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Sketch- Based Image Retrieval Hypothesis-Driven Object Boundary Selection with HLR Descriptor

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Abstract: The appearance gap between sketches and photo-realistic images is a fundamental challenge in sketch based image retrieval (SBIR) systems. The existence of noisy edges on photo-realistic images is a key factor in the enlargement of the appearance gap and significantly degrades retrieval performance. To bridge the gap, we propose a framework consisting of a new line segment-based descriptor named histogram of line relationship (HLR) and a new noise impact reduction algorithm known as object boundary selection. HLR treats sketches and extracted edges of photo-realistic images as a series of piece- wise line segments and captures the relationship between them. Based on the HLR, the object boundary selection algorithm aims to reduce the impact of noisy edges by selecting the shaping edges that best correspond to the object boundaries. Multiple hypotheses are generated for descriptors by hypothetical edge selection. The selection algorithm is formulated to find the best combination of hypotheses to maximize the retrieval score; a fast method is also proposed. To reduce the distraction of false matches in the scoring process, two constraints on spatial and coherent aspects are introduced. We tested the HLR descriptor and the proposed framework on public datasets and a new image dataset of three million images, which we recently collected for SBIR evaluation purposes.

Keywords: Photo-realistic images; histogram of line relationship (HLR); Large-scale sketch retrieval; line segment-based descriptor.

I. INTRODUCTION

Long before the invention of writing systems, people drew and sketched to communicate with each other, and the oldest-known forms of writing were primarily logo-graphic in nature. Generally, a sketch depicts the rough shape of an object and provides a conceptual representation to facilitate communication. We can easily recognize objects from other people's sketches, and this form of expression is arguably the most universal communication tool for people who speak different languages. Compared with keywords, a sketch is generally more natural and more informative, breaking down the language barrier. Sketch-based image retrieval (SBIR) can therefore be a very valuable information search tool, supplementary to keywords-based search. The benefits of SBIR are becoming obvious with the proliferation of touch-screen devices such as smart phones and tablets.

Although sketch is a good way to express people's thoughts, there is a large gap in the appearance of user sketches and photorealistic images (referred to hereafter as the appearance gap). When people sketch, they usually focus on the main structure of an object and only draw the semantic contour boundary. In contrast, photo-realistic images contain the color, texture and detailed shape of an object, which makes it very difficult to directly match a sketch and the corresponding photo-realistic image. An intuitive way to achieve this is to apply edge extraction to a photo-realistic image prior to matching. After edge extraction has been applied, the photo-realistic image is represented by strong edges, which makes both types of image comparable. Several important works [1][4] have validated this general approach.

II. SYSTEM REQUIREMENT

As we know that now a days there is a tremendous increase in terrorist activities which need to be stopped as early as possible and arrest those criminal who are behind these hazardous activities. By being influence by the recent terrorist activities such as 26/11, German bakery etc types of attacks done by the terrorist has motivated us to make such a kind of project that will be beneficial for social activities and will be able to punish those criminals. In the previous time it was very difficult to find a criminal based on just sketch which was drawn by the sketch-artist and then the cops starts their investigation based on the sketch to find the criminal. Our editor is available all the time but there may be possibility that the sketch-artist will be available or not available. If the sketch-artist is not available then there will be delay to find the criminal by investigation and those criminal will be free of any terror roaming all around.
Our project is so user-friendly that even a child can handle this project. In our project the witness who has seen the criminal attempting a crime will sit in front of our editor then he can make the sketch of that criminal based on the various features present in the tool and can make an appropriate sketch of that criminal and if available in the database his digital photo can be extracted.

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Objective

In our project we are minimizing the task of the forensic department and the cops of finding a particular criminal based on the sketch. Previously it was very difficult for the cops and the forensic department to search a particular criminal based on the sketch. By just having the sketch it was complicated to find a criminal. So we have proposed such a project which will be very advantageous in the field of forensic department because it will be very easy to find the criminal based on the photo but from the sketch it is difficult. Here we are going to use three algorithms (SNS-SRE) for converting the database photo to the sketch and PCA algorithm for matching purpose.

Problem Statement

In today world we are facing a lot of problem in detecting a criminal based on its sketch. The witness dictates the sketch to the artist and he used to draw it, but by just making a sketch of that criminal it is not possible to catch that criminal. So here we have proposed a system which will match the sketch with the digital image present in the database. As it is not possible to match a sketch image with a digital image. So we are converting the digital image present in the database into sketch image and then match it with the sketch drawn by the artist on sketch editor.

