. It was specially designed for handicapped persons to detect obstacles under voice recognition properties. Face identification and voice detection are practically featured under noisy circumstance to overcome already prevailing voice assistant packages with obstacle detection [6]. This proposal is based on Bangla voice inputs and constructing the response to those inputs as predefined.

A six degree rotating robot to pick up 2D objects from surface using Arduino micro controller. Using ultrasonic sensors, the distance between robot and objects are fetched. Inverse kinematic algorithm is used to make the arms of robots move in different degree of rotation. [5]
The specific key components used in detecting the object intrusion using robot is:

- Raspberry PI
- Amazon Echo Dot- for speakers
- Motor driver

The robot is being operated by using speech recognition mechanism using amazon echo dot.
Artificial Neural Network has been used to gain control over the robot [5].

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The next report indicates motion detection using skeleton model. In current paintings with RGB-intensity cameras, highly-priced wearable sensors and illuminator array were used to assemble the 3-D human skeleton version in recognition system [7]. The system is carried out by means of using deep neural network framework to get high accuracy reputation of human motion in indoor and outside areas [7].

Proposed System:

The proposed system act as a remedy for safety measures concerns with respect to field fencing in terms of coding implementations. The counter measures that can be taken to avoid depends on different categories of animals. The animals are to be allergic to some type of sound or smell. The requirements can be satisfied by adoption of sensors to fields.

The animal movement is captured and an alarm gets triggered with resistive noise to alert the farm or field owners. An immediate attention is made through a voice activated assistant to call for help using social media technologies.

The main aim is to get attention of animal intrusion irrespective of labour. The intrusion message has to reach the owner in advance to save the farm to the most. The help requirement can be fetched using the voice assistant note that get activated once the keyword is mentioned.

Machine learning with frame differentiation and motion detection algorithm package in OpenCV are under usage for the complete architecture of the source code.

In the proposed work, the security camera is fixed upon fencing, whenever animals come near to fencing or animals try to enter into the fields, the camera detects the movements of animals and a buzzer sounds automatically until the farmers understand the alarm regarding intrusion. Additionally, a voice assistance is being implemented for the farmers in their mobile phones to send SMS. In this project, camera is fixed on the fence.

Similar project with a slight varying procedure comes in line with sensors but the cost for sensor implementation would be way more high than expected [2]. Voice detection is based on noise prediction [6]. Here since the voice assistant is provided in enclosed area, noise could be avoided as a threatening factor.

Implementation:

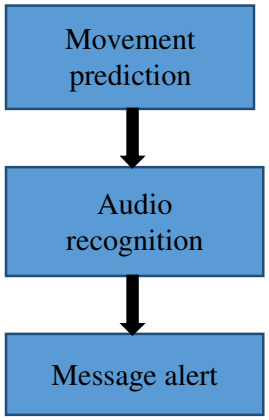

Fig.1. steps in proposal

The working phase involves fixing of cameras on fences to capture animal movement using python OpenCV and once captured, generation of alert sound using python OpenCV packages. The acknowledgement to make safety measures are bypassed by voice assistant like module to call for help using messages.

The phases involved are:

- Detection movement using python OpenCV.
- Detection using contours

Alert sound packages

Acknowledgement messages to farmers or owners.

Motion detection is the process of prediction small or big modifications in fixed frames which might be to be noticed by a transferring body. Something very common in pc technology, mainly in laptop imaginative and prescient, are parameters. each parameter can have a number values. the proper fee will depend on many elements. it's far in our palms to evolve every price to a particular scenario.

