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Active Feature Description in Animals Footprint Identification

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***Abstract*: We propose a novel method in Animal footprints identification, which are used to identify the animals by the footprints in a digital method. The recognition of animal tracks plays an important role in ecological research and monitoring, and tracking tunnels are a cost-effective method for species over large areas. Traditionally, tracks are collected by a tracking system, and analysis is carried out in a manual identification procedure by experienced wildlife biologists. Unfortunately, human experts are unable to reliably distinguish tracks of morphologically similar species. We propose a new method using image analysis, which allows automatic identification of animals by using the digital images as an input then compared it with the database.**

I. INTRODUCTION

Animal footprints identification is a computer technology being used to identify the animals by the footprints in a digital method. The recognition of animal's tracks plays an important role in ecological research and monitoring, and tracking tunnels are a cost-effective method for species over large areas. Traditionally, tracks are collected by a tracking system, and analysis is carried out in a manual identification procedure by experienced wildlife biologists. Unfortunately, human experts are unable to reliably distinguish tracks of morphologically similar species. We propose a new method using image analysis, which allows automatic identification of animals. In this method the Difference of Gaussian (DOG) feature detector and Scale Invariant Feature Transform (SIFT) feature descriptor are used to recognize the animals footprints.

II. RELATED WORK

An automated method of differentiating tracks of small animals. The automatic track recognition system follows three main steps: (1) track acquisition: field collection and scanning; (2) template extraction: extracting an initial template database from a given training set for future matching; (3) template comparison: querying a template database to find a comparable template and automatic track classification for classifying inputs into different classes according to their geometric characteristics. This method resolves the need for experienced biologists to subjectively classify species tracks, and allows animal tracking methods to be used on a much larger scale.

a. Track Acquisition

Tracks must first be acquired in the field using standard field methodologies. Multiple footprints from multiple animals are possible on a single tracking card. Tracks collected from the field can appear faint (dry ink) or overlap one another (possibly from multiple animals). This requires a flexible image analysis methodology that can tolerate such difficulties. Any method will only be practical if it can correctly identify most of the clearly delineated prints, and preferably some of the more ''difficult'' prints. Scanned images are segmented through an automated binarization process in order to extract patterns for recognition. The quality of recognized patterns significantly influences the subsequent analysis. In the case of animal tracks, the intensity of a footprint can vary greatly depending on factors such as the type and age o tracking media. A fixed binarization threshold over an entire card, does not provide proper footprint patterns, so Abutaleb's method is implemented, which has been reliable for binarizing insect footprints. However, animal footprints can have large variability in the characteristics of individual prints (on the same card). This makes a straightforward adaptation of Abutaleb's method impossible. We chose an adaptive binarization method whereby the tolerance for distinguishing footprints from cards is adjusted locally within a card, depending on the relative intensity of any particular footprint. We convert a gray-scale scanned image into a binary (black and white) image as follows: we initiate a standard scan on the gray-scale image and if the local mean and pixel values on a part of the card are within a defined small range (i.e., card background), we continue with scanning; otherwise we initiate a connected region of pixels (i.e., a footprint).

b. Template Extraction

An appropriate number of footprints of known animals identification must be extracted to generate an initial template database. Members in this database are used subsequently for identifying unknown footprints. Templates must reflect the variance within species characteristics, while also expressing the discerning characteristics among species. Tracks previously must have been independently correctly identified, such as by live- capturing individuals from the target species in the field and collecting footprints from them. The track acquisition process is manually aided by selecting appropriate footprint regions. From these cards, the k most representative ones are chosen for our template database, T. A symmetric distance measure can be used to calculate correspondence between binary patterns.. For fingerprint template selection, the minimum distance of unidentified prints from templates is used, and this method has shown good experimental performance in dealing with intra-class variation. Based on these concepts, we use an adapted method for track recognition that calculates the average pairwise symmetric distance for a footprint with all other n 1 footprints.

c. Template Comparison

Template comparison is to compare unknown footprints from image with those in our template for automatic species identification. An algorithm seeks to find the most likely match by estimating similarity between potential unique footprint configurations and templates in the database. Because the central pad is more likely to leave clear marks on the tracking card, we start by finding all preliminary central pad ellipses based on area constraints . All other ellipses that are close to the central pad (within a limited distance) will qualify as possible toes to that central pad. Unique footprints must now be defined and we develop a previous method for identifying these. The central pad and all potential toes are placed into a local coordinate system where toes are ordered by angle, and all combinations of the central pad with these toes are iteratively compared with the template list. A similarity value is calculated for a potential combination (a central pad and its preliminary toes) and the selected template using a linear evaluation function.

III. METHODOLOGY

The methodology we adopt is a Bag of Words classification model. The animal footprints interest points are detected, as a first step, using one feature detection method the animal footprints are extracted from each interest point. They represent the local information used to learn and recognize the footprints. Each animals footprints is described using feature description method. For classification the, we use Principal component analysis (PCA).