Organization

In Face sketch-photo synthesis and retrieval introduces a method for representing face which is based on the features which uses geometric relationship among the facial features like mouth, nose and eyes. Feature based face representation is done by independently matching templates of three facial regions that is eyes, mouth and nose .Principal Component Analysis (PCA) method which is also called Eigen faces is appearance. based technique used widely for the dimensionality reduction.

The proposed photo synthesis method (SNS-SRE) works at patch-level and is com- posed of two steps: sparse neighbor selection (SNS) for an initial estimate of the image and sparse-representation-based enhancement (SRE) for further improving the quality of the synthesized image. SNS can and closely related neighbors adaptively and then generate an initial estimate for the image. In SRE, a coupled sparse representation model is rst constructed to learn the mapping between sketch patches and photo patches, Finally two retrieval modes, namely sketch-based and photo-based retrieval, are proposed, and a retrieval algorithm is developed by using sparse representation.

System Development

A. Conclusion from Literature Survey

In this paper, we have proposed system architecture for CSBIR based on HSV color space and texture characteristics of the image retrieval. In spite of the traditional text based image retrieval, color sketch based image retrieval is developed which gives best results. Through the quantification of HSV color space, we combine color features and Texture features using Euclidean distance classifier. Image retrieval experiment, indicates that the use of color features and texture characteristics of the image retrieval method is superior to sketch based image retrieval. In this work, it is observed that the proposed method achieved high retrieval rate using the color sketches of the images. This paper will be very useful in crime prevention. The proposed CSBIR has more retrieval rate than SBIR. The future work will focus on improved retrieval performance of color and shape dominant images by exploring additional image features. Further, a research is in progress to improve the method aiming to increase the retrieval rate.

B. Proposed System Architecture

After analyzing existing sketch-photo synthesis approaches, we and that there is a disadvantage that may harm the face image retrieval process. In this paper a new sketch photo synthesis method, SNS-SRE, is proposed based on sparse representation to mitigate the ad-verse effect. Face Photo Sketch Recognition Synthesis was proposed for recognizing face in straightforward way. This technique is used to overcome the difficulty of matching photos sketches in 2 different modalities. It was developed mainly for security purposes thus used in LAW ENFORCEMENT.

Automatic retrieval of photos of suspects from police mug-shot database can help the police narrow down potential suspects quickly. However, in most cases, the photo image of a suspect is not available drawing based on the recollection of an eyewitness Therefore; automatically searching through a photo database using a sketch drawing is very useful. It will not only help the police to locate a group of potential suspects, but may also help the witness and the artist to modify the sketch drawing of the suspect interactively based on the similar photos retrieved. The key objective for sketch-based face photo recognition is to reduce the difference between the two modalities i.e. to bring photo sketch into same mode so that recognition process becomes easier.

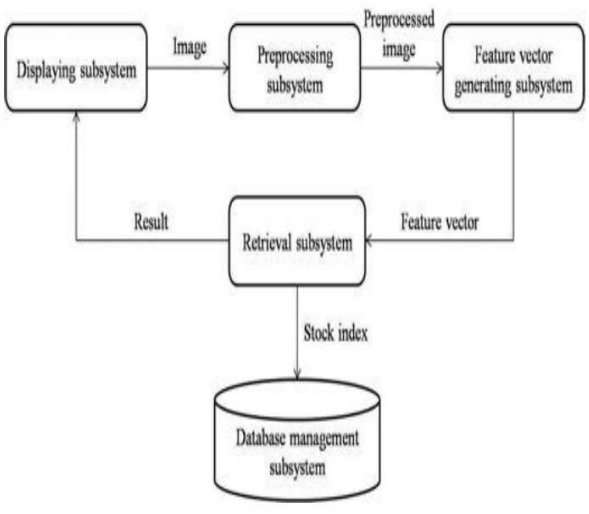

Fig.1 Proposed System Diagram

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C. Feasibility Study

- Software Requirement
- Operating System:-

Microsoft windows (windows XP and above)

- Language:-

Microsoft Visual Studio(C)

