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PREVENTING AGRICULTURAL FARM DAMAGES FROM ANIMAL ENTRY USING EXPERT SYSTEM

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Abstract - Agriculture is the vertebral column of Indian economy. There will be an increased loss of crops due to the entering of wild life in the agricultural lands. Animals wandering in residential areas is growing day by day. It affects the human being and their assets. Animals such as elephants and wild pigs damages the grain, crops etc. Farmers in India face cruel damages by animals and obtains allower yield. Traditional farmers arranged security guards to protect crops from wild animals. The safety of human and animal is essential equally. So, animal detection system is necessary in tribal agricultural fields. For that the agricultural region has to be monitor incessantly to prevent the agricultural region from the entry of wild animals. With regard to this issue, we have developed a system to secure the agricultural crops the disaster of animal using Co-occurrence histogram oriented gradient technique and lib-linear classifier.

Key Words: Classifier ,Damages, Detected, Disaster.

1.INTRODUCTION

Wild animals are a special challenge for farmers throughout the world. Animals such as deer, wild boars, rabbits, moles, elephants, monkeys, and many others may cause serious damage to crops. They can damage the plants by feeding on plant parts or simply by running over the field and trampling over the crops. Before the beginning of every farm season, most farmers prefer to plan potential yields. On the other hand, some farmers chose to skip planning. While hoping for the best, farmers are often presented with various challenges and obstacles that require them to constantly question their productivity and resulting final success. Successful farmers always seek to determine the satisfactory level of wild animal crop protection using one of the following five technologies: Agricultural fences are quite an effective wild animal protection technology. However, utilizing fences as a practice is often regulated. Some local and state entities may restrict or prevent the use of certain types of fences. Therefore, before deciding on a suitable fence, it's important to check local law regulations. The quality of fencing depends on the material and structure. Depending on how it is made and what it is made of, some permanent fences can last up to 30 years. Farmers usually use one of the following types of fences: Wire fences; constructed of metal wires woven together forming a physical barrier. The fences are effective, long lasting, and require relatively little maintenance. However, they are expensive and recommended only for the protection of high-value crops. Polypropylene fences are generally less expensive and easier to install and repair than other types. Additionally, these fences are widely acceptable and meet various regulations. Their disadvantage includes their short lifespan and questionable effectiveness in areas with a higher possibility of wild animal crop damage. An electric shock is used to animals that come in contact with the fence, thus preventing animals from crossing the fence. These fences are long lasting and an effective crop protection measure. Costs vary depending on specific type and size of an area. Before purchasing electric fences, it's very important to make sure they are allowed for use in the specific area, and for protection against endangered animal species. Additionally, it's recommended that electric fences are marked with a warning sign to prevent any possible human contact.

2. LITERATURE SURVEY

A literature survey is a written account providing an overview of all the important literature related to a particular topic. The literature review is designed to discover what is known or not known about a topic or research question. It is used to determine the current status of the research on a topic or research question. It provides an understanding of the methodologies used in research related questions. It is more helpful to identify the areas for further study.

A. AN IMAGE-BASED ANIMAL DETECTION SYSTEM USING METHOD BASED ON EIGENFACE AND USING THE PCA ALGORITHM

Principal component analysis (PCA) converts a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables called principal components using an orthogonal transformation. PCA was invented by Karl Pearson in the year 1901. The number of distinct principal components is one less than the number of original. Variables show the number of observations. This transformation is defined in such a way that the first principal component has the largest possible variance (variance is the tendency of data to be different), and each succeeding component in turn has the highest variance possible under the constraint that it is orthogonal to the preceding components. The resulting vectors are uncorrelated, orthogonal basis set. PCA is sensitive to the relative scaling of the original variables. Following steps are followed to perform PCA by Discrete Cosine Transform. Transform coding constitutes an integral component of applications of contemporary image processing. Each pixel in an image exhibits a certain level of correlation with its neighbouring pixels. Thus, a transformation is defined to map this correlated spatial data into transformed coefficients that are uncorrelated. Palpably, the transformation should utilize the fact that the information content of an individual pixel is relatively small i.e., to a large extent visual contribution of a pixel can be predicted using its Neighbours

1. Resize the images of training dataset to some constant size (here 256 x 256) and convert these two-dimensional matrices into one Dimensional vector and calculate the mean of each pixel position of images.

