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A Perception of novel Features Selection method for Face Recognition using linguistic techniques

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Abstract: **The way people describe the facial features using quite commonly encountered descriptors such as "long nose", "small eyes" and also allude to their feelings according to a specific person like "seems to be nice", may be utilized to enhance automatic face recognition systems. The faces are represented using a set of key points; and then a matching algorithm is applied to find the similar faces in the test data using a few training faces. To address this aspect, one can engage the linguistic descriptors and the linguistic modeling. A face recognition approach using the SIFT features has been proposed in that finding the subset of those features, which are more useful for face recognition, will lead to better results for the face recognition problem.**

Key words: **linguistic, Face recognition, linguistic modeling.**

I. INTRODUCTION

Computational face recognition has been a challenging problem for more than last two decades, mainly because of a plethora of its applications e.g. border control, surveillance systems, driver's license, and passport control. The algorithms reported in the literature utilize various techniques originating from numerous branches of science such as mathematics and Geometry, statistics, neural networks, fuzzy logic, etc. Face recognition is becoming a very hot and interesting research area because of its potential applications in particular involving the great concern of security and privacy. Although spectral transform act as a good feature extractor in normal conditions, they fail to neutralize the variations in pose, background and illumination in real time applications. Gabor transform allows the description of the spatial frequency structure in the image while preserving information about spatial relations [1]. Face recognition includes preprocessing, feature extraction and classification. Preprocessing is very useful in suppressing irrelevant information. It eliminates undesired distortions and enhances important features for further processing. In face recognition applications, the original input data is usually of high dimension. Feature extraction is a process of transforming the input data to a reduced set of salient features. In face recognition the feature set is classified using different techniques namely Euclidean distance classifier, Bayesian classifier and neural network classifier.

Preprocessing is an operation at the lower level of abstraction, Image size normalization, histogram equalization, image sharpening, edge detection, filtering and segmentation are some of the preprocessing methods in image processing. The ORL data base is used in this paper and no preprocessing is performed as the images are noise free and there are no significant changes in illumination level. A classification problem occurs when an object needs to be assigned into a predefined group or class based on a number of observed attributes related to that object. Conventional statistical classification procedures are built on the Bayesian decision theory. In these procedures, an underlying probability model must be assumed in order to calculate the posterior probability upon which the classification decisions made.

An important factor in the process of automatic description of the facial features or regions in a linguistic way is a correct measurement of the features. The methods of detection often suffer from the lack of accuracy. However, there are a lot of datasets supplemented by features description covering very simple information like gender and race.

II. REVIEW OF LITERATURE

Human faces are arguably the most extensively studied object in image-based recognition. This is partly due to the remarkable face recognition capability of the human visual system [2], and partly due to numerous important applications for automatic face recognition technologies. In addition, technical issues associated with face recognition are representative of object recognition.

Nowadays the detailed descriptions of facial features used for criminal identification can be found in the documents standardizing the procedures of comparison such as FISWG [6]. Additionally, the examples of police descriptions can be found at police websites, e.g. a Chicago Police Department [7]. Finally, the policemen are equipped with the textbooks describing the faces and their specific types, see for instance. Beside the works and mentioned in the previous section, where the results were obtained with a large amount of "witnesses" engaged, there are many more papers presenting detailed methods of facial features linguistic description and the ways of dealing with these descriptions in the further process of computational matching faces. Let us describe some of such attempts in the field. For instance, in [8 it was proposed a system where 8 facial features are considered. The

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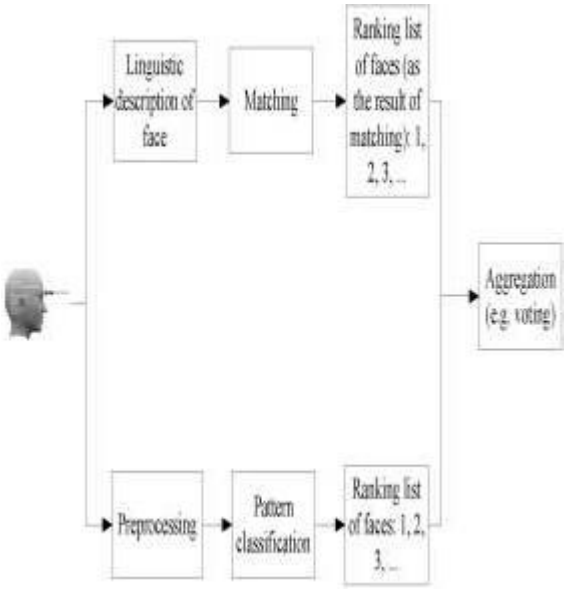
estimated by subjects in terms of linguistic descriptions such as "small", "rather small", "medium", "rather big" and "big", and represented as the fuzzy sets. In the process of classification these fuzzy sets were compared using matching based on the measure of overlap. The linguistic values were obtained using the top-down image processing based on fuzzy rules and presented in [8].Where the descriptions of facial features were supplemented by the descriptions using total impressions words, e.g. intelligent, childish, or cold face. In [8] a neuro-fuzzy algorithm utilizing linguistic descriptions built on a basis of triangular and trapezoidal membership functions depending on the normalized facial features detected computationally was used. However, the number of linguistic descriptions depends on the number of persons in the database. The authors of paper [7] proposed a fuzzy retrieval system based on the queries constructed by using the descriptions of the chosen parts of face.

III.EXISTING SYSTEM

The input of a face recognition system is always an image or video stream. The output is an identification or verification of the subject or subjects that appear in the image or video. Some approaches define a face recognition system as a three step process – see Figure 1.1. From this point of view, the Face Detection and Feature Extraction phases could run simultaneously. Figure 1.1: A generic face recognition system. Face detection is defined as the process of extracting faces from scenes. So, the system positively identifies a certain image region as a face. In [9] the authors proposed an extension of the system based on linguistic description from the perspective of multi criteria decision making. They showed how to carry out an efficient process of face description by using a set of linguistic descriptors of the single features and groups of the features.



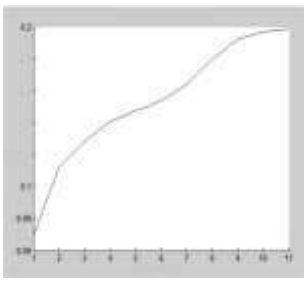
For this purpose they utilized the Analytic Hierarchy Process (AHP) [9] which is a method of pair wise comparisons realized in that case at two levels of hierarchy (facial features and their groups), in order to establish the hierarchic importance of the features. The collection of features engaged in this process evaluated by the experts from the fields of forensics and psychology is recalled. The features were chosen in such a manner to be relatively easy to describe using frontal facial 2D images.

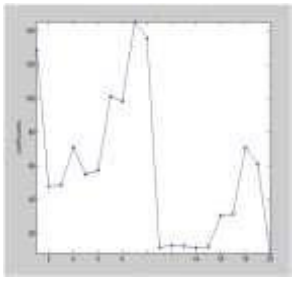
Moreover, there was proposed the entropy-based method of evaluation of the relevance of the estimation process completed by the individuals. Admittedly, the quite similar kind of description was utilized in the recognition of human emotions and social interaction as well. In particular, a very commonly considered method here is the Facial Action Coding System (F ACS) for quantity tying the facial actions in terms of so-called Action Units where the computational methods are involved). Moreover, the AHP was involved in the process of emotion recognition.

IV.PROPOSED SYSTEM

Feature selection methods that are categorized based on how the features are combined in the selection process namely feature subset-based and feature ranking-based and based on how the supervised learning algorithm used namely wrapper, embedded, hybrid, and filter. The subset-based methods generate the feature subsets using any one of the searching strategies for evaluation.

The exhaustive or complete search is used to generate the subset that leads to high computational complexity since maximum number of possible combination of the subsets to be generated from the N number of features to evaluate them. The ranking-based methods take less computation time and achieve high generality since they do not use the supervised learning algorithm. They cannot remove the redundant features since they only compute the correlation or similarity between the individual feature and the target-class. Therefore, they can be a suitable choice for high dimensional space with a suitable redundancy analysis mechanism.





However, the process should proceed in the following way. First, one has to construct the original model of the description of facial parts and its application to the problem of people identification, i.e. face retrieval in datasets containing the

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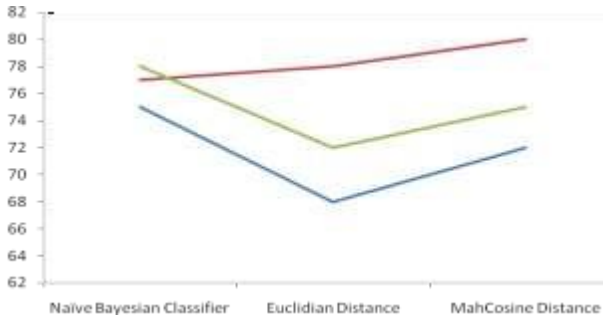
digital photos. The important factor improving that retrieval is an application of the linguistic variables and linguistic modeling, i.e. the usage of linguistic variables as the vehicle to represent the estimated values of the properties of facial features

Naïve Bayesian Classifier	Euclidian Distance	MahCosine Distance
75	68	72
77	78	80
78	72	75



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V. CONCLUSION

The sketch of the history of the methods in this field has been discussed with the presentation of the tools used. Finally, the possible directions of the development of such approaches have been presented, particularly in the context of an Analytic Hierarchy Process application to this research area. Therefore, the feature selection can be developed for high-dimensional data using the filter approach with ranking method for selecting the significant features from the high-dimensional space. In addition, to overcome the limitations of the ranking method the redundancy analysis mechanism can be adopted with a suitable clustering approach.

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