- Processor:-

Intel Pentium processor 4 or higher

- Memory:-

Memory: 40 GB hard disc, 1GB RAM or higher

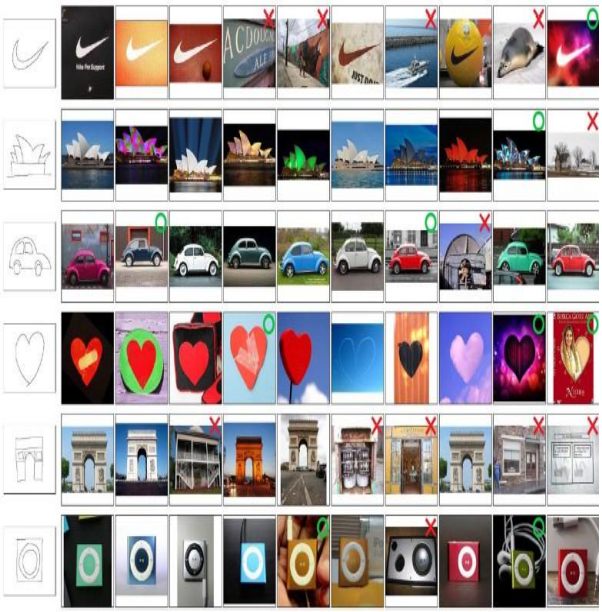

Fig. 2.Examples of top 10 retrieval results. Images marked with a green circle indicate that although the object boundaries are surrounded by many noisy edges, they are successfully saved by our object boundary selection algorithm. Failure cases are marked with a red cross.

System Design

A. DFD (ER Diagram)

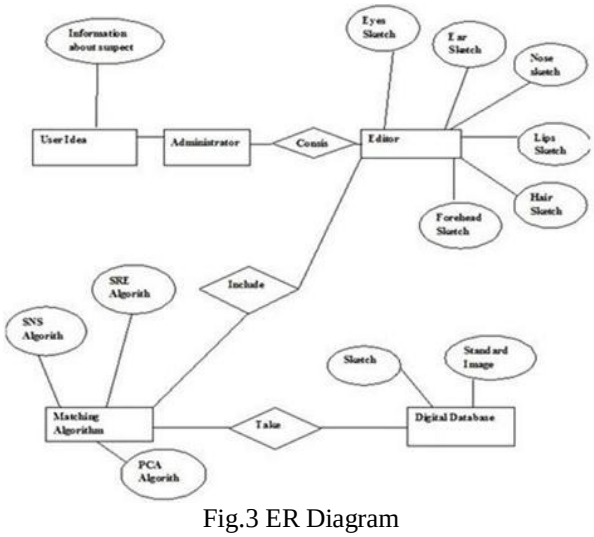

Fig.3 ER Diagram

ER-modeling is a data modeling technique used in software engineering to produce a conceptual data model of a information system. Diagrams created using this ER-modeling technique are called Entity-Relationship Diagrams, or ER diagrams or ERDs. So you can say that Entity Relationship Diagrams illustrate the logical structure of databases. Dr. Peter Chen is the originator of the Entity-Relationship model.

III. CONCLUSION

In this paper, we develop a systematic approach that bridges the appearance gap for SBIR. We consider sketches and extracted edges from a new angle, i.e., treating them as a set of line segments, In this paper, we develop a systematic approach that bridges the appearance gap for SBIR. We consider sketches and extracted edges from a new angle, i.e., treating them as a set of line segments, the sketches and extracted edges.

Based on the HLR, we propose an object boundary selection algorithm to reduce the impact of noisy edges, which is critical for SBIR. A fast method is applied to efficiently find the solution for the object boundary selection algorithm. Considering that false matches could degrade retrieval performance, we propose the spatial constraint and coherent constraint to filter the false matches. The experimental results validate the effectiveness of our framework.

Although our method achieves significant performance improvement in SBIR, this might be further improved if we follow to decrease the impact of quantization errors in the descriptor mapping procedure. We will address this in future work. The designed mechanism takes the advantage of the both proactive and reactive schemes i.e. proactive detection and the superiority of reactive response. This merging of both the proactive and reactive schemes to work together helps to reduce the wastage of resources. The performance evaluation shows that the CBDS scheme outperforms the DSR, 2ACK and BFTR schemes which are selected as benchmark with regards to packet delivery ratio and routing overhead.

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