# Large scale collaborative wildlife monitoring Using raspberry PI2

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**ABSTRACT**

The animal object detection and segmentation using multilevel graph cut in spatiotemporal region domain and also used the patch verification method to determine the true animals in background patches. For region classification, deep convolution neural network is intensive and important to re rank a large pool of object proposal produced by bottom up proposal method. In existing approach, video captured by motion triggered cameras in natural environment represent challenging scenes. These types of scenes are highly cluttered with moving shadows, rainfall, sun spots, moving object, rippling water, darkness, swaying trees. We recognize that accurate and efficient animal detection from highly cluttered natural scenes in camera trap is challenging task in existing system. To achieve accurate and fine-grain animal detection from background patches we need to perform image analysis at pixel or small block level. However, with the low- contract between foreground animal and cluttered background, it is often very difficult to determine if a pixel or belongs to the animal or background based on local neighbourhood information only, unless we resort to global image vegetation. We construct an efficient pre-processing method to convert colour images to grey scale images using the local binary pattern (LBP) algorithm to find feature extraction and Euclidean distance (ED) is used to verify the animal images in database and image features .our experimental results is to capture the complex background motion and texture dynamic to detect the foreground animals and also provide the performance evaluation of animal detection from highly cluttered natural scenes with accuracy.

**KEY WORDS:** Local binary pattern, Euclidean distance, grey scale image, segmentation, camera trap images, Background patches.

## 1. INTRODUCTION

Object recognition technique from computer vision science can be used to identify wild animal on sequence of photograph by motion triggered cameras which are notorious for high level of noise. To improve the performance of recognition using combination of sift and lbp. Some biometric features that are important for detecting colours, spots and size of the body (Redmon, 2015). Animal detection method are helpful to known locomotive behavioural of target animal and also prevent dangerous animal intrusion in residential area .Lightning and luminance problem can affect the detection of presented animal intrusion (Russakovsky, 2015). Detection and segmentation of wild life in agricultural field is to reduce wildlife mortality. In novel thermal feature extraction, thermal signature describes heat characteristics of the object and calculated using the morphological operation (Fragkiadaki, 2015). Natural image matting is applied with different algorithm like k nearest neighbour matting. The result of image segmentation affected by factor such as homogeneity, texture, and image content and so on k nearest neighbour matting does not assume local colour line or learning Strategies (Perazzi, 2015). Convolution neural network to rerank proposals from bottom up approach. Number of object categories increase computational complexity also increase Objectiveness helpful for object discovery and semantic properties (Peter, 2014). The animal detection prevents intruders from entering into residential area. Histogram is calculated on the basis of orientation of gradients .algorithm designed to recognize different kinds of objects. Texture and shape detectors also benefits from new oriented gradient features (Oneata, 2014). Deep convolution neural networks is capable of changing position and scale of boxes to different object. CNN based object detection technique having some problem of object detection as a iterative search in space of bounding boxes .since the search problem is nonlinear, Piecewise regression model that moves boxes towards object and remove object stage from detected object. Video captured in natural environment represent a lot of challenging scenes. These types of scenes are highly cluttered with moving shadows, rainfall, sun spots, moving object, rippling water, darkness, swaying trees. Performance comparisons over a diverse set of challenging camera trap data demonstrated that patch verification is sensitive to object in false alarms (Zhi Zhang, 2016).

**Related Work:** The work related to features extraction, foreground and background segmentation, object discovery using CNN method, verification of animal using HOG. We provide a review of related work in the section.

**Feature Extraction:** In object recognition works in computer vision community, combination of sparse coding spatial pyramid matching and local binary pattern are used to represent the object (Fragkiadaki, 2015). Fast compression distance is applied in features extraction and nearest neighbour classifier. Histogram of oriented gradient (HOG) is used for feature extractions that are utilized in the classification. Feature are scale invariant but not rotational invariant, extraction from background can be performed by using threshold segmentation (Redmon, 2015). HOG used for extracting shape and texture combined with joint learning approach for animal detection.

Adjacent rectangular region at location and calculation of pixel intensity values in the region. Deep convolution neural network features are learned from camera trap images and used for image recognition. DCNN features aiming to enhance the performance of background verification. The video protest chart cut calculation created in our previous work builds foundation models utilizing HOG and Bow highlights. It develops a closer view remarkable quality diagram (FSG) to portray the striking nature of a picture fix in the spatio-transient space. It then plans the protest division as a vitality minimization issue which can be explained utilizing the diagram cut strategy.

**Foreground and Background Segmentation:** Object extraction can be done using image segmentation and image matting. To extract required object from entire image using segmentation .The value between one and zero which indicates foreground and background using natural alpha matting Wind might be regarded as foreground images and some inactive animal can be mistakenly interpreted as background patches (Fragkiadaki, 2015). Segmentation and subsequent blob detection needs to adapt to the environment. New approach to generate animal objects using multilevel graph cut and develop a cross frame temporal verification .foreground- background cut-off level to create an object region for camera trap. To propagate the foreground-background segmentation information across frames to refine segment in iterative manner.

