Tracking And Detection using MATLAB

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***Abstract* - 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 project, here created a database of object, which is to be track i.e. animals like dog, elephant, tiger, lion etc, also in this project, 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 project uses multiple processing techniques along with Gabor filtering process to generate texture based recognition. This project 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 we can able to recognize the particular human being and any object.**

***IndexTerms* - *k*-Nearest Neighbors algorithm (KNN).**

I. INTRODUCTION

In this project i.e. image processing, a Gabor filter, named after Dennis Gabor, is a linear filter used for object detection and recognition. Frequency and orientation representations of Gabor filters are similar to those of the human visual system. They have been found to be particularly appropriate for texture representation and discrimination. The Gabor space is very useful in image processing applications such as optical character recognition, iris recognition and fingerprint recognition. Relations between activations for a specific spatial location are very distinctive between objects in an image. Furthermore, important activations can be extracted from the Gabor space in order to create a sparse object representation. In the spatial domain, a 2D Gabor filter is a Gaussian kernel function modulated by a sinusoidal plane wave. Simple cells in the visual cortex of mammalian brains can be modeled by Gabor functions.

II. ALGORITHMIC FLOW

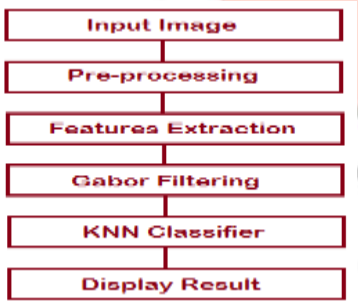


Fig1 : algorithmic flow

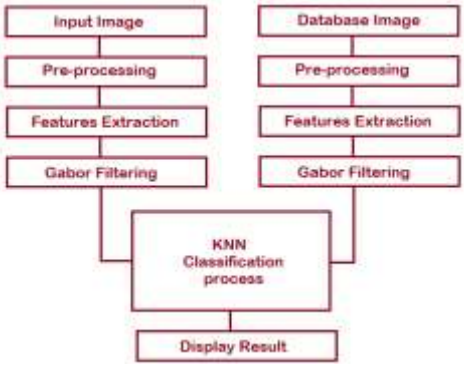


Fig 2 : Modified Flow

In this algorithmic flow the input image which is to be recognize whether it is animal i.e. Tiger, Lion, Elephant, Dog or any particular human being etc. Initially created database of all the things i.e. images of Tiger, Lion, Elephant, Dog or any particular human being etc on which form matching with input image then according to input i.e. input image which is to be recognize, there is formation of matching with the images available in the database to recognize it. Initially the input image which is to be recognize is loaded into Matlab similarly this same image loaded into database, Then application of mat lab processing in terms of algorithmic flow that is pre-processing, Features Extraction, Filtering process and finally classification. Pre-processing involves RGB to Gray conversion of image and accordingly resizing of image as per our requirement. Then features extraction process uses to extract all the features from that image. Gabor filtering process is use to extract texture bases representation so that for every individual object, body, human being, animal with any view i.e. front view, top view, side view so that it is easier to recognize a particular object and finally classification helps to identify the textures that means classification according to texture of a particular animal or human being. As we know that for every particular object texture will be same in all views i.e. front view, top view and side view.

III. FEATURES EXTRACTION

Feature plays a very important role in the area of image processing. Before getting features, various image preprocessing techniques like binarization, thresholding, resizing, normalization etc. are applied on the sampled image. After that, feature

extraction techniques are applied to get features that will be useful in classifying and recognition of images. Feature extraction techniques are helpful in various image processing applications e.g. character recognition. As features define the behavior of an image, they show its place in terms of storage taken, efficiency in classification and obviously in time consumption also. Here in this paper, we are going to discuss various types of features, feature extraction techniques and explaining in what scenario, which features extraction technique, will be better. Hereby in this paper, we are going to refer features and feature extraction methods in case of character recognition application.