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Gray scale conversion:

To get the keen knowledge about the image or video being processed it is necessary to get the gray scale reading. Earlier than performing any operation on photographs, it is a good idea to convert to grayscale. it's miles less complicated and greater foremost to work with these sorts of images. Alternatively, the noise due to the digicam itself and by means of the lighting should be minimized. That is accomplished through averaging each pixel with its buddies. it is commonly known as smoothing.
gray = cv2.cvtColor (frame, cv2.COLOR_BGR2GRAY)

Threshold Application:
In this part of the method what is done is to preserve the ones pixels that exceed a threshold. The intention is to modulate the image, this is, to have two viable values. All people who exceed the brink can be white pixels and those that do not exceed it is going to be black pixels. this may assist to pick out the transferring object. In OpenCV there's a way to apply a threshold.
_,thresh=cv2.threshold(blur,20,255,cv2.THRESH_BINARY)

Outline Detection:
As soon as the image with black or white pixels is were given, it's far required to detect the outlines or blobs. A blob is a set of pixels that are connected to each different, that is, it has neighbors with the identical cost. while we speak about neighbors, it's miles that those are next door
The modules involved in complete proposal are:

- Moment detection
- Alert sound
- Audio capturing and response
- Alert message generation

Movement detection

This module specifies how movement prediction is done using OpenCV. Initially the IDE used here is PyCharm. For motion detection, the package used is OpenCV for computer vision. Two frames of camera are used to predict movement. Grey and blur images are verified for night time coverages.

Alert Sound:
This module specifies the alert sound that is being generated once animal movement predicted. The alert sound is required to make the user's stay alert of what is happening with the farm/field. The PyCharm package in sound has been imported for alarm sound effects. The package is imported to give a better sound effect for immediate response.

Audio Capturing and Response (Voice Assistant)
This Module specifies how the audio or voice command given is heard and a response, that is the message acknowledgement generated. For audio capturing speech recognition package has to be installed. The recognized voice that is given as an input would be in form of text. That text has to be converted into speech. Hence pyttsx3 has to be installed. The voice gender can be analyzed and accessed. Create a listener package for speech recognition package.
Packages to be Installed:

- winsound
- speech recognition
- pywhatkit
- pyttsx3

Winsound:

The winsound module affords get entry to the simple sound-gambling equipment furnished by means of windows platforms. It includes functions and numerous constants. Beep sound is used to beep the laptop's speaker. The frequency parameter specifies frequency, in hertz, of the sound, and ought to be in the range 37 via 32,767. The duration parameter specifies the variety of milliseconds the sound

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need to final. If the machine isn't capable of beep the speaker runtime error is raised.

To fix a message sound with the default beep sound gift name the underlying Message Beep () feature from the Platform API. This plays a sound as special within the registry. the sort argument specifies which sound to play; The cost -1 produces a "easy beep"; that is the very last fall returned if a legitimate can't be played in any other case. If the device suggests an blunders, runtime error is raised. Winsound ship document characteristic is used to send document. The sound parameter is the name of a WAV document.

Speech Recognition:

Speech recognition has its roots in studies done at Bell Labs in the early Nineteen Fifties. Early structures have been restricted to a single speaker and had constrained vocabularies of approximately a dozen phrases. modern speech recognition structures have come a protracted manner in view that their historical opposite numbers. they are able to understand speech from multiple speakers and have significant vocabularies in several languages. In a standard HMM, the speech sign is divided into 10-millisecond fragments. The electricity spectrum of every fragment, which is basically a plot of the signal's power as a function of frequency, is mapped to a vector of real numbers referred to as coefficients. The measurement of this vector is typically small sometimes as low as 10, despite the fact that more correct systems may also have size 32 or greater. The final output of the HMM is a chain of these vectors. To decode the speech into textual content, corporations of vectors are matched to 1 or more phonemes—a fundamental unit of speech. This calculation calls for training, since the sound of a phoneme varies from speaker to speaker, and even varies from one utterance to any other by means of the equal speaker. A special algorithm is then carried out to decide the maximum probable word (or words) that produce the given sequence of phonemes. The Speech recognition library acts as a wrapper for several famous speech APIs and is consequently extremely flexible. this kind of the Google net Speech API helps a default API key this is hard-coded into the Speech popularity library. that means person can get off your toes without having to sign up for a carrier.

PyWhatKit

the usage of PyWhatKit package, the YouTube videos can be accessed on specifying a key-word to fetch specific song or video to play. This package is utilized in sending files or images with key-word specification and beneath direct get entry to. every other cool automation that PyWhatKit python gives is an automatic google search. it may be used as PyWhatKit.seek() characteristic to look for something on Google. person can also make use of pywhatkit.info () function to get records about the subject as properly. Contours can be defined certainly as a curve becoming a member of all of the continuous points (along the boundary), having equal color or intensity. The contours are a beneficial tool for shape analysis and item detection and reputation. Contour analysis is done to get the rectangular frame to detect the movement occurring using python programming.

Experimental Results:

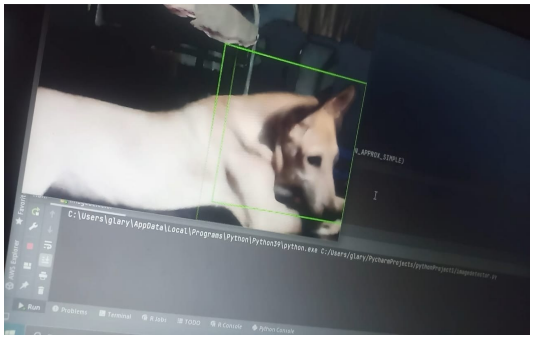

Fig. 1. Animal movement detection using frame differentiation

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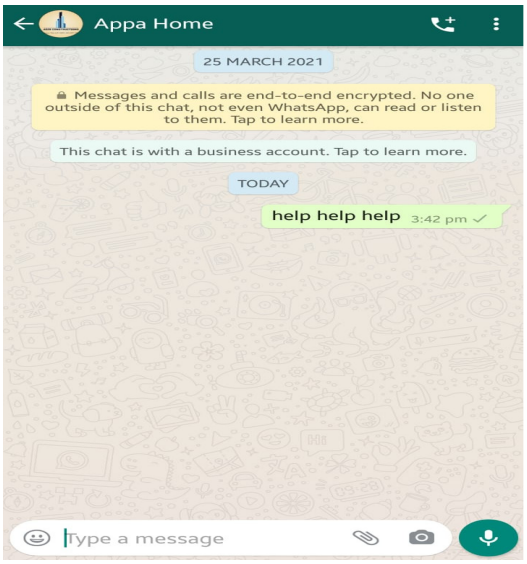

Fig.2. Message acknowledgement once audio detected.

In fig.1 the contour analysis with rectangular structure is done and the camera readings of animal motion is predicted. An alarm sound would be triggered; hence the user would be aware the intrusion condition.

In fig.2 once alarm is triggered the user can get in contact with any trustable person just by speaking some keyword that is given as input, hence safety measures could be taken in prior.

Future Development:

The proposed system is to be achieved with sensors for predicting which animal would be afraid of which sound so that immediate precautions could be made. The Twilio Python Helper Library makes it easy to have interaction with the Twilio API from your Python utility. The maximum recent model of the library can be determined on PyPi. The Twilio Python Helper Library supports Python applications written in Python 2.7 and above. The library mechanically handles paging. Collections, such as calls and messages, have listing and move techniques that web page underneath the hood. With both listing and flow, person can specify the wide variety of facts person need to get hold of (restriction) and the most length person want each page fetch to be (page_size). The library will then deal with the undertaking for person.

listing eagerly fetches all statistics and returns them as a list, while circulation returns an iterator and lazily retrieves pages of data as you iterate over the collection. we also can web page manually using the page technique.

Conclusion:

The fencing protection using movement detection algorithm with frame differentiation is proposed.

Alarm sound with termination condition has been implemented. Audio detection using voice assistant is implemented to support once alarm goes off.

The message acknowledgement to trustable person irrespective of manual handling has been implemented.

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