# Partial Face Recognition using Multi key-point Descriptor with Neural Network

**John Appu, Ganesh Ghone, Rahul Tandel, Neetu Singh**

***Abstract— The technique of Partial Face Recognition is to verify whether the given probe or input image has any similarity with the images present in a given database. Improvements are being made to this technique and software updates are released on regular intervals. There are multiple techniques for recognizing face with the images having controlled background, also finding faces by color, motions and other basic external factors. The method of implementation which is used for face recognition in this paper is MKD SRC Algorithm. This approach is alignment free. We are using neural network for easy association of sets to improve efficiency and accuracy. The system is self-learning so the accuracy factor improves as the number of scanned images or processed images increases.***

***Index Terms - PFR: Partial Face Recognition, MKD: Multi Key-point Descriptor, SRC: Sparse Representation Classification.***

## I. INTRODUCTION

The Face Recognition technology has been given great attention due to the enormous amount of demand it has gained over a period of time. Forensic science is proof that each and every person has its own unique identification mark among a given set of parameters such as nose, eyes and other facial parts. Using these parameters, it can be determined whether a given part of the face provided in the probe image belongs to the respective identity or not. Then the Face Recognition approach is carried out by using MKD SRC algorithm. This algorithm provides an approach for comparing partial face images with the images available in the database to verify whether the input images are a part of the available images.

This method provides a solution to problems such as, whether it is possible to recognize a person from a given input partial image and what portion of the face and what size of partial image is necessary for accurate recognition.

Face Recognition has applications in various fields such as information security and access control, law enforcement and surveillance purpose. With the help of PFR, it is possible to identify a suspect in a crowd by matching the captured face . Suspect can be identified on the basis of a partial face in an image. The approach for Partial Face Recognition used in this paper is based on MKD by does not require a definitive face alignment with respect to the co-ordinates of the eye or other points which are being taken into consideration.

In MKD the descriptor size of the image depends on the actual content of the image. To improve performance in matching we have added neural network which improves key-point description indices from time to time. The neural network assures that the sparse representation algorithm works on a specified set of descriptors chosen by neural network

## II. LITERATURE SURVEY

In the first approach which is SRC-LBP[1](Sparse Representation based Classification using local Binary Pattern) where the facial image which is provided as an input is divided into many sublevels and each of those levels are summarized as LBP(Local Binary Pattern) histogram over all the sublevels. Whereas in MKD-SRC the given probe image is cropped and feature extraction is performed on it using GTP (Gabor Ternary Pattern).In AAM [11], a statistical model is created which consists of shape and grey-level appearance of the face whose usability can applied to many probe faces. A relationship is established between the model parameters and residual errors obtained a training image and a synthesized model whereas in MKD-SRC the histogram which are generated after applying GTP to the cropped face is compared with the histogram of the images stored in the database and the matching accuracy is calculated to determine whether the probe image matches with the images present in the database. In the RBF[7](Radial basis Function network) technique the partial face image of a person is given to the input unit and if after performing various iterations of tests if the max value of the output vector is greater than the threshold value then the face is recognized as a registered person but if the value of the output vector is smaller than the threshold value then it is rejected and thereby not stored in the database. But in the MKD-SRC approach there are no such complications for including external images in the database. The bag-of-words (Bow) representation [3] is field of categorization scheme which is applied to face recognition. The drawback in this representation is that the given input image should not be occluded otherwise the descriptor histogram of the partial view of the input image will be different from whole view. This is another technique which is used for partial face recognition. In this approach, [4] we require a very high resolution input images which should always have good



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texture of the skin. Yet another drawback in this approach is it is not applicable to different variations of pose.