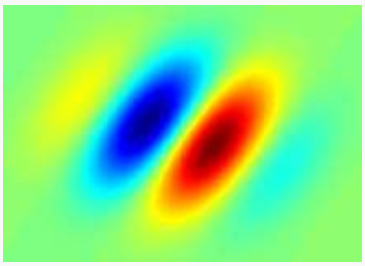
Feature extraction a type of dimensionality reduction that efficiently represents interesting parts of an image as a compact feature vector. This approach is useful when image sizes are large and a reduced feature representation is required to quickly complete tasks such as image matching and retrieval.

Feature detection, feature extraction, and matching are often combined to solve common computer vision problems such as object detection and recognition, content-based image retrieval, face detection and recognition, and texture classification.

IV. PRE-PROCESSING

Pre-processing is a common name for operations with images at the lowest level of abstraction -- both input and output are intensity The aim of pre-processing is an improvement of the image dataoimages. that suppresses unwanted distortions or enhances some image features important for further processing. Four categories of image pre-processing methods according to the size of the pixel neighborhood that is used for the calculation of a new pixel geometric, pixel brightness transformations, brightness: pre-processing methods that use a local neighborhood transformations, image restoration that requires knowledge of the processed pixel, and Other classifications of image pre-processingoabout the entire image methods exist.

V. GABOR FILTER FOR TEXTURE BASED RECOGNITION



In image processing, a **Gabor filter**, named after Dennis Gabor, is a linear filter used for edge detection. Frequency and orientation representations of Gabor filters are similar to those of the human visual system.

Relations between activations for a specific spatial location are very distinctive between objects in an image. Furthermore, important activations can be extracted from the Gabor space in order to create a sparse object representation.In the spatial domain, a 2D Gabor filter is a Gaussian kernel function modulated by a sinusoidal plane wave.Simple cells in the visual cortex of mammalian brains can be modeled by Gabor functions.Thus, image analysis with Gabor filters is thought to be similar to perception in the human visual system.Its impulse response is defined by a sinusoidal wave (a plane wave for 2D Gabor filters) multiplied by a Gaussian function. Because of the multiplication-convolution property (Convolution theorem), the Fourier transform of a Gabor filter's impulse response is the convolution of the Fourier transform of the harmonic function and the Fourier transform of the Gaussian function.The filter has a real and an imaginary component representing orthogonal directions. The two components may be formed into a complex number or used individually.The texture feature extraction stage of this work is based on the optimized multichannel Gabor wavelet filters. The next paragraphs give a brief overview about them. Gabor filters are biologically motivated convolution kernels that have enjoyed wide usage in a myriad of applications in the field of computer vision and image processing. In order to extract local spatial textural micro-patterns in mammogram ROIs, Gabor filters can be tuned with different orientations and scales (see Fig. 5.1), and thus provide powerful statistics which could be very useful for breast cancer detection.Gabor filters have been widely used in pattern analysis applications. For example, it has been used to study the directionality distribution inside the porous spongy trabecular bone in the spine.[1]

Complex

$$g(x,y;\lambda,\theta,\psi,\sigma,\gamma) = \exp\left(-\frac{x'^2+\gamma^2y'^2}{2\sigma^2}\right)\exp\left(i\left(2\pi\frac{x'}{\lambda}+\psi\right)\right)$$

Real

$$g(x,y;\lambda,\theta,\psi,\sigma,\gamma) = \exp\left(-\frac{x'^2+\gamma^2y'^2}{2\sigma^2}\right)\cos\left(2\pi\frac{x'}{\lambda}+\psi\right)$$

Imaginary

$$g(x, y; \lambda, \theta, \psi, \sigma, \gamma) = \exp\left(-\frac{x'^2 + \gamma^2 y'^2}{2\sigma^2}\right) \sin\left(2\pi \frac{x'}{\lambda} + \psi\right)$$

where

$$x' = x\cos\theta + y\sin\theta$$

and

$$y' = -x\sin\theta + y\cos\theta$$

In this equation, λ represents the wavelength of the sinusoidal factor, θ represents the orientation of the normal to the parallel stripes of a Gabor function, ψ is the phase offset, σ is the sigma/standard deviation of the Gaussian envelope and γ is the spatial aspect ratio, and specifies the ellipticity of the support of the Gabor function.