2. Then calculate the Eigen Faces and Eigen Values of the images.

3. Next using the Eigen Faces and Eigen Values, centred the image vectors.

4. Then calculate projection of centred images into face space.

5. Now acquire the test image and calculate its projection by using previously obtained mean.

6. Now compare the projection of our test images to projections of dataset by calculating the Euclidean Distance.

7. The projection of dataset which is most near to projection of test image, i.e. the dataset image with least Euclidean Distance is our Recognized Image.

8. To improve the accuracy and determine which image is not of animal and addition threshold has been added by us which determined whether B

B. TRACKING AND DETECTION OF ANIMAL USING MATLAB

As per technical evolution and latest trends taken into consideration, here effectively created a system i.e. face recognition system. This system is created in the vision of security point of view so it can be use for the application of navigation, forest, animals tracking, thief tracking, spacecraft security, army, military applications etc. In this research, here created a database of object, which is to be track i.e. animals like dog, elephant, tiger, lion etc, also in this work, it is easier to recognize a particular human being. This is possible with the help of Matlab processing and according to texture base recognition, can able to recognize a particular object, animal and human being etc. This concept uses multiple processing techniques along with Gabor filtering process to generate texture based recognition. It uses algorithmic flow i.e. pre-processing, Feature extraction, Gabor filtering and KNN Classifier for this object recognition. This project created according to forest security i.e. animal recognition also one can able to recognize the particular human being and any object.

Firstly image is captured from the cameras at fixed intervals. The image is pre-processed in order to achieve better accuracy. Later, the image is processed with sliding window technique in order to identify the animal in the image. W-Co HOG feature vector used to calculate the feature vector. This feature vector supplied to the classifier to detect the animal in a particular window. In sliding window technique different sliding windows are used in order to identify animals in different sizes of animal and zoom level of the camera. In the CoHOG method, gradient directions are used to calculate feature vector and the magnitude is ignored. In the method magnitude is also considered to extract more robust features. Weighted Co-occurrence Histograms of Oriented Gradients (WCoHOG) is used for more robust feature descriptors than CoHOG.

3. PROPOSED METHODOLOGY

Based on image processing and computer vision techniques, once the animal gets detected in the video, then we have to

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find the distance of the detected animal from the camera mounted on the testing vehicle, so that the farmers gets an indication of distance (how far or near is the identified animal) of animal from the field and accordingly can apply sound or take other corrective actions to prevent damages.

