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Review

Face Recognition using Content Based Image Retrieval for Intelligent Security

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ABSTRACT

Building an intelligent security system using facial recognition is the goal of this article. Frontal face photos with and without obstructions, as well as facial photographs with and without barriers, are the data utilized in this study. The CBIR (Content Based Image Retrieval) technique was used in this study. Primarily based on original data acquired from the internet, police department offices, and actual shootings, this piece makes use of about 10,000 pictures. The identification and face recognition procedure involves storing facial picture data in database object-based files. As a result, facial similarity approaches are used to extract photos of faces. At this point in the identification process, the software may set the front face's shape, extract features, and execute intelligent similarity (facial data matching) to automatically unlock the door. Crime rates in the modern world may be reduced with the use of this approach. A few examples of possible applications for this system are home security, business entrances, and airport gates. The results of the studies demonstrate that our system is capable of opening doors based on facial detection and identification.

Keywords
Face recognition; CBIR; Intelligent; Security system; Criminal; Similarity.

INTRODUCTION

The complexity, multidimensionality, and situational variability of human faces makes the creation of face recognition algorithms a challenging task. Thus, it remains a challenge for professionals to develop a system that can automatically recognize and interpret facial expressions. One kind of self-recognition technology is biometrics, which makes use of either physical characteristics or behavioral patterns to identify a person. Fingerprints, retinas, iris patterns, and facial features are among them [1]. Recently, it has become one of the most used tools for studies involving facial detection and identification [2, 3]. Conversely, it is stated in [4] that facial recognition.

Almost half a century ago, systems were identified as a subfield of computer vision and pattern recognition. One subfield of human biometrics is facial recognition. [5] and [6]. The security system is being enforced quite strictly due to the recent increase in criminal activity. An integral part of any reliable security system must be able to monitor and secure data at all times. With this security system application, we may rest easy knowing that we are well protected. Also, it has the potential to lower the community's crime rate.

A door is a symbol of the highest significance in the realm of home security, business, government offices, and other significant structures and residences. One good consequence of technological progress is the installation of door security systems, which is an example of automation. Since the gate will essentially open itself upon valid password entry, automation will essentially replace the human function with a tool or machine. In the future, people won't need to keep an eye on every door since the system will sound an alert if someone tries to force their way in. In this study, the Content Based Image Retrieval technique was used to construct an intelligent system. This smart system is designed to take the role of a traditional security system that relies on text and is thus easily "hacked" by unauthorized individuals.

This article will investigate the use of facial recognition technology to create an intelligent system that can automatically unlock doors or gates. Section 2 will include relevant prior research; Section 3 will detail the procedures used; Section 4 will present and analyze the

findings; and Section 5 will offer a summary and recommendations for further study.

II. RELATED WORKS

2.1. Face recognition

According to [7] face recognition system is a computer application for automatically identifying or verifying a person from a digital image or a single frame from a video source. This can be carried out by comparing selected facial characteristics of the likeness and a facial database. It performs that by matching the face of the retrieving user with a database of faces formerly stored in memory. Face recognition offerings a interesting issues in the area of image analysis and computer vision, and it has acknowledged a great deal of interest over the last few years since of its applications in different areas. There are many issues occur due to many factors that can affect the images. When processing images one must take into account the variations in frivolous, image quality, the individuals pose and facial expressions along with others. Whilst, [8] stated that different types of facial images are taken for face detection. The images that are collected in a semi-controlled situation are used as a query. Images were taken in uncontrolled indoor location and different facial expressions (such as open / closed eyes, smiling / not smiling) or formations (such as w/glasses, center-light, happy, left-light, normal, right-light, w/no glasses, unhappy, sleepy, surprised, and flash). The images are taken by changing the lighting and facial minutiae (glasses / no glasses) at different times and are used as input. It showed different results and performance algorithm.

An essential problem in image recognition and computer vision is defining the distance between two images. Significant efforts have been made to outline image distances that provide automatically reasonable results [4, 16, 1, 10]. Among others, two representative measures are the tangent distance [16] and the generalized Hausdorff distance [4]. Tangent distance is locally invariant with reverence to some chosen alterations, and has been extensively used in handwritten digit recognition. The generalized Hausdorff distance is not only robust to noise but also allows portions of one image to be compared with another, and has become a typical tool for comparing shapes. [11].

