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Face Annotation Using Unsupervised Label Refinement and Facial Gesture Detection using Eigenfaces Algorithm

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Abstract: The development of tools in media have witnessed an explosion of the vast number of digitalized photos .The present work focus only on the annotation of the faces, i.e labeling each image with a name and it does not focus on other aspects like expression, quality of the picture etc. we intent to go for the more useful information of different expressions in face and to categorize the image further into different expressive aspects. A lot of information is conveyed by human beings in the form of facial expression apart from just what is spoken. Proper recognition of such expression has thus become important for any modern human computer interface. We present here a method of facial expression recognition based on Eigen faces.

Keywords: Image mining, gesture detection, face annotation.

I. INTRODUCTION

In this popular World, High Mega pixel cameras and the development of tools in media for internet-based photo sharing have witnessed an explosion of the vast number of digitalized photos which are clicked and stored by consumers. A Huge part of photos shared by users in the web are human images mainly their faces. Many of these images were tagged with names, but some of this were not tagged properly.

This results in auto face annotation, which is a significant technique, focus to annotate facial images automatically. Currently Auto face annotation are beneficial in many applications Besides, face annotation techniques can also used in video news domain to find important persons seen in the videos.

Classical face annotation techniques are frequently used as an extended face recognition problem, in which the different classification models were trained from a collection of well named facial pictures by using the supervised or semi-supervised machine learning techniques. Normally, the "model-based face annotation" approaches are few in several aspects.

First, it consumes time and collecting a huge amount of human-named training facial images are expensive. Next, it is normally hard to generalize the models when new training data or new persons are added, in which an intensive retraining process is usually required. Frequently the annotation/recognition performance will be poor if the number of persons/classes is very huge.

To overcome these drawbacks, here we propose and investigate a framework of search-based face annotation (SBFA) by mining faintly named facial images that are freely obtainable from internet. One great task in search-based face annotation is how effectively it accomplish annotation by exploiting the list of most similar face images and their faint names that are commonly noise and also incomplete. To overcome this problem, we prefer an unsupervised label refinement approach for refining the labels of face images in web using machine learning techniques. The present work focus only on the annotation of the faces, i.e labeling each image with a name and it does not focus on other aspects like expression, quality of the picture etc.

we intent to go for the more useful information of different expressions in face and to categorize the image further into different expressive aspects like disgust, anger, happy, fear, sad or surprise. To enhance this feature we intent to use eigen faces algorithm.

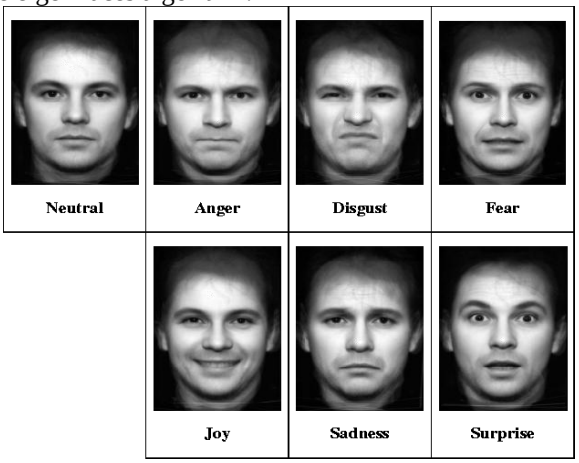

Fig1: Different Human expressions

As a summary, the main contributions of this paper include the following:

1. We investigate and implement a promising search based face annotation scheme by mining large amount of weakly labeled facial images freely available on the web.

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2. We propose a novel ULR scheme for enhancing label quality via a graph-based and low-rank learning approach.
3. We propose an efficient clustering-based approximation algorithm for large-scale label refinement problem.
4. We propose an efficient Eigenfaces Algorithm for facial gesture detection.

II. SEARCH BASED FACE ANNOTATION

Paper mainly focused on annotation of human faces and detecting the facial gesture. Search based annotation helps for annotation.search-based face annotation, consists of the following steps:

1. facial image data collection;
2. face detection and facial feature extraction;
3. high-dimensional facial feature indexing;
4. learning to refine faintly labeled data;
5. similar face retrieval; and
6. face annotation by majority voting on the similar faces with the refined labels.

The first four steps are usually conducted before the test phase of a face annotation task, while the last two steps are conducted during the test phase of a face annotation task, which usually should be done very efficiently. We briefly describe each step below.

The first step is the data collection of facial images as shown in Fig. 1a, in which we crawled a collection of facial images from the Web by an existing web search engine according to a name list that contains the names of persons to be collected. As the output of this crawling process, we shall obtain a collection of facial images, each of them is associated with some human names. Given the nature of web images, these facial images are often noisy, which do not always correspond to the right human name. Thus, we call such kind of web facial images with noisy names as weakly labeled facial image data.

The second step is to preprocess web facial images to extract face-related information, including face detection and alignment, facial region extraction, and facial feature representation. For face detection and alignment, we adopt the unsupervised face alignment technique proposed in. For facial feature representation, we extract the GIST texture features to represent the extracted faces. As a result, each face can be represented by a d-dimensional feature vector.

The third step is to index the extracted features of the faces by applying some efficient high-dimensional indexing technique to facilitate the task of similar face retrieval in the subsequent step. In our approach, we adopt the locality sensitive hashing (LSH), a very popular and effective high-dimensional indexing technique.

