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FINGERPRINT RECOGNITION SYSTEM USING MINUTIAE APPROACH

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ABSTRACT

Fingerprint recognition refers to comparing of the unknown fingerprint with the known fingerprint. As we all know that fingerprint is used in many applications now a days. Sometimes it may not work properly because of comparing the large area of thumb. This also consumes more time to recognize the fingerprint. Quality of the fingerprint extracted may not be good in some cases. These are the major drawback in the present fingerprint recognition system. So here, we use minutiae which can be used as an identification mark for fingerprint verification. Minutiae means the small or precise details of something. As we consider the small part of the finger, the efficiency also increases. This system maintains a database of fingerprints.

If the fingerprints are matched, it displays as "FINGERPRINT MATCHED" and it also displays the details of the person with matched fingerprint.

Another main feature which we added is "IDENTIFICATION OF UNAUTHORIZED PERSON". With this feature we can restrict the persons we need from entering the school, college or home etc.

This fingerprint recognition system not only used for biometric, it can also be used in solving the criminal cases where identification of fingerprint is required. So it's a multipurpose project which is not available in the present market.

I. INTRODUCTION

Here in our project the main object used is a fingerprint of a person. Before going in deep explanation of our project we should know about what is a fingerprint.

A fingerprint is the pattern of ridges and valleys on the surface of a fingertip. The endpoints and crossing points of ridges are called minutiae. It is a widely accepted assumption that the minutiae pattern of each finger is unique and does not change during one's life. Ridge endings are the points where the ridge curve terminates, and bifurcations are where a ridge splits from a single path to two paths at a Y-junction. Figure 1.1 illustrates an example of a ridge ending and a bifurcation. In this example, the black pixels correspond to the ridges, and the white pixels correspond to the valleys.

Figure 1.1: Example of a ridge ending and a bifurcation

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When human fingerprint experts determine if two fingerprints are from the same finger, the matching degree between two minutiae pattern is one of the most important factors. Thanks to the similarity to the way of human fingerprint experts and compactness of templates, the minutiae-based matching method is the most widely studied matching method.

Fingerprints are considered to be the best and fastest method for biometric identification. They are secure to use, unique for every person and does not change in one's lifetime. Besides these, implementation of fingerprint recognition system is cheap, easy and accurate up to satisfiability. Fingerprint recognition has been widely used in both forensic and civilian applications. Compared with other biometrics features, fingerprint-based biometrics is the most proven technique and has the largest market shares . Not only it is faster than other techniques but also the energy consumption by such systems is too less.

So we use fingerprints in our project for two purposes. One purpose is using fingerprints for biometric or attendance purpose. And the other purpose is to find the match between fingerprints to know the details of a person like which police use in solving a criminal case.

Another main feature which we added is "IDENTIFICATION OF UNAUTHORIZED PERSON". With this feature we can restrict the persons we need from entering the the school ,college or home etc.

This fingerprint recognition system not only used for biometric, it can also be used in solving the criminal cases where identification of fingerprint is required. So it's a multipurpose project which is not available in the present market.

Figure 1.2: Fingerprint matching

II. LITERATURE SURVEY

1. Biometrics is the science of recognizing the identity of a person based on the physical or behavioral attributes of the individual such as face, fingerprints, voice and iris. With the pronounced need for robust human recognition techniques in critical applications such as secure access control, international border crossing and law enforcement, biometrics has positioned itself as a viable technology that can be integrated into large-scale identity management systems. Biometric systems operate under the premise that many of the physical or behavioral characteristics of humans are distinctive to an individual, and that they can be reliably acquired via appropriately designed sensors and represented in a numerical format that lends itself to automatic decision-making in the context of identity management.