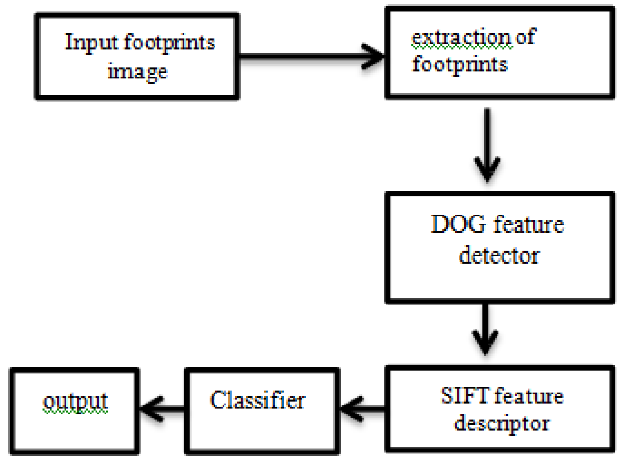


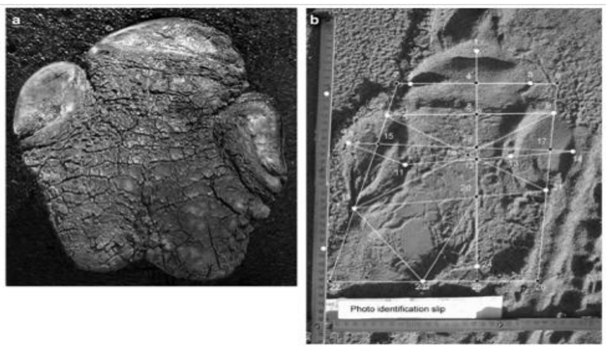
Fig.1 Frame Work

IV. EXPERIMENTAL WORKS:

In this paper we present the animals footprint recognition by implementing the feature detector and feature descriptor algorithm to recognized the animals from a footprints images. The image is given as an input then the intrerest point from an image are extracted. Using the Difference of Gaussian (DOG) feature detector and Scale Invariant Feature Transform(SIFT) feature descriptor are done to identified and recognize the animals footprints.

3.1 Feature Detector:

In this paper to extract the local image features, the Difference of Gaussian (DOG) feature detector are used. This feature developed a method for extracting distinctive scale-invariant features by finding extreme in Differences of Gaussians (DoG). The initial images separated by a constant factor k in scale-space-time. To obtain animals footprints feature points, each sample point is compared to its 26 neighbors at time t, t-1 and t+1 in the current scale and its 27 neighbors at time t, t-1 and t+1 in the scale above and below, respectively. The space- time interest point is selected only if its response is larger than all of these neighbors. After the detection of scale-space, the edge-like features are discarded.



3.2 Feature Descriptor:

In this paper Scale Invariant Feature Transform(SIFT) feature descriptor are used to detect the interesting points (invariant to scale and orientation) using DOG. It determine location and scale at each footprints location, and select them based on stability. The local image gradients are use to assigned orientation to each localized keypoint. It extract the animal footprints image gradients at selected scale around keypoint and form a representation invariant to footprints shape distortion and illumination them.

The following steps are used in SHIFT feature descriptor.

Detect interesting points using DOG.

The interesting point of an animals footprint are detected.

Accurate keypoint localization :

This reject the low contrast points and the points that lie on the edge
Low contrast points elimination: Eliminating edge response:

Orientation Assignment

This aim to Assign constant orientation to each keypoint based on local image property to obtain rotational invariance.

Local image descriptor :

This aim to Obtain local descriptor that is highly distinctive yet invariant to variation like illumination and affine change.

Principal Component Analysis (PCA)

Principal component analysis (PCA) is a statistical procedure that uses an orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables called principal components. The number of principal components is less than or equal to the number of original variables. This transformation is defined in such a way that the first principal component has the largest possible variance (that is, accounts for as much of the variability in the data as possible), 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 an uncorrelated orthogonal basis set. The principal components are orthogonal because they are the eigenvectors of the covariance matrix, which is symmetric. PCA is sensitive to the relative scaling of the original variables.

PCA is the simplest of the true eigenvector- based multivariate analyses. Often, its operation can be thought of as revealing the internal structure of the data in a way that best explains the variance in the data. If a multivariate dataset is visualised as a set of coordinates in a high-dimensional data space (1 axis per variable), PCA can supply the user with a lower- dimensional picture, a projection or "shadow" of

this object when viewed from its (in some sense; see below) most informative viewpoint. This is done by using only the first few principal components so that the dimensionality of the transformed data is reduced.

2.3 Classification
Support Vector Machine

In machine l e a r n i n g , support vector machines (SVMs, also support vector networks) are supervised learning models with associated learning algorithms that analyze data and recognize patterns, used for classification and regression analysis. An SVM model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible. The best hyperplane for an SVM means the one with the largest margins between the two classes. Margin means the minimal width of the slab parallel to the hyperplane that has no interior data points.

V. CONCLUSION:

In this paper, we have presented the process of animals footprints recognition using feature detection methods and feature description methods. The objective is to find the the animal name using the Animals footprints images by comparing it with the image in the database to recognize them.

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