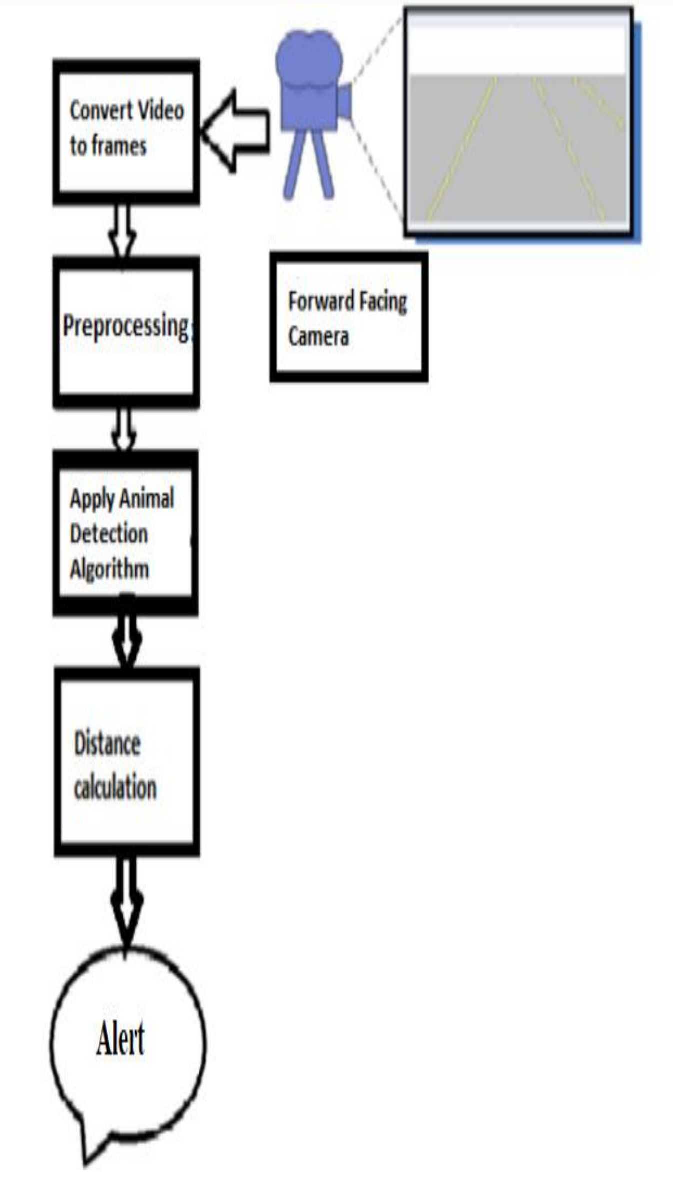

Fig 1: Proposed Architecture

Before extracting the features of a image, it is important to separate the regions from the background. Segmentation can be done directly by considering as background the regions with quality below some threshold. The steps that are present in almost every process are

Image enhancement

Normalization

Filtering

Binarization

The image is first converted into grayscale. For contrast expansion, local histogram equalization is used. Mapping of gray levels 'q' into gray level 'p' is made so that the distribution of gray level 'p' is uniform and thus defines histogram equalization. The range of gray levels is expanded near the histogram maxima. The delectability of the image features is improved since the contrast is expanded for most of the image pixels. The probability density function of a pixel intensity level l_k is given by,

$$Pk\ (lk) = \frac{mk}{m!}$$

The normalization process is done by

$$lnorm\ (x, y) = \frac{l(x,y) - lmin}{lmax - lmin} X\ M$$

The procedure for animal detection:

1. Collect all positive and negative images in the data folder

. 2. Generate Annotation (for visually selecting the regions of interest of the object instances in any given images).

3. Create sample.

4. Train data and generate XML file

5. Testing

Once the animal gets detected in the video (frame), next step is to calculate the distance of the identified animal from the camera mounted on the testing area so that the worker is aware of how far or near the animal is from the field and when to apply sound or take similar actions to prevent an animal entering in the field. A video is taken and converted into frames (image of size 640 * 480). Following is the procedure for calculating the distance of the detected animal from the camera-mounted area in pixels.

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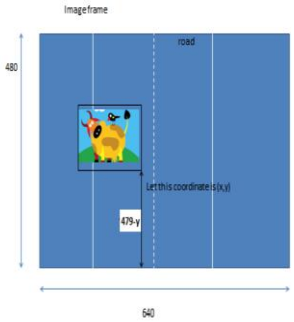

Fig 2: Distance Calculation

Let the right bottom coordinate of the detected cow be (x, y). Then the distance of animal from the lower edge (field/camera) is 479 – y. Once the camera position in the field and height of the camera from the ground was fixed (camera calibration done), we took different images of the same object kept at various depths from the camera centre. The depth of the object from the camera centre in meters was known to us. We then noted the corresponding depth of the object in pixels. The best fitting second order polynomial equation is

$$y = 0.0323x^2 + 22.208x + 1.3132$$

Where y is the depth in pixels and x is depth in meters

4. RESULT AND DISCUSSION

Parameters which are necessary for testing the performance of the classifier/system are Sensitivity (True Positive Rate), Specificity (True Negative Rate) and Accuracy given as

$$Sensitivity = \frac{TP}{TP + FN}$$

$$Specificity = \frac{TN}{TN + FP}$$

$$Accuracy = \frac{TN + TP}{TN + TP + FN + FP}$$

Here, TN stands for true negative; TP stands for true positive; FN stands for false negative; and FP stands for false positive. True positive (TP) and true negative (TN) are the most relevant and genuine parameters of classification. False Positive indicates that the animal is detected in the frame (video) even though the animal is absent in that particular frame at that given location. False Negative (FN) indicates that there is no animal present in the frame (video) even though the animal is present in that particular frame.