2. Most automatic systems for fingerprint comparison are based on minutiae matching. Minutiae are essentially terminations and bifurcations of the ridge lines that constitute a fingerprint pattern. Automatic minutiae detection is an extremely critical process, especially in low-quality fingerprints where noise and contrast deficiency can originate pixel configurations similar to minutiae or hide real minutiae. Several approaches have been proposed in the literature; although rather different from each other, all these methods transform fingerprint images into binary images. In this work we propose an original technique, based on ridge line following, where the minutiae are extracted directly from gray scale images. The results achieved are compared with those obtained through some methods based on image binarization. In spite of a greater conceptual complexity, the method proposed performs better both in terms of efficiency and robustness.

3. This paper presents a review on different approaches of Minutiae based verification techniques for fingerprint. In Minutiae matching technique we have an input or a template fingerprint image, then minutiae

are extracted first. After that by applying certain techniques like using metric, minutiae extraction, edge enhancement, matching method based on partial fingerprints, using minutiae score matching, minutiae-based template synthesis etc.As information technologies have advanced greatly in the last few decades, the security problem within a network creates a major problem. For solving this, biometric identification techniques have been given considerable attention. Fingerprint-related techniques, due to their desirable properties, e.g., universality, uniqueness, permanence, perpetuity, collectability, performance, acceptability and particularity, are most widely applied and documented. A minutia matching is widely used for fingerprint recognition and verification. By this review paper we want to compare between various techniques based on minutiae and checks the effectiveness of accuracy fingerprint verification.

4. Thinning is a very important preprocessing step for the analysis and recognition of different types of images. Thinning is the process of minimizing the width of a line, in an image, from many pixels wide to just one pixel (Lam et al., 1992) [3]. Thus Correct and Reliable thinning of character patterns are essential to a variety of applications in the field of document analysis and recognition systems like pattern recognition; finger print recognition etc

5. Biometrics are Personal Identification in Networked Society is a comprehensive and accessible source of state-of-the-art information on all existing and emerging biometrics: the science of automatically identifying individuals based on their physiological or behavior characteristics. In particular, the book covers General principles and ideas of designing biometric-based systems and their underlying tradeoffs Identification of important issues in the evaluation of biometrics-based systems Integration of biometric cues, and the integration of biometrics.

III. PROPOSED METHOD

The proposed Fingerprint recognition System has following features:

1. To find the match between two fingerprints.
2. If fingerprints are matched, details of the matched fingerprint are displayed.
3. We can also use to restrict any person from entering any place(School/college/home).

Fingerprint recognition refers to comparing of the unknown fingerprint with the known fingerprint. As we all know that fingerprint is used in many applications now a days. Sometimes it may not work properly because of comparing the large area of thumb. This also consumes more time to recognize the fingerprint. Quality of the fingerprint extracted may not be good in some cases. These are the major drawback in the present fingerprint recognition system. So here, we use minutiae which can be used as an identification mark for fingerprint verification. Minutiae means the small or precise details of something. As we consider the small part of the finger, the efficiency also increases. This system maintains a database of fingerprints.

In our proposed project, we used ARDUINO UNO for storing the code and for storing the fingerprints in the database. So that we can store some fingerprints and use them which is done in the case of finding a criminals. And it can be used as biometric too as it gives the details of a person when the fingerprints are matched. So our proposed project can be used for two purposes. First purpose is for biometric which can be used to take the attendance of students. The other purpose is to find the criminal using fingerprint matching method. The efficiency of this system is very high as it uses only small part of the fingerprint to identify.

Here in this project we used ARDUINO UNO for dumping the code. Finger print module is used to place the fingerprint for checking. All fingerprints are stored in the database. When we give the power supply the fingerprint recognition system shows the project name on the LCD. Then we can place the fingerprint on the fingerprint module to check for the match with the fingerprints in the database. If the fingerprint is matched with the existing fingerprints in the database then, it shows the details of a matched finger print which can be used in biometric and also criminal case solving purposes.