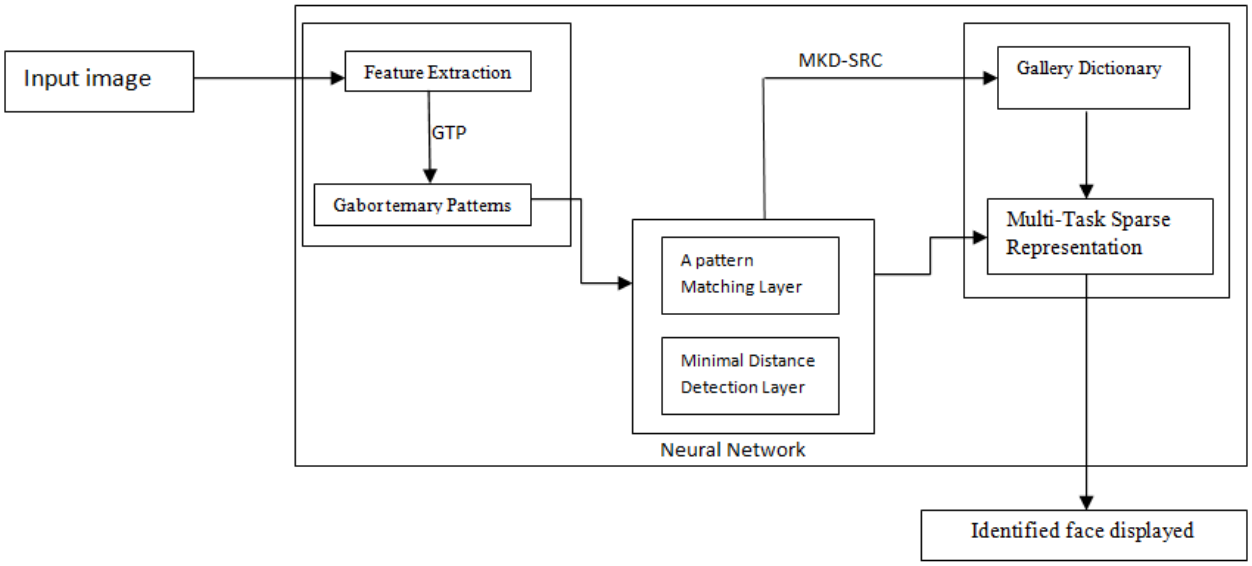


Fig 1: Block diagram of proposed partial face recognition system

## III. PROPOSED SYSTEM

In the proposed system we are performing identification process to identify an image from a dataset of images by using an image patch given as input to system. First of all there is a huge database of partial faces. This proposed system consists of three main modules, one is the feature extraction and creation of key-point descriptors and the other is neural network and the last module is the recognition process.

In the first module we are using Scale Invariant Feature Transformation (SIFT) for extracting features of the cropped input image to the system. Here SIFT acts as a local interest point detector. There many other interest point detectors but they are not 'Scale Invariant'. Once the task of feature extraction is performed then each key-point patch is given as input to the Gabor Ternary Pattern (GTP) to create descriptor for each patch extracted.

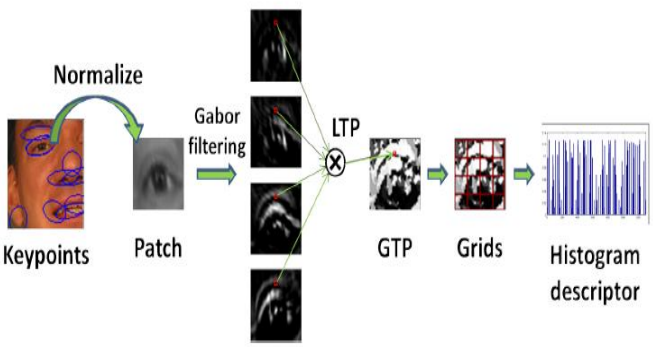


Fig 2: Components of GTP

In GTP descriptor, there are various components, firstly Gabor filtering is done on the patch, Gabor filters are used because they provide good perceptions of the local image structures, then four orientations are generated and LTP process is applied on each of the orientation in order to combine all the four orientations to one single patch. The patch that is generated after applying LTP is nothing but GTP, this region is divided into sub grid cells, each of fixed size pixels. A histogram of GTPs is calculated in each grid cell, and all the histograms are integrated to form a feature vector.

The feature vector is given to the input layer of the neural network [12]. The given approach used in [12] allows a fully self-learning neural network that helps in reducing the heavy processing involved in key-point matching. The neural network assigns descriptor indices based on key-points extracted through a certain region. Another end of the neural network is provided to the Multi-keypoint spare representation. This end does the job of processing the descriptors which are provided by neural network. Every time there is match or hit the neural network reassigns the channel for higher accuracy. Flawed connections are terminated

Whenever there is a false hit during the training phase. This way the accuracy and speed of the system improves gradually.

Here we have to create a gallery of descriptors. We perform the same method for creation of descriptors as mentioned above for each image stored in the database we can be further used for recognition purpose. Then the Multi-Task Sparse Representation is used to determine the identity by mapping the probe image descriptors to the gallery of descriptors. A Sparse representation is formulated for the input Image for which we have created multiple descriptor. This complete process is nothing but MKD-SRC. By the end of this complete process the identified image is displayed by selecting the matched image from the database.


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## IV. EXPERIMENTAL RESULTS

. We can improve overall accuracy by a factor of 3-4% and time taken for operations is reduced by 40% due to less number of sets to be compared.

## V. CONCLUSION AND FUTURE WORK

This system can be upgraded to perform fully over a neural network which scans images and processes them on the fly. The sparse representation technique can be upgraded or used in coherence with DCT(Discrete Cosine Transform) to match faces more efficiently.

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