Face recognition is one of the challenging aspect in the field of image analysis and computer vision. The focus towards the face recognition has been increased in the last few years leads to encouraging results but still we are unable to find the face recognition technique which is able to perform efficiently in the various situations commonly encountered in daily due to its enormous applications in different domains. The research conducted in this field for the past four decades life. The algorithms related to face recognition technique are thoroughly studied taking a number of test images and varying the conditions and variables. Proposed Genetic algorithm based method is applied on three different benchmarked databases: ORL (Olivetti Research Laboratory), UMIST and Indbase. The ultimate objective of the research work is to improve the recognition rate. The proposed method gives better recognition rate as com-pared to existing PCA and LDA methods. It has been observed that the proposed Genetic algorithm based method has achieved the 98.57 % face recognition rate with ORL database, 100

% recognition rate with UMIST database and 98.33 % recognition rateIndbase database which is far better than the existing techniques PCA and LDA. The proposed work can further be improved using other optimization algorithms and can also be applied on other benchmarked databases [9]. The main goal of face recognition technology is to match a given face image against the stored database of images. Face recognition technique uses several other disciplines such as image processing, computer vision, pattern recognition, neural networks and psychology. With the current perceived world security situations, governments as well as businesses require reliable methods to accurately identify individuals, without overly infringing on rights to privacy or requiring significant compliance on the part of the individual being recognized.

2.2. Content Based Image Retrieval

Stated by [10] that Content Based Image Retrieval (CBIR) is the process of searching and retrieving images from a database on the basis of features that are extracted from the image themselves. In this paper image classes are used such as Africa, beaches, buildings, buses, dinosaurs, elephants, flowers, foods, horses and mountains. Features are extracted from the entire image database and the feature vectors have been stored. Furthermore they said that a new hybrid feature scheme is proposed for efficient CBIR in this paper based on spatial, frequency, CEDD and BSIF feature descriptors. In addition to spatial features such as color auto- correlogram, moments, and HSV histogram features and frequency domain features like SWT moments, Gabor wavelet transform features, CEDD and BSIF features are used to increase precision of the presented approach. Using spatial domain features lowest precision results were obtained whereas frequency domain features resulted in better precision as compared to spatial domain features. Finally, in order to improve the precision we extracted CEDD and BSIF descriptors, which resulted in highest precision. Both global and local features are combined to obtain higher retrieval rate. Experimental results obtained using the proposed approach are better compared to existing methods. Currently we are working on techniques for reducing the feature vector size which will further reduce the execution time.

2.3. Content Based Image Retrieval

New approach has been proposed for an image retrieval system based on region growing segmentation on DCT compress domain. It is presented as a different way to develop image indexing by using of DCT descriptors. The method has been carried out for compressed images database to verify its performance in JPEG standard stream line.

The proposed method of region growing segmentation on DC images offers huge storage and time saving for Image indexing and retrieving. From this work, it could be concluded that segmentation, while imperfect, is an essential step and very useful in building indexin g keys. In summary, this indexing key method is a promising method for image retrieval on segmented image on compress domain. This new approach could be used for image indexing by other segmentation methods. For the near future, it will be used another segmentation approaches such as Support Vector Machine, Fuzzy

logic, and Split Merge to improve speed of image indexing and Retrieval [12].

According to [10] stated that semantics in general terms describe about the denotation of something. In programming, semantics tells about the meaning and format of syntaxes written in the program code, in the same manner when discussed in the field of image processing, semantics tells about the interpretation of images from the user level perspective. In CBIR features are extracted which do not justify the user's perspective and his critical thinking properly. This loophole is called semantic gap as discussed earlier in the starting of paper. So to bridge this gap, researchers proposed methods by which retrieval based on High Level semantics was possible.