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IV. BLOCK DIAGRAM

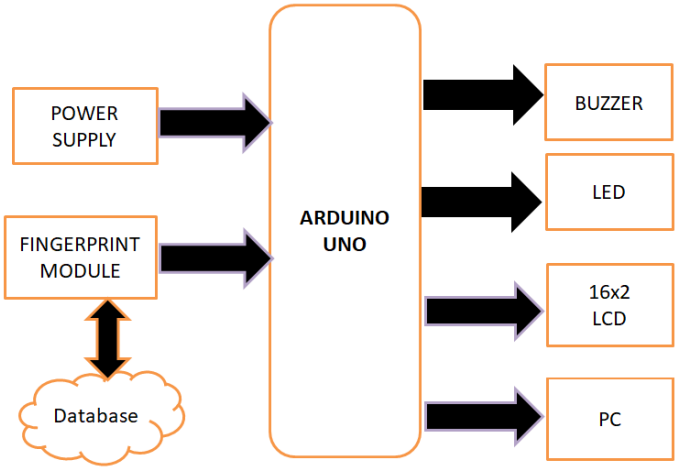

Figure 4.1: Block diagram of fingerprint recognition system

V. WORKING

Here in this project we used ARDUINO UNO for dumping the code. Finger print module is used to place the fingerprint for checking. All fingerprints are stored in the database. When we give the power supply the fingerprint recognition system shows the project name on the LCD. Then we can place the fingerprint on the fingerprint module to check for the match with the fingerprints in the database. If the fingerprint is matched with the existing fingerprints in the database then, it shows the details of a matched finger print which can be used in biometric and also criminal case solving purposes.

VI. RESULTS

Below are the results that are obtained by the fingerprint recognition system.

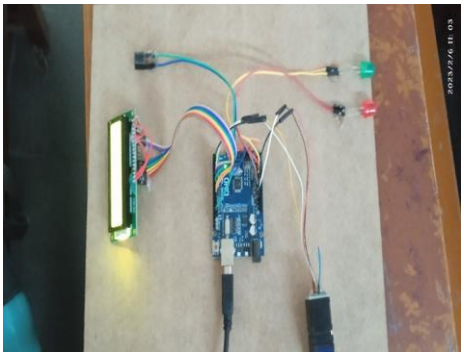

Figure 6.1: Hardware setup

We used ARDUINO UNO for storing the code and for storing the fingerprints in the database. So that we can store some fingerprints and use them which is done in the case of finding a criminals. And it can be used as biometric too as it gives the details of a person when the fingerprints are matched

Figure 6.2: Details of a person when matched

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Figure 6.3: Details of student when matched

If the fingerprints are matched, the details of the person whose finger print is match are displayed on the LCD. If the fingerprints are not matched, the details of the person will not be displayed on the LCD. Above shown figures can be used as either biometric or in solving criminal cases. The above images are the outputs of our proposed project. It consists of details of the person whose fingerprint is matched. The details can be changed while we are enrolling. Here we enrolled for biometric purpose and given our name, section, and roll number as details of a person. If we use same system for biometric purpose, we can add other details like person name, phone number, address etc. Along with the LCD, we also used LED's and buzzer. Here we used two LED's one is red and one is green. Red LED glows when an unauthorized person fingerprint is recognized. Green LED glows when authorized person fingerprint is recognized. Buzzer works along with red LED. Buzzer sounds when an unauthorized person fingerprint is recognized. All the fingerprints are stored in the database of a fingerprint module. This system recognizes the fingerprints which are available in the database and tell us whether the given fingerprint is matched with the existing fingerprints or not.

VII. CONCLUSION

This project has higher efficiency compared to that of the projects that are available in the market. We can use only small part of the finger (50% of thumb impression) to verify a fingerprint which is available in the database. Another main feature which we added is "IDENTIFICATION OF UNAUTHORIZED PERSON". With this feature we can restrict the persons we need from entering the school, college or home etc. This fingerprint recognition system not only used for biometric, it can also be used in solving the criminal cases where identification of fingerprint is required.

VIII. FUTURE SCOPE

In this project we used only 50% of the fingerprint for recognition which improved the efficiency. Further it can be developed in the case of efficiency by taking 30-40% of the fingerprint for recognition.

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