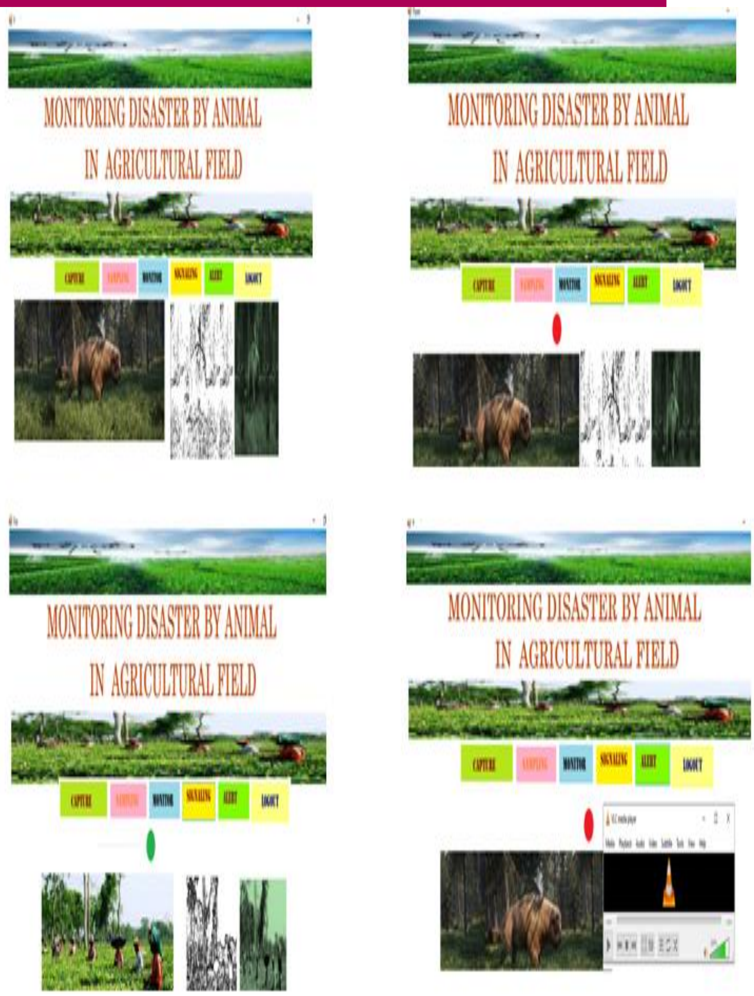

Fig 3: Experimental Outcome

In our implemented animal detection system, we took 640 frames in which 105 frames are showing animal detected i.e. rectangular box even though there is no animal present in those frame at those places. So, false positive in this case turns out to be 105 and true negative turns out to be 535. Similarly out of 640 frames, 125 frames are showing no animal detected i.e. no rectangular box even though animals are present in that frame. So false negative turns out to be 125 and true positive turns out to be 515.

So, substituting TP = 515, TN = 535, FP = 105, FN = 125

Table -1: Implemented Results

Feature Descriptor	TP	FP	TN	FN	Sensitivity	Specificity	Accuracy	Average Processing Time
HOG	515	105	535	125	80.4%	83.5%	82.5%	100ms
Haar	502	142	498	138	78.4%	77.8%	78.1%	150ms

5. CONCLUSION

This research uses this principle of neural networks for monitoring animal. The experimental results show that the better result. It is hoped that later researchers will be able to conduct more in-depth research on this basis to further improve the performance of animal recognition algorithms based on neural networks for animal identification.

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