Library Management System Using Facial Recognition Technology

Vinil Harsh[1], Sudhanshu Mukherjee[2], Aniket Chikhale[3]

[1-3]*Students, Department of Computer Science and Engineering, G.H. Raisoni Academy of Engineering and Technology, Maharashtra, India*

Abstract - *Biometrics is a label used to outline an individual's DNA, hand geometry, face, etc. or behavioral traits, consisting of hand signature, voice tone, keystrokes and so on. For that reason, those biological traits are specific for each individual. In many situations, face popularity associated technology are turning into extra famous amongst biometric-primarily based totally technology that degree an individual's herbal data. Genetic biometrics has normally used to authenticate and pick out people with the aid of using studying their physical traits, consisting of fingerprint, eye iris, vein etc.*

The goal of this work is to present a Windows-based real-time application system for performing Library Transactions that uses face recognition algorithms. Instead of using a Library card, a camera would take pictures of students' faces while they were performing a library transaction and compare them to photos of the students in the Library's database to verify the student's identity. Local Binary Patterns face algorithms will be used to reduce the impact of light exposure on the system's accuracy.

Key Words*: *Real Time, Facial Recognition, Image Processing

1.INTRODUCTION

Face recognition, also known as biometric systems, is a technology that automatically identifies or verifies a person's identity by analysing facial features and expressions. It is widely used to identify individuals carrying passports and driver's licences, even if they are unaware that a face recognition system is checking their identity autonomously [1, 2]. Face recognition software has numerous applications in the modern world, including computer login using facial verification as a password, gaming, people tagging, security, and so on [3]. The face Detection And recognition Systems and applications on the market have flaws ranging from reliability issues to lower recognition accuracies in specific environments, complicated feature extraction, high setup costs, and performance issues. However, there is a growing demand for a robust Face Recognition System (FRS) that can be used across a wide range of industrial applications, organisations, and the general public.

There have been numerous previous studies on Face Recognition Security Systems, but a robust solution that addresses the shortcomings of the current FRS remains elusive. Eigen Faces and LBP face recognition algorithms were used in this study to develop and implement a Window-based application capable of addressing these challenges and problems. Individually, the LBP algorithm has produced acceptable results. However, the LBP algorithm shows more promise and performs better under different lighting conditions, which affect the recognition process [4]. As a result, it is only logical to use the LBP algorithm to produce superior results.

Library data processing is a task that refers to library systems that are generally small or medium in size. It is used to manage the library using a computerised system in which he or she can record various transactions such as book issue, book return, addition of new books, addition of new students, and so on. The ID Cards with Barcodes are primarily used for user validation when issuing books. Because it is a physical token, it has the potential to be misplaced or misused. We propose incorporating a face recognition technique to validate the user performing the transaction. Figure 1 depicts the architecture for facial image recognition.

2. METHODS AND MATERIALS

2.1 Local Binary Pattern

Extracting valuable characteristics from pre-processed face photos is possible using a variety of techniques. The Local Binary Pattern (LBP) approach is one of these feature extraction methods. In 1996, Ojala et al. [5] developed this relatively novel method. Can be done with LBP characterise a digital image's texture and shape. When an image is broken down into smaller sections, the features can be extracted.(figure.2.1).

Figure 2.1: A pre processed image divided into 64 regions

These characteristics are binary patterns that describe the region's pixels' surroundings. The areas' features are

concatenated into a single feature histogram, which serves as an image representation. The similarity (distance) between the histograms of two images can then be used to compare them. Numerous research [2, 3, 4] indicate that face recognition employing the LBP approach produces excellent results in terms of speed and discrimination performance. Because the texture and structure of images are represented in such a way, the approach appears to be extremely resistant against face photographs with varying facial expressions, changing lighting conditions, image rotation, and person ageing.

2.2 Face Recognition using Local Binary Patterns

We demonstrated how the LBP-method can be applied to images (of faces) to extract features that can be used to calculate the degree of similarity between these images. The basic principle is that the LBP-code is calculated for each pixel in an image. The frequency of occurrence of each potential pattern in the image is tracked. The histogram of these patterns, also known as labels, forms a feature vector and so serves as a representation of the image's texture. These histograms can then be used to calculate the distance between the histograms to determine the similarity between the photos.

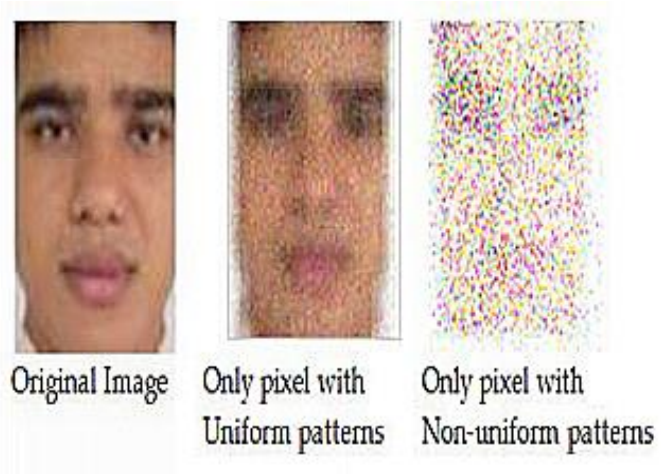

Figure 2.2: Using LBP, a face image is separated into two images: one with only pixels with uniform patterns and one with only pixels with non-uniform patterns.

Figure 2.2 depicts an image that has been divided into two parts: one with only pixels with uniform patterns and one with only pixels with non-uniform patterns. The LBP operator is used to generate these images. It is possible that the image with only pixels with uniform patterns contains a significant number of pixels, namely 99 percent of the original image. As a result, 99 percent of the pixels in the image exhibit consistent patterns (with LBP this is even 99 percent). Another notable feature is that the background is kept by selecting only pixels with consistent patterns. This is due to the fact that the backdrop pixels all have the same colour (the same grey value), and hence their patterns have no transitions. It also appears that many of the pixels surrounding the lips, noise, and eyes (particularly the brows) have consistent patterns.

2.3 The Face Recognition Algorithm

Input: Training Image set.

Output: A feature derived from a face image is compared to the centre pixel, and a recognition with an unknown face image is performed.

1. Set temp = 0

2. WITH RESPECT TO EACH IMAGE I IN THE TRAINING IMAGE SET

3. Initialize the pattern histogram with a value of 0 (H = 0).

4. FOR EACH CENTRAL PICTURE pixel tc, I

5. Determine the pattern label for tc and LBP (1)

6. Increase the volume of the appropriate bin by one.

7. CONCLUSION

8. For each face image, find the highest LBP feature and integrate them into a single vector.

9. Contrast with the image of a test face

3. CONCLUSIONS

Our main goal throughout this effort has been to first identify the student/user using face id, i.e. recognising it first, and then proceed to the library section to handle library transactions such as returning the particular book and issuing a different book.

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