

3-D Hand Geometry Attendance System Based On Recognition System for User Authentication

Shweta Naik¹ Kashish Gour² Aniket Thorat³ Tauqeer Khan⁴ Prof. Rekha Kotwal⁵

^{1,2,3,4,5}JSPM's Bhivarabai Sawant Institute of Technology and Research, India

Abstract— Biometrics which can be used for identification of individuals based on their physical or behavioral characteristics has gained importance in today's society where information security is essential. Hand geometry-based biometrics systems are gaining acceptance in low to medium security applications. Hand geometry-based identification systems utilize the geometric features of the hand like length and width of the fingers, diameter of the palm and the perimeter. The proposed system is a verification system which utilizes these hand geometry features for user authentication. This project introduces an inexpensive, powerful and easy to use hand geometry based biometric person authentication system. One of the novelties of this work comprises on the introduction of hand geometry's related, position independent, feature extraction and identification which can be useful in problems related to image processing and pattern recognition.

Keywords: Biometric, Sensor, Hand-Geometry, Authentication, Verification

I. INTRODUCTION

Biometrics authentication is the ideal solution to the security requirements. Not only it is much more user friendly than remembering a number of passwords or carrying around a card, but it is something that cannot be stolen or cracked. The biometric authentication systems use human traits which are unique to the individual and neither is stolen nor duplicated. Biometrics authentication is truly the future of personal identification. Hand geometry based biometry systems exploit features on the human hand to perform identity verification. Due to limited discriminatory power of the hand geometry features, these systems are rarely employed for applications that require performing identity recognition from a large scale database. Nevertheless, these systems have gained immense popularity and public acceptance as evident from their extensive deployment for applications in access control, attendance tracking and several other verification tasks.

As for system development and implementation, it should be able to help the lecturers to managing their student attendance systematically. The system must have database that contains student information and it must be able to help lecturer to manipulate data, update database, alert lecturers accordingly, and also nice interface to make it easier to use. Finally, the attendance system must be user friendly for commercial purpose. This system will regulation about attendance to class, and implement it to develop the system that will do all the attendance management automatically.

II. HAND GEOMETRY APPLICATIONS

Hand geometry recognition security systems is current among the most widely used biometric technology, it can be used in any application requiring the unique verification of individuals, including time and attendance applications (i.e.,

tracking when an individual enters and exits a location), or access control applications. Below are some applications of hand geometry based verification system.

A. Cash Vault Applications

A cash vault mantrap has two door and entry and exit, and a hand scanner inside verifies the entrants. Number of people entering from the public side of mantrap is recorded by a personnel counter and a programmable logic controller reports the count to the hand scanner which must match the number of people using the scanner.

B. Dual Custody Applications

In dual custody access control, two different people must verify before the scanner sends an output. Dual custody concept is common in physical security, has several variations and can be translated easily to hand scanner electronic access control.

C. Anti-pass Back

A common access control function in which a user is prevented from passing a card to an accomplice. Anti-pass back seems redundant for hand scanner applications as its difficult at best to pass a hand.

D. Time and Attendance

The first hand geometry time and attendance installations used hand scanners connected to a printer or access control software to record users' arrival and departure. This required manual sorting of event data, though some "computer savvy" managers exported event data files to spreadsheet programs where they could sort and calculate the data.

E. Point of Scale Applications

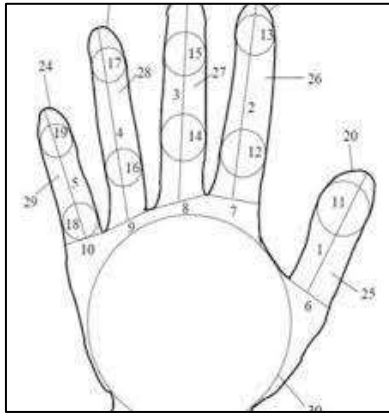
For the purpose of identity verification, point of scale application is used, like debit systems are becoming more common in our everyday lives as we move toward being cash less society.

F. Interactive Kiosk

Hand scanners have found broad applications in the interactive kiosks. A host computer maintains user files and interacts with the user through a touch screen monitor or keyboard. It checks that user is valid or not, if yes, monitor displays a menu of choices from which the user may select. The interactive kiosk communicate.

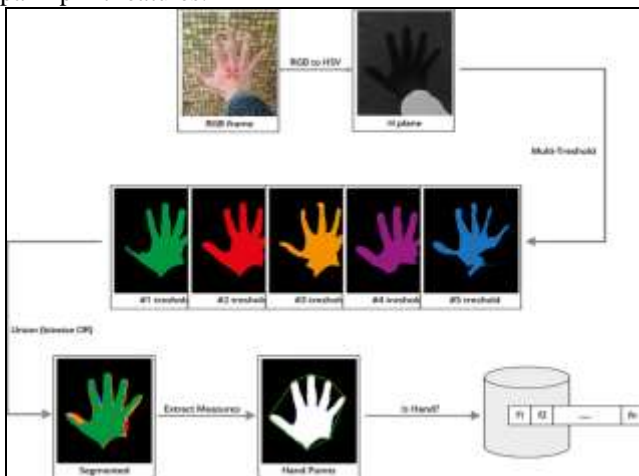
G. Hand Gestures

Gesture recognition is a mathematical interpretation of a human motion by a computing device. Gesture recognition, along with facial recognition, voice recognition, eye tracking by commonly originate from faces or hands. Hand gestures are popular in many kinds of applications, such as education, entertainment, games, computer controls and so on.



H. Extracting of hand geometry images features.

The hand geometry images can be extracted from a hand image in a single shot at the same time. Unlike other multi-biometrics systems (e.g., face and fingerprint, voice and face, etc.), a user does not have to undergo the inconvenience of passing through multiple sensors. Furthermore, the fraud associated with fake hand, in hand geometry based verification system, can be alleviated with the integration of palm print features.



I. Registration Procedure

Registration in a hand geometry recognition system is the process by which a record or template of the individual's hand geometry is established. Live scans are compared to this template when a user attempts to access an asset. If the live scan matches the template, the user is given access to that asset. To register in hand geometric, the candidate's hand is placed palm down on the reader's surface. The placement of the hand is aided by pins that serve as guides to correctly orient the hand and fingers for the camera. The camera then takes an image of the hand and stores it. The unit's internal processor and software convert the image of the hand to a mathematical representation, which is then compressed by an algorithm and stored as the user's template. The template may reside in the biometric unit's internal memory, in a centralized database of users, or on other media, such as on a smart card or a hard disk. Registration process involves one of the following two tasks: (i) Add a new user to the database; (ii) Update a current user's feature vector.

J. Advantages of Hand Geometry Biometrics

- Simple, relatively easy to use and inexpensive
- Hand geometry data is easier to collect, unlike the fingerprints where a good frictional skin is required by imaging systems, and retinal data where special lighting is required
- Environmental factors, such as, dry weather that causes the drying of the skin is not an issue.
- Usually considered less intrusive than fingerprints, retinal, etc.
- