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Design of Improved Image Registration Techniques for Sketch Based Face Recognition

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Abstract: *Law enforcement agencies are widely used Facial sketches by to assist in the identification and apprehension of suspects involved in criminal activities. Forensic investigations are used sketches which is either drawn by forensic artists (forensic sketches) or created with computer software (composite sketches) following the verbal description provided by an eyewitness or the victim. These sketches are posted in public places and in media in hopes that some viewers will provide tips about the identity of the suspect. This method of identifying suspects is slow and tedious and may not lead to apprehension of the suspect. Hence, there is a need for a method that can automatically and quickly match facial sketches to large police mugshot databases.*

Keywords: Forensic, mugshot, enforcement.

I. INTRODUCTION

We all know that there are many software's and applications available to convert a image to a sketch the vice-versa tough is not yet induced ,that is there exists few methodology that would support the conversion of a sketch to an image. This research is a layout for the similar idea initially this research plan is distributed into four parts Detection and Extraction of features, Matching of features, Registering features to form image, Smoothening and finish to form an image.

Usually people are more comfortable with image instead of sketch. General observation says that identification of a particular person from the sketch is monotonous whereas with an image format is easy. So the research in this area will be worthwhile in the crime branch. Recognize the particular person face is very common task in criminal field therefore this can be proven one of the helpful technologies. Since it will automatically search and process and will find matching faces from the large database, it will be great support to the officers to solve the case. It can make the investigation process more reliable. An image will provide more ease of recognition than a sketch. This need of an image in place of a sketch motivated the idea of bringing up a project that can convert a sketch to an image.

Image registration is a process of transforming different sets of data into one coordinate system, and data may be from - (a) multiple photographs, (b) different sensors and both (a) & (b) vary from different (i) times, (ii) depths, and (iii) viewpoints, and thus aligning to monitor the subtle differences between two or more images. This process involves designating one image as the reference (also called the reference image or the fixed image), and applying geometric transformations to the other images so that they align with the reference. Image registration allows you to compare common features in different images. The development of IR techniques and algorithms is highly complex because it is required to find spatial correspondences among images, and have vast applications in - Computer Vision, Medical Imaging, Image Mosaicking, Biological Imaging and Brain Mapping, Remote Sensing, Military, Satellite communication, Criminology, and Optimization, etc. Image registration techniques are not only required but also essentially necessary to compare data & images obtained from different measurements based on their application requirements.

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Many numbers of algorithms are designed and developed based on the application requirements of image registration techniques which include mathematical models also. Image registration algorithms are broadly divided into ten classifications. They are

1. Intensity-based and feature-based;
2. Transformation models;
3. Spatial Frequency domain models;
4. Single-multi-modality modals;
5. Automatic, semi-automatic, manual modals;
6. Similarity modals;
7. Uncertainty models;
8. Optimization models;
9. Parametric and non-parametric models;
10. Rigid and non-rigid models.

II. LITERATURE REVIEW

As refer to merging images, in [1] there are several techniques provided for achieving the objectives and also they are result oriented. From the terms and the result given in the paper, it can be state that authors aiming to smoothly finish image which is created by merging another few images.

Another paper [2] initially refers to find similarities between two faces. Methodology is based on the expressions on the face which are crucial to us because we consider facial feature. The expression used for differentiating facts which is one of the necessary content in our project. Thus this identification of features is studied from this paper.

Recognition of pattern and face is highlighted in [3], this not only define different terms for identifying face and producing result in the form of acceptance and rejection but also gives a determined https://www.iaeme.com/ijcet/index.asp percentage of the face match. In [4] introduces comparison method that produces highly dependable results and thus can be useful. Assessment of results from various methods helps to figure out better outcome.

Feature identification and recognition methodologies with an improvisation that it also presents the identification of these facial expressions or features or faces are prior. In [5] clarifies any temperament to the original face image can be identified separately and considered and avoided according to the input and the recognition is done.

In order to imply a combination of nonlinear diffusion and bilateral filtering refining image and edge detection technique is proposed. Citation of two well established methodologies in image processing community is done in order to get a base to the model, which makes understanding and implementing the method very easy. Execution of numerical experiments exhibits that the proposed model can achieve more accurate reconstructions from noisy images, in comparison to other popular nonlinear diffusion models in the literature. In [6] briefs a diffusion stopping criterion, established from the second derivative of the correlation between the noisy image and the filtered image which can be introduced as new and simple.

Survey of several terminologies referring to face matching and feature matching is done in this paper. Also detailed analysis of same with result is done along with their comparison and outcomes. All present techniques for the same are studied and a detailed analysis of the same is presented in [7]. Analyzing approach is based on the study of all these techniques under the similar databases and inputs such that the obtained outputs are visually identified to be similar or not and to what extent documents represented as vectors.

Literature survey of Sketch Based Face Recognition: Forensic vs. Composite Sketches [8] address the problem of automatic facial sketch to mugshot matching and compare the effectiveness of forensic sketches and composite sketches. The contributions of paper include: (i) a database containing mugshots and corresponding forensic and composite sketches that will be made available to interested researchers; (ii) a comparison of holistic facial representations versus component based representations for sketch to mugshot matching; and (iii) an analysis of the effect of filtering a mugshot gallery using three sources of demographic information (age, gender and race/ethnicity). Experimental results show that composite sketches are matched with higher accuracy than forensic sketches to the corresponding mugshots.

Literature survey of Classification of Image Registration Techniques and Algorithms in Digital Image Processing [9] in order to understand the phenomenon of Image Registration and its implementation methodologies. This survey emphasizes Image Registration as the most essential part of panoramic image generation & creation, where applications and uses are unimaginable for researchers longing to invent & implement alternative image registration methods from general to specific to complex applications.