**Object Discovery Using CNN Method:** Locomotive behaviour of wild life can be detected using Haar like features. The animal face are measured by face detection method with local contrast configuration. Luminance problem with change of natural environment can also affect. The detection of true animals. Convolution neural networks based object detection networks used for finding localization of animals. False rate due to localization is indication of GCNN multistep training strategy. The problem of object detection as a iterative search in space of all bounding boxes and migrates them (Peter, 2014). The multi box approach generates object region from the neural networks and as regression model to predict the object bounding boxes (Oneata, 2014).

**Verification of Animal Detection:** To develop an effective cross frame image identification method to determine if an image is belongs to background patches. Combination of DCNN features and hand-crafted images features designed for camera trap. Edge and shape of object can be characterized by intension of individual gradient (Peter, 2014). The method not only reduce the computational complexity but also object detection. Image verification includes features extraction and distance or metric learning. Image verification includes colours, SURF key point, texture filters, Haar like descriptors, matrices. Image verification method to determine if images belongs to background or not. Hand-crafted images features designed for camera traps able to improve performance in animal images.

## 2. PROPOSED SYSTEM

To achieve accurate and fine-grain animal detection from background patches we need to perform image analysis at pixel or small block level. However, with the low-contract between foreground animal and cluttered background, it is often very difficult to determine if a pixel or belongs to the animal or background based on local neighbourhood information only, unless we resort to global image vegetation.

**Pre-processing:** If input images are colours images means we are converted to grey scale from that colour images. Local binary pattern are used to find the feature extraction for images. The LBP operates the pixels of an image with decimal numbers and encode the local structure around each pixel.

Each pixel is compared with eight neighbours in a 3x3 matrices neighbourhood by subtracting the center pixel value.

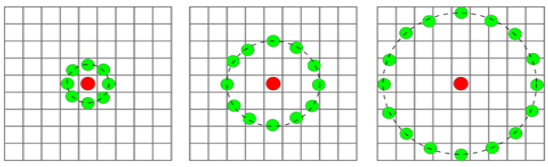

**Figure.1. Pixel Image**

The values are encoded with 0 and the others with 1. Sampling points spaced on a circle which is centered at the pixel to be labelled, and the sampling points does not fall within the pixels values are interpolated using bilinear interpolation.

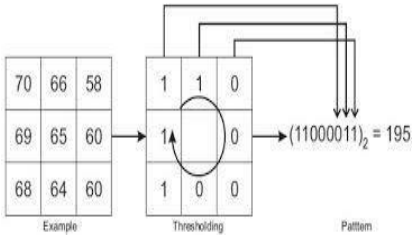


**Figure.2. Conversion of binary values using local binary pattern**

**3.2. Euclidean Distance:** Image Euclidean distance is spatial relationship between pixels of different images and also embedded. The pixel located near one another having little variance in the gray scale value and define matrix according to spatial distance. Euclidean distance maps can be generated by sequential algorithm. This indicates that each pixel in the background of binary images producing negligible error in two picture scans. Pictures are two dimensional array with elements, different dimension $X^i$ and $X^j$ are perpendicular between pixel is discarded. Pixel located on same object having closer relationship than that of pixel are located with different object.

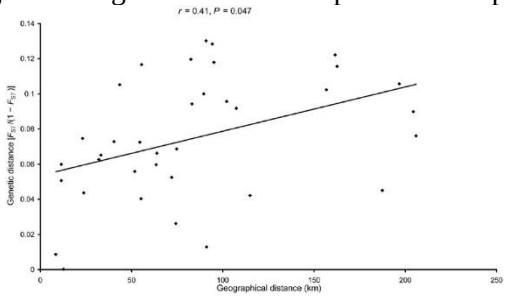


**Figure.3. Eculidean Geographical Distances For Pixel Values**

**Image Capture Technique:** Embedded image capturing using raspberry pi2 system platform acquire images and store them into real-time databases. Advance camera that represent a quantum leap in sophistication. Digital camera capture high level description of scenes and analyzed. System run a wide range of algorithm to extract meaning from video.

**Figure.4. Images captured by motion triggered cameras**

The animal image is capturing based on Passive infrared sensor. Then the image is send to personal computer using raspberry pi router. Receiver collect that images, find which type of animal images and detail is given to database.

**Figure.5. Image Captured At Day And Night Time**

**System Requirement:** Project has the following component requirements as below:

**Raspberry PI2:** It delivers six times the processing capacity of previous models. This board is central module of whole embedded image capturing and processing system. It contains main processing chip, memory, Ethernet port and interfaces.

**Figure.6. Raspberry Pi2**

**Main Signal Processing Chip:** The main signal processing chip used in our system is a Broadcom 700MHz Chip in which CPU core is a 32 bit processor designed by RISC Machines, Ltd. It has very rich peripheral. This main processing chip connects a camera and display units.