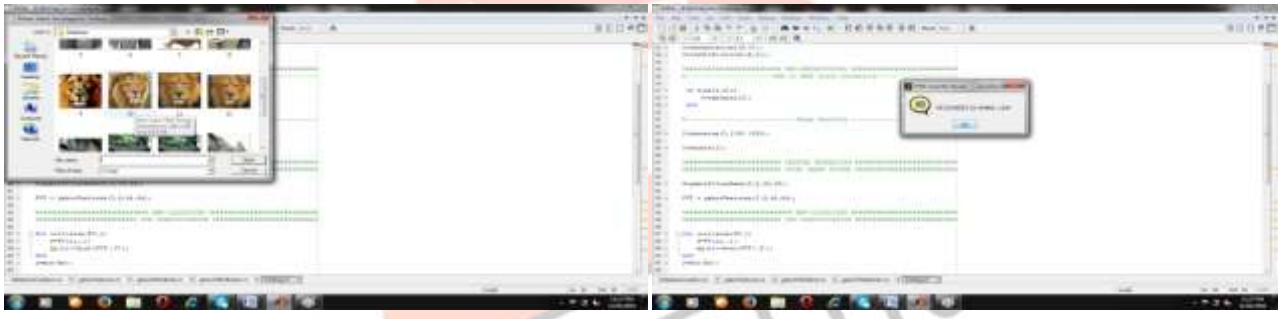
VI. FEATURE EXTRACTION

A set of Gabor filters with different frequencies and orientations may be helpful for extracting useful features from an image. Gabor filters have been widely used in pattern analysis applications.[5] For example, it has been used to study the directionality distribution inside the porous spongy trabecular bone in the spine.[6]

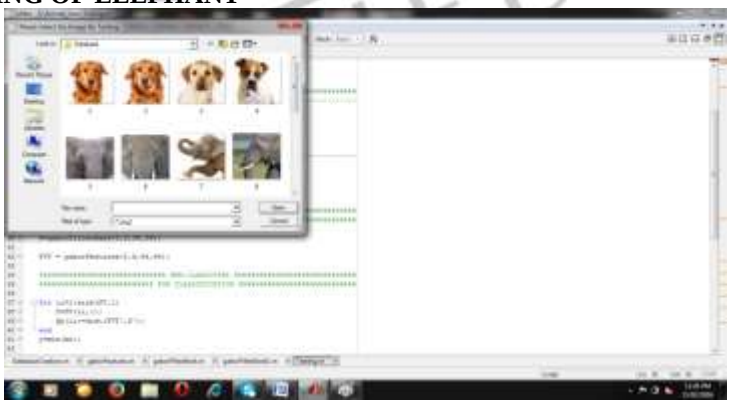
Gabor filters are directly related to Gabor wavelets, since they can be designed for a number of dilations and rotations. However, in general, expansion is not applied for Gabor wavelets, since this requires computation of bi-orthogonal wavelets, which may be very time-consuming. Therefore, usually, a filter bank consisting of Gabor filters with various scales and rotations is created. The filters are convolved with the signal, resulting in a so-called Gabor space. This process is closely related to processes in the primary visual cortex.[7]Jones and Palmer showed that the real part of the complex Gabor function is a good fit to the receptive field weight functions found in simple cells in a cat's striate cortex.[8]

The Gabor space is very useful in image processing applications such as optical character recognition, iris recognition and fingerprint recognition. Relations between activations for a specific spatial location are very distinctive between objects in an image. Furthermore, important activations can be extracted from the Gabor space in order to create a sparse object representation.

VII. OUTPUT : TRACKING OF LION



VIII. OUTPUT : TRACKING OF ELEPHANT



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