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LARGE SCALE COLLABORATIVE WILDLIFE MONITORING USING RASPBERRY PI

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ABSTRACT- A combination of Raspberry PI and the PIR sensor is used to show the motion detection of animals. The camera detects the slightest hint of motion then it captures an image and converts it to greyscale such that the processing of the image is done to understand what type of animal by a specially designed algorithm (LBP) .If an animal crosses into habitation then with the help of this process, the people can be made aware by means of E-mail.

KEYWORDS: PIR Sensor, Raspberry pi, Mat-Lab, LBP Algorithm (Local Binary Pattern), wildlife detection,Grey Scale image.

1.Introduction

The historical backdrop of natural life monitoring, tracking and conservation comprises following technology that portrays the development of advancements that have been utilized to screen, track, and find a wide range of sorts of untamed life animals. Numerous people have an enthusiasm for following natural life, including scholars, logical specialists, and protectionists. Biotelemetry is the term used to depict the instrumental system for picking up and transmitting data from a living creature and its condition to a remote spectator. People attempt to keep wild creatures from entering their range and rural land by passing high voltage power in the wall over the backwoods edge. This is a risky answer for both people and natural life. So as to keep away from the clash among people and wild creatures and to avoid endangered species like wild elephants dying from accidents, so LBP algorithm with MATLAB Coding and hardware implementation is designed and used supremely for the purpose of creating alert and awareness to human habitat by sending e-mail and preventing animal hit from highway roads and it saves human life and property.

2.Related System

Distinguishing and dividing moving items from the background feature is a vital and empowering venture in capturing images and video details. There is a critical collection of research led amid the previous two decades on foundation demonstrating and frontal area protest recognition. The Related Work refers to following techniques, [1]Camera traps gives the broad range of species information, location, movement.The technique involves invisible IR flashes to capture image and can record animal behavior as well, and useful for education and scientific purposes. [2]To Record a video clip and to capture a photo, IR sensors are used to detect animal with the help of Landscape Scale Camera Trapping. Automated analysis tool technique which makes camera trap images more efficient. Animal body is separated from vegetation by background extraction. The main purpose of feature level are extraction, motion ,

biometric features such as body size, moving speed. [3]The paper identifies and proposes IOT application for alert system purpose and to detect wildlife animal in south american environment eventhough ICT (information and communication technology) is adapted .In a animal a sensor is implanted which sends data to the server and to track movement of animals ,by the help of sensors embedded in environment, animal sounds are detected and wireless communication is sent back to source by middleware which detects wildlife animals. [4] Doppler radar technology is used to detect wildlife animals by WSN Wireless Sensor Network. The guideline of Realtime and occasion based driver warning have been acquainted with habit effect for cautioning animal hit through street systems.The Technique actualizes the WSN Nodes alongside the Doppler radars for the constant discovery of natural life presence on roadsides. These sorts of scenes are complicated by regularly dynamic feature like influencing trees, waving water, moving shadows, sun spots, rain, and so on. It is getting more confounded when common creature disguise added additional intricacy to the examination of these scenes[5].

3.Proposed Scheme

The proposed techniques perceive the exact and productive animal monitoring from exceedingly jumbled common scenes by camera-triggered pictures from raspberry pi through PIR Sensors. To accomplish precise and fine-grain animal recognition from the database picture examination at the pixel level by LBP algorithm is performed as follows. The paper uses LBP ALGORITHM Technique, by which it describes visual representation for segmenting in Computer Vision. To test local binary images, LBP Algorithm plays a vital role and used for texture descriptor. In proposed system,3 modules implemented such as

3.1.Preprocessing : The color image is converted to grey scale by the LBP algorithm technique implied below in Methods.

3.2.Matching : The received grey scale image is matched with the stored database and the wildlife animal can be detected by their location, size, appearance.

3.3.Raspberry pi : Both Webcam and PIR Sensors are connected to Raspberry PI, by which PIR Sensors detects the motions and triggers the USB camera to capture animal through webcam connected with raspberry pi, then the animal image is detected.

Hence, with the low-difference between the foreground extraction and the jumbled background extraction, it is hard to figure out whether a pixel or a pixel piece has a place with the background and to detect natural life animals in light of nearby neighborhood data just, unless using frequently global image analysis. For instance, pixels on the deer body may be fundamentally the same as the background vegetation. For this situation, it is troublesome for us to figure out whether these pixels have a place with the deer in view of nearby neighborhood data just until a man sees the deer head and legs, which includes global image analysis.