**Figure.7. Memory Processor Chip**

**Image Capturing Cameras:** Camera is directly connected to CSI connector on raspberry. CSI bus is capable of extremely high data rates and its carrier pixels. The measured temperature is not the genuine body temperature of the creature, as the estimation is likewise reliant on warming from the Sun, the insulated properties of the hide, or quill coat, and the separation between the creature and the camera. These variables may fluctuate in outside situations; consequently, the division and resulting blob recognition needs to adjust to this environment. We utilize an edge powerfully acclimated to every edge by utilizing the middle temperature ˜ t in the picture, to bar exceptions.

**Figure.8. Passive Infrared Sensor for Animal Capture**

**Memory:** The design does not includes a built in hard disk and rely on the SD card for booting. This memory is intended to run Linux kernel based operating system.

**WI-FI Router:** Unique WAN features for wireless broad band access to simplify signal and shared data.

**Figure.9. Wireless Router**

**Sensor:** For animal crossing detection, sensing technologies using the laser sensors, motion sensors and thermal infrared camera are used for image processing and pattern recognition strategy. The effective sensing forms the most challenging aspect of such systems for a large environment and when the network nodes are power constrained. The thermal infrared camera approach will not work because even with an expensive infrared camera, an object of moose size in 1500 meters will yield one pixel on the resulting camera images due to the resolution limitation. The other two approach Using laser sensors and motion sensors can work properly, their sensing range (typically in tens of meters) greatly reduces the coverage of each sensing node. Therefore, densely deployed roadside network is required, which inevitably increases the overall investment. However, for identified road sections with high animal crossing frequency, technology provides a viable solution to address the roadside safety problem.

In automated large scale monitoring, the dataset consist of 100 camera trap images sequences with 10 species in both daytime colour and a night time colour infrared formats. If both foreground and background are same means, we cannot identify animal in existing system. Here, we identify the animal in both cases. For each images, we manually labelled the bounding box for animal and also stored in datasets.

For performance evaluation, we have to use performance metrics in change detection dataset are
1) Recall 2) precision 3) F-measure

The proposed system is able to achieve accurate and segmentation of background animals in dynamic scenes by preserving true and false positives.

**Table 5.1 Survey of animal captured**

| Survey area | No. of sites | No. of cameras | Survey Period |
|---|---|---|---|
| **Djelk IPA** | **10** | **44** | **August 2013** |
| **Kakadu** | **10** | **50** | **October 2013** |
| **Darwin** | **28** | **139** | **January 2014** |
| **Warddeken IPA** | **12** | **57** | **August 2013** |
| **All locations** | **60** | **290** | |

**Table 5.2 Performance Comparison on Camera Trap Images**

| Specie | Activity hours | Kuiper test | Records (100 traps days) | Capture rate |
|---|---|---|---|---|
| *Didelphis pernigra* | Nocturnal | K=123.28* | 21 | 16.4 |
| *Cuniculus taczanowskii* | Nocturnal | K=158.29* | 17 | 13.28 |
| *Dasyprocta punctata* | Diurnal | K=174.27* | 6 | 4.68 |
| *Sciurus granatensis* | Diurnal | K=187.25* | 3 | 2.34 |
| *Leopardus wiedii* | Nocturnal | K=183.75* | 2 | 1.56 |
| *Puma concolor* | Cathemeral | K=187.75* | 4 | 3.12 |
| *Conepatus semistriatus* | Nocturnal | K=178.38* | 2 | 1.56 |
| *Mustela frenata* | Diurnal | K=144.75* | 3 | 2.34 |
| *Nasua nasua* | Cathemeral | K=144.75* | 22 | 17.18 |
| *Nasuella oltvacea* | Nocturnal | K=187.88* | 4 | 3.12 |
| *Tremarctos ornatus* | Diurnal | K=163.29* | 12 | 9.37 |
| *Mazama rufina* | Nocturnal | K=168.39* | 11 | 8.59 |
| Domestic animals | | | | |
| Cattle | Diurnal | | 14 | 10.93 |
| Dogs | Diurnal | | 3 | 2.34 |
| Horses | Diurnal | | 4 | 3.12 |
| Total | | | 128 | |

Features extraction from background can be performed by using threshold segmentation techniques. The object is found by using background subtraction after obtaining the background patches. Threshold segmentation based on the pixel values is performed. In this technique, researchers should carefully choose the threshold frequency value as they also should consider the negative value obtained at pixel point by direct subtraction. The idea of threshold segmentation is simple, which pixel of gray scale images must be greater than threshold are set to white and those less than the threshold value will be set to black. It is difficult to select the threshold value accurately as the background image continuously changes. Therefore, appropriate threshold should be chosen for different background patches. The video recorders is only turn on when it is positive that animal been detected to prolong battery life time and to ensure recorded video capture. This method especially crucial in situation whereby video man is not suitable to present at the recording scene for safety issue. The animal faces are measured by utilizing HOG detection technique with different local contrast configuration of luminescence channel to detect the image region of animal faces

## 4. CONCLUSION

We developed an accurate and fine-grain animal detection from background patches and need to perform image analysis at pixel or small block level. We found that the preprocessing extraction and Euclidean distance are able to enhance performance during animal object verification. At a time we cannot trap more than one animal is challenging one in animal detection using motion triggered cameras. Experimental results show that it is an effective method to actualize embedded image capturing system.

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