Besides the indexing step, another key step of the framework is to engage an unsupervised learning scheme to enhance the label quality of the weakly labeled facial images. This process is very important to the entire search based annotation framework since the label quality plays a critical factor in the final annotation performance.

All the above are the processes before annotating a query facial image. Next, we describe the process of face annotation during the test phase. In particular, given a query facial image for annotation, we first conduct a similar face retrieval process to search for a subset of most similar faces from the previously indexed facial database. With the set of top K similar face examples retrieved from the database, the next step is to annotate the facial image with a label by employing a majority voting approach that combines the set of labels associated with these top K similar face examples.

In this project, we focus our attention on one key step of the above framework, i.e., the unsupervised learning process to refine labels of the weakly labeled facial images.

III. UNSUPERVISED LABEL REFINEMENT BY LEARNING ON FAINTLY LABELED DATA

Preliminaries

We denote by $X \in IR^{nxd}$ the extracted facial image features, where n and d represent the number of facial images and the number of feature dimensions, respectively. Further we denote by $\Omega=\{n1, n2, \ldots,; n_m\}$ the list of human names for annotation, where m is the total number of human names. We also denote by $Y \in [0; 1]^{nxm}$ the initial raw label matrix to describe the weak label information, in which the i^{th} row Y_{i*} represents the label vector of the i^{th} facial image $X_i \in IR^d$. In our application, Y is often noisy and incomplete.

In particular, for each weak label value Y_{ij}, $Y_{ij} \neq 0$ indicates that the i^{th} facial image X_i has the label name n_j, while $Y_{ij} \neq 0$ indicates that the relationship between i^{th} facial image X_i and j^{th} name is unknown. Note that we usually have $Y_{i*} = 1$ since each facial image in our database was uniquely collected by a single query.

Following the terminology of graph-based learning methodology, we build a sparse graph by computing the weight matrix $W = [W_{ij}] \in IR^{nxn}$, where W_{ij} represents the similarity between X_i and X_j.

Clustering-Based Approximation

The number of variables in the previous problem is n * m, where n is the number of facial images in the retrieval database and m is the number of distinct names (classes). In particular, the clustering strategy could be applied in two different levels:

1. one is on "image-level," which can be used to directly separate all the n facial images into a set of clusters.
2. The other is on "name-level," which can be used to First separate the m names into a set of clusters, then to further split the retrieval database into different subsets according to the name-label clusters.

Working of Eigenspaces Algorithm

Eigenfaces is the name given to a set of eigenvectors when they are used in the computer vision problem of human face recognition. The eigenfaces themselves form a basis set of all images used to construct the covariance

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matrix. This produces dimension reduction by allowing the smaller set of basis images to represent the original training images. Classification can be achieved by comparing how faces are represented by the basis set.In the Eigen spaces approach for facial expression recognition, one possibility is to calculate the Eigenface of each facial expression from a labeled database of different persons. This is how the face detection method works. Even if we consider 256 x 256 greyscale images the size of the matrices representing them will be huge and operations on such matrices quite costly. So what we need is to extract only the relevant information out of a face image, encode it efficiently to reduce operational cost and compare such an encoded face image with a set of similarly encoded face images. Considering an image as a vector in a high dimensional space, we need to find the eigenvectors of the covariance matrix of the set of those images. These eigenvectors represent a set of features that together characterize the variation between the images.Project a test image to each Eigenspace and select the closest matching Eigenspace and the class of the corresponding Eigenspace is the class of the input image. However the problem here is that the person whose facial expression needs to be classified is unrecognized. The same expressions vary from person to person.

Human Gesture Recognition A vast array of algorithms is available for each module of face recognition system, how to combine them is still a challenging problem, especially for an expression recognition task.

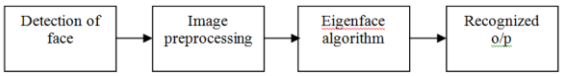

Fig2: Face Gesture Recognition

In our proposed method, facial expression contained by the input image of a human face in determined by the Eigenspaces method. This method is a modified approach to the well-known approach of face detection using Eigenspaces but here we have used it for expression recognition. From the standard database of images, we divided the images into six classes based on the six universal expressions they represent and then compute the Eigenspaces of each class. The original face images are calculated a best coordinate system for image compression, where each coordinates is actually an image that they termed an "Eigen picture". Any collection of face images can reconstruct by storing a small collection of weights for each face, and a small set of Eigen pictures

IV. CONCLUSION

This paper investigated a promising search-based face annotation framework, in which we focused on tackling the critical problem of enhancing the label quality and proposed a ULR algorithm. To further improve the scalability, we also propose a clustering-based approximation. After Face annotation, Eigenfaces algorithms were used for facial gesture detection. From an extensive set of experiments. When we human beings think of estimating the expression of another person, it is not only the facial image but also the context of the whole situation that comes into account.

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BIOGRAPHIES

K.Madhumathi, Research scholar in Department of Computer Science, Nallamuthu Gounder Mahalingam College, Pollachi. She received her Master of Science in Software systems (M.Sc (ss)) from Sree Saraswathi Thyagaraja College, Pollachi under Bharathiar University, Coimbatore. She has presented a paper in International level conferences, published an journal and attended Workshops / Seminars. Her research focuses on Data Mining (Face Annotation Using Unsupervised Label Refinement and Facial Gesture Detection using Eigenfaces Algorithm

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