SCHEMATIC DIAGRAM: WILDLIFE MONITORING:

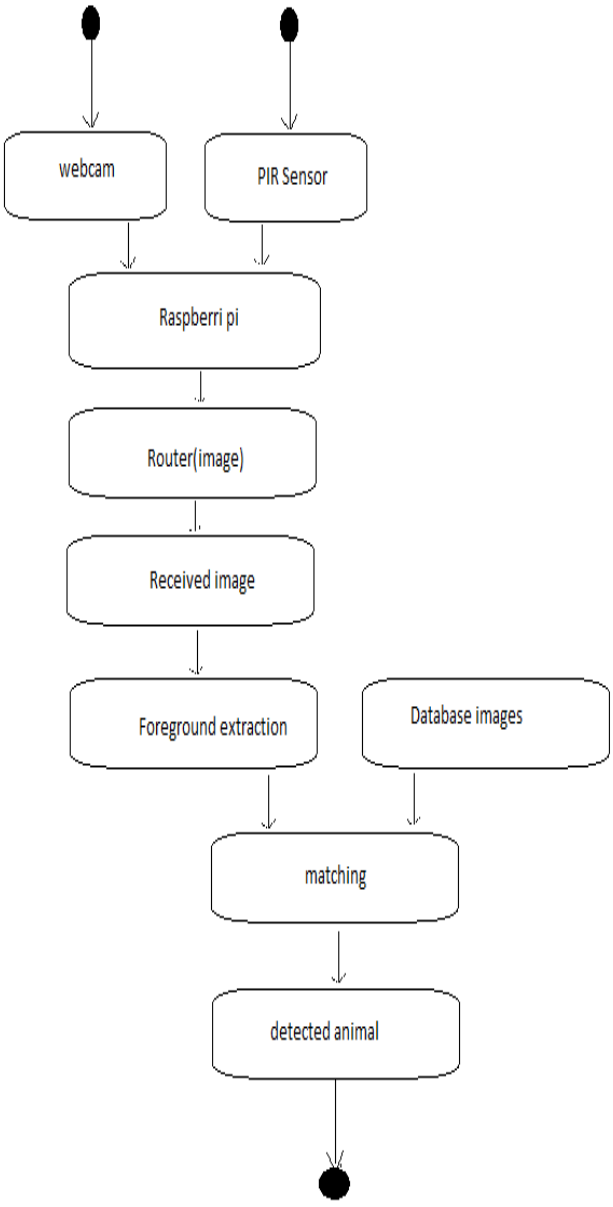


Fig.1 Overview of the Proposed System

The Proposed System detects animal through feature extraction and these process mentioned in fig.1.

Sender:

Both Webcam and PIR Sensors are connected to Raspberry Pi, by which PIR Sensors detects the motions and captures through webcam and then the animal image is detected shown in Fig.2.

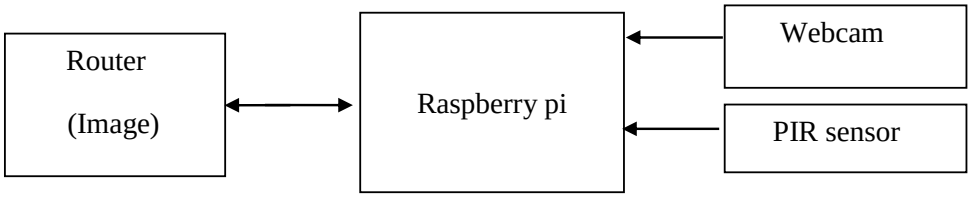


Fig. 2 PIR sensors are connected to Raseberry Pi

Receiver:

The Detected Animal Image is Sent to Receiver Side and by Foreground Extraction it is compared with Database image and details by Matching Process , then the Animal Name could be detected and can be send as E-mail or Message to create an awareness to the habitat surrounded by people. The Foreground Extraction actually extracts the animal image instead of trees, shadows, grass, water waves and so on. The Images in the database are stored earlier with their location, size, color and bio-metric features,and behaviour shown in Fig.3.

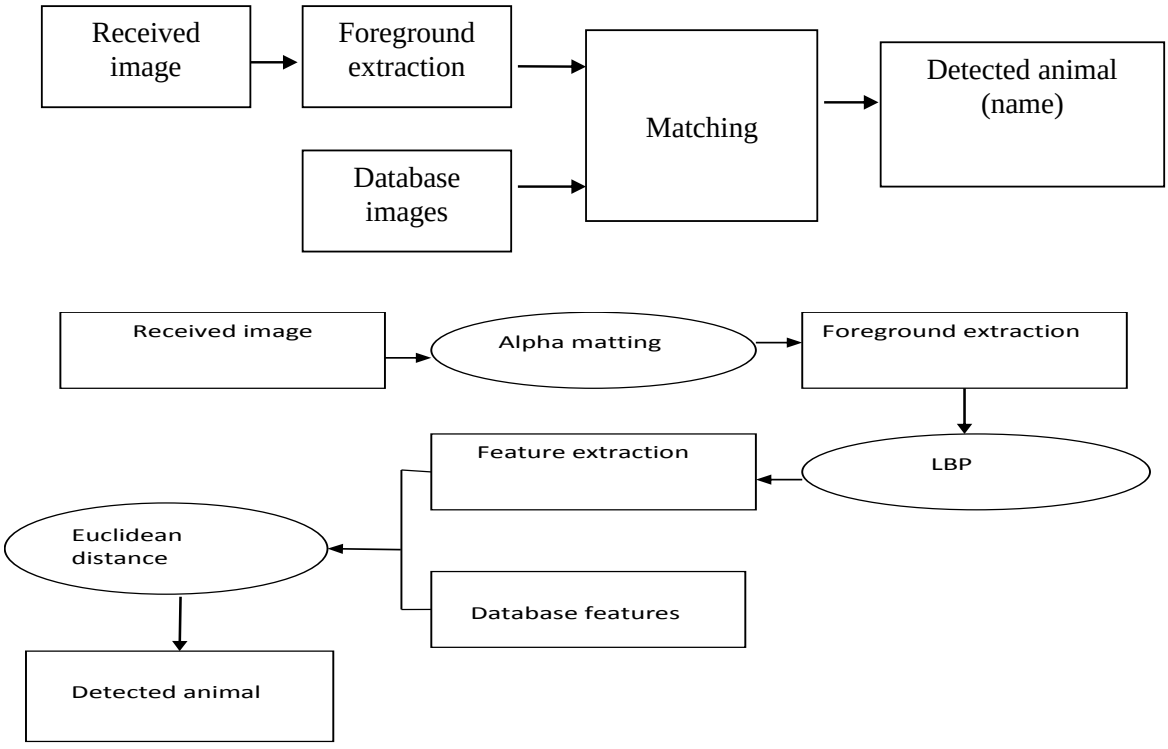


Fig. 3 Detected Animal is sent to Receiver Side

The Detected Animal Image is sent to Receiver Side and by Foreground Extraction it is compared with Database image and by Local Binary Pattern (LBP) algorithm it finds the feature extraction, to test Local Binary images. Euclidean Distance (ED) finds distance between database and test image features and by matching process and alpha matting with the stored database (i.e.,location,size,biometric features of animals) that can detect the particular wildlife animal and create an awareness to human habitat by sending e-mail and creating an alert system shown in Fig 4.

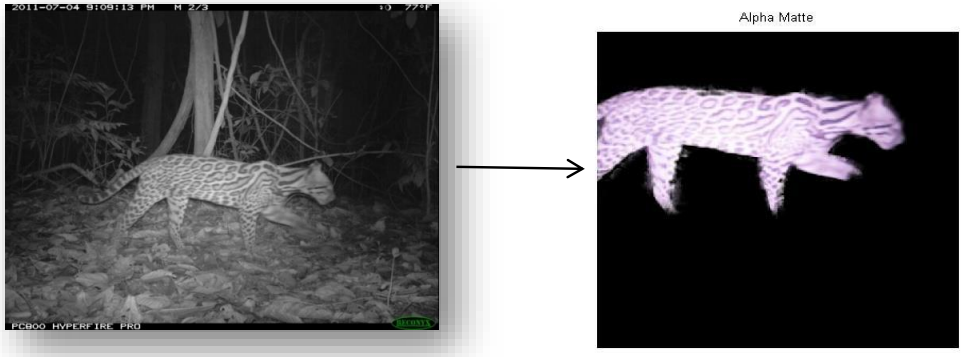


Fig.4 Conversion of Grey Scale to Foreground Extraction

Methods:

- **Preprocessing**
- **Matching**
- **Raspberry pi**

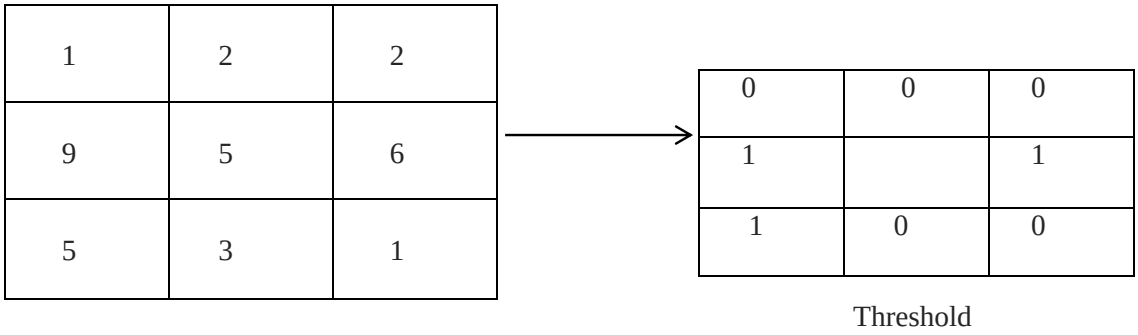
Preprocessing:

If the input images are color images, it has to be converted to gray scale from that color image. Local Binary Pattern (LBP) algorithm technique finds the feature extraction and tests Local Binary images.

Step1: LBP Algorithm-values:

1	2	2
9	5	6
5	3	1

Step2: **Comparing with Centre Value using LBP ALGORITHM Technique**,



Binary : 00010011

$(00010011)_2 = (19)_{10}$

Decimal : 19

LBP Algorithm converts binary to decimal values as employed above by threshold values.

The LBP feature is a vector that makes simplest form made by the following process:

- ✓ The examined window is divided into cells (e.g. 32x32 pixels for each cell). In a cell there consists pixels and each pixel is compared to its adjoining neighbors (on its left-top, left-middle, left-bottom, right-top, etc.). The pixels are to be followed in a circular direction i.e. either clockwise or anti clockwise

  - ✓ If the value of the center pixel is greater than that of the neighboring pixels then the value is '0' else it is '1'. The output results in 8-digit binary number is converted to the decimal number for convenience and to find feature extraction.

  - ✓ The histogram is to be figured for the given cell over each number that happens. The histogram can then be standardized (optional).To get the component vector of the whole window all these standardized histograms must be connected.

Matching:

Matching finds Euclidean Distance (ED) between database and test image features. ED mainly states that where the distance is measured in terms of two points between the Euclidean Spaces that are available. The distance is then measured in terms of metrics. The entire process comes under a single norm which is termed as the Euclidean norm. ED is used to verify whether the person is in database or not.

The generalized formula for ED is

$$d(\mathbf{p},\mathbf{q}) = d(\mathbf{q},\mathbf{p}) = \sqrt{(q_1 - p_1)^2 + (q_2 - p_2)^2 + \cdots + (q_n - p_n)^2}$$

$$= \sqrt{\sum_{i=1}^{n} (q_i - p_i)^2}.$$

Where p_i and q_i are called Euclidean Vectors.

The space between the distance starts from the origin of the space and respective two points. The Euclidean distance between p and q is the Euclidean length.

3.4 Raspberry PI

This is a credit card sized board which has high capabilities and the hardware has on board its own processor, has high performance with its inbuilt RAM and the processor can be overclocked. It has its own real time clock that can be synchronized in real time and the normal computer keyboard and mouse can be used as peripherals for this particular device shown in Fig.5 and Fig.6.

Fig.5 Raspberry PI board

Fig.6 PIR Sensors

The animal image is captured based on a motion detection, PIR (Passive infrared sensor)sensor, then this image is send to pc using raspberry pi router. Receiver collect that images, find which type of animal images and detail is given to database.

3.5 Working Module of PIR Sensors

Passive Infrared Sensor is an electronic Sensor incorporated with fresnel lens used to detect the animal/human being or object movement radiating more than 0·C within the distance of 6metres away. This radiation is not visible to naked eyes. PIR sensors actually don't detect heat, despite they measure infrared radiation from an object. Pyroelectric materials generates energy from heat by solid state sensor or set of sensors.It is an Motion detector to sense object,people,animals movement and widely used in burglar alarm and as well referred as passive infrared detector (PIRdetector) shown in Fig.7.

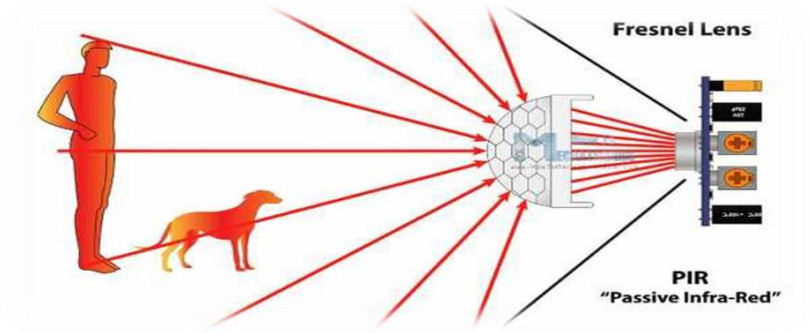


Fig.7 PIR Senor-Working

4. Experimental Results

The proposed model is made in such a way that the disadvantages of the existing system have been identified and have been tried to be rectified and the things like the greyscale imaging as well as the foreground of the images are taken to identify the animal matched with database which is being detected by the raspberry pi and PIR sensor that trigger to capture image and monitor and detect wildlife animals. The proposed strategy is likewise simple to execute and natural well disposed. Finally it serves as an alert system and creates awareness to human habitat by sending e-mail by which saves human assets and life as well as it can prevent animals get hit from vehicle in highway roads. We can come up with more progressed ways to deal with totally avoiding the wildlife creatures from leaving forest limits and utilizing more secure strategies than PIR Sensors and Raspberry-Pi shown in Fig.8 and Fig.9.

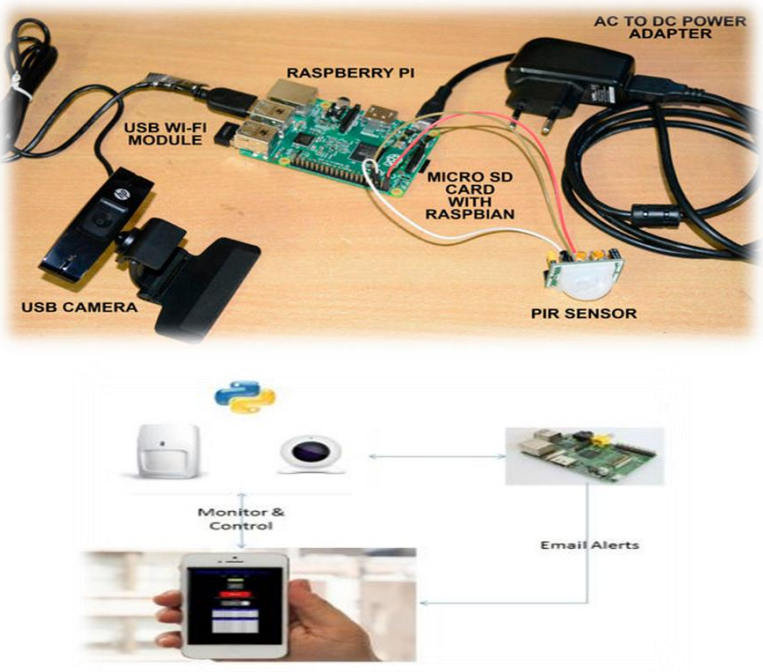


Fig.8 E-mail Alert System

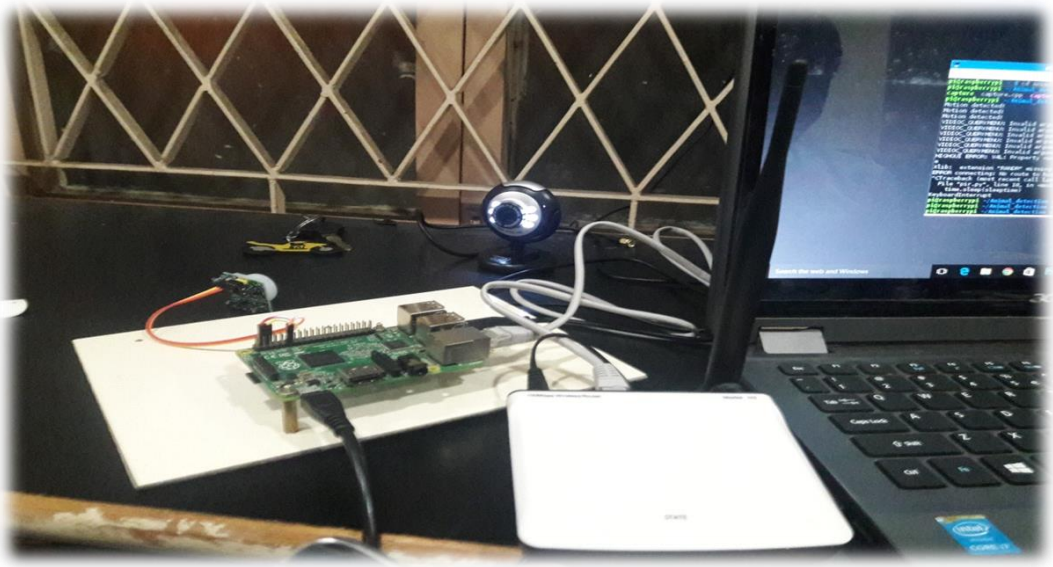


Fig.6 REAL TIME SETUP

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