III. METHODOLOGY

The entire process is summarized into four modules which are elaborated below the modules namely are as stated:

- Feature Detection.
- Feature Extraction.
- Feature Matching.
- Registering image.
- Smoothening and finishing.

1. Feature Detection:

The very initial task is to detect prominent facial features using feature detection methodologies. In order to generate patterns from time series data for classification purposes several feature extraction methods have been introduced.

Figure 1: Feature Detection

2. Feature Extraction:

Conversion of the real-valued signal into complex valued analytic signal required by Hilbert transform for extracting the phase information. Time series data is predefined in the SDF-based feature extraction, which is first converted into symbol sequences, and then probabilistic finite-state automata are constructed from these symbol equines for compressing the pertinent information into low-dimensional statistical patterns.

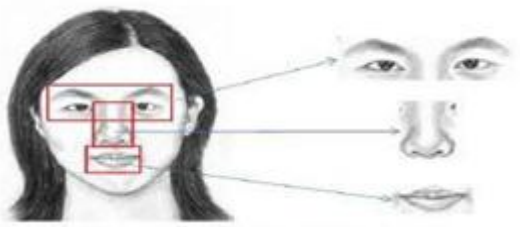

Figure 2: Feature Extraction

3. Feature matching:

Application of primary component analysis is done on each image by the Eigen Object Recognizer class, the results of which will be an array of Eigen values which can be recognized by a Neural Network which is trained. PCA is a frequently used method of object recognition as its results, can be fairly accurate and resilient to noise.

Figure 3: Feature Matching

4. Registering Features:

The previous mode of feature matching provides several image outputs viz. Eyes, nose, mouth, blank face. The objective now shifts to registering all these constituents together in proper extents at proper location. In order to spot exact location of every feature their original landmarks are revised from the input sketch, this simplifies the task of dimensional repositioning of the features. Facial points are detected to register the location of every component specifically at its precise dimensions.

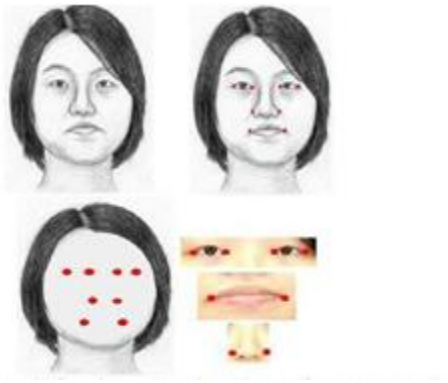

Figure 4: Approach for detecting location of Components.

Figure 5: Approach for registering of features

5. Smoothening and finishing output:

Resizing the components and realigning them is thus a necessity, for which application of certain filtering and smoothening algorithms is conducted. The output is finalized by performing gradient smoothening on the image and image blending algorithms are executed for obtaining a perfect outcome, the output is a visually pleasant image form as shown on Fig 6.

Input Sketch Output Image

Figure 6: Final outcome of image formation.

IV. PROPOSED ARCHITECTURE

Architecture includes details for whole conversion of the sketch into an image. The keywords are as stated, components of face which includes the features such as eyes, nose, mouth etc. and blank face mask that denotes the outline of the facial structure.

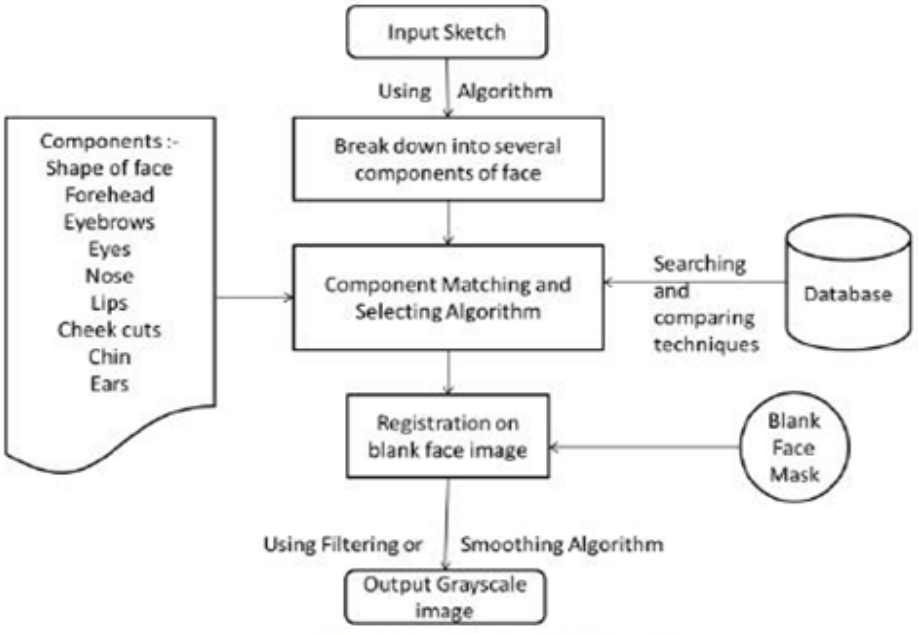

Figure 7: Proposed Architecture

V. CRITICAL RESEARCH ISSUES AND CHALLENGES

Registering Features and Smoothening and finishing are the critical issues and challenges of this research. Registering all the components together in proper dimensions at proper location In order to detect exact location of every feature their original landmarks are revised from the input sketch. Facial points are detected to register the location of every component specifically at its precise dimensions. Resizing the components and realigning them is thus a necessity, for which application of certain filtering and smoothening algorithms is conducted. The output is finalized by performing gradient smoothening on the image and image blending algorithms are used for obtaining a perfect outcome, the output is a visually pleasant image form.

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