Meanwhile [14] gives a comprehensive summary about content based image retrieval, semantic gap, Low Level

features and High Level semantics. A literature review of

oftentimes utilized in the house or residence [3], business firms [4-6], robotics [7-9] and also for traffic monitoring systems [10]. The purpose of home surveillance security system is essentially used to screen the activities, behavior or other changes in information in order to manage or protect personal belongings. These days, this surveillance system is being installed at home to monitor and avoid any unwanted activities to occur. Thus, the owner can quickly take necessary actions in case of any aggravations [13]. As house break-in cases increasingly rapidly, there is multiple intelligent home security system that is being developed with many necessary features. Moreover [13] defined that one of the fundamental reasons that bring about the increase in the rate of this case is the failure in intruder confirmations. In fact, these failures lead to prolonged crimes. A smart alarm system is developed in this paper to be installed in the locker to overcome the intruder confirmation issues. The development works in a way that when an object's movement or action passes through infrared radiation and blocks it.

III. METHODS

3.1. Research Steps

Research is conducted in two phases, first phase involves the collection of facial image of more than 10,000 facial images. In this first phase, activities will be focused on activities and face features extraction. Figure 1 describes the flow of activities which constitute the face extraction. To stage face recognition , this works use to implement image retrieval by image query into the system, which an implementation of image retrieval based on face detection feature. Database used in this study is a combination or mixture of some facial expressions such as facial was mediocre, angry face, smiling, shouting, and laughing, while also used illumination (some variation of radiation from the left side, right side, and radiation from both sides).

work done in CBIR is also given. CBIR is still an immature technique which needs more enhancements for better retrieval results. Researchers are still working on the main issue of CBIR which is the reduction of semantic gap. Though a lot of work has been done in this domain, but still a generic approach is not yet developed for image retrieval which uses High Level semantic parameters. As there is no proper technique available which reduces semantic gap fully, future research directions are suggested

Face image query

Face images

Fig.1: Diagram of face recognition retrieval system

retrieval

2.3 Intelligent System

There has been a dramatic increase in the importance of home monitoring security systems in recent years. Various facial expressions, including a neutral face, an angry face, a smile, a yell, and laughter, as well as lighting (varying degrees of radiation from the left and right, as well as radiation from both sides), were used in this study's database. For the purpose of determining the efficacy (effectiveness) of face photos, the following search precision and recall metrics were utilized: [8].

IV. RESULTS AND DISCUSSION

Preprocessing the photos is also part of this task and entails the following steps: i). Editing the image to a 64-bit x 64-bit format, secondly. After determining the maximum ratio of extracting image features (iii), cropping the original picture to remove unwanted parts, and then extracting image features (iv) from a 640 by 480 pixel facial pose. Assemble the colors green, red, and blue. After the pre-processing was finished, we created a face database and performed face recognition.

Based on image retrieval, the study demonstrates that all face images are saved in a database and indexed. We were able to complete the retrieval procedure by comparing the query picture to the database image. Figures 4, 5, and 6 show a snapshot of the face recognition system operating without any barriers. The database only stores photographs of faces, and those photos must be taken head-on, without any obstructions. The recognition approach utilized in this study is based on comparing comparable face images that have been used before. When the results of the likeness test are same or when the system recognizes the facial picture perfectly, otherwise, it is not recognized.

The photographs were pre-processed using RGB before being input into our system. The pre-processing included extracting a facial image using the maximum ratio from a picture of a face with dimensions of 640/IV x 480/4 pixels. The job begins with pre-processing, and then it deploys face recognition using the data collected in the previous stage. The goal is to generate a database array of face pose positions. Here, all the photographs that were saved and retrieved were ranked, and any images of faces were identified as masks. The face detection technique was used to carry out the retrieval operation. Image detection and recognition algorithms are similar to Java code. In this scenario, the "identified person" might be defined as a picture whose location is identical to that of an earlier, comparable image. "Unidentified person" [18] would be the case otherwise.

V. CONCLUSION AND FUTURE RESEARCH

Intelligent face recognition software that makes use of RTF and con-

tent-based picture retrieval. Given the reasonable detection accuracy, the application design was executed admirably. When looking for a certain face, the system will provide an error message if the data is not in its database. Face detection has a high degree of accuracy.

This, when averaged over 25 tests, yields results above 75%. Improving the effectiveness of retrieval will need a lot more effort in the future. The CBVR approach, which uses a person's gait as a key to unlock doors mechanically, might be applied in future works. This may be accomplished by creating a database of video clips that contains 500 to 1000 clips, each with a length ranging from 30 to 60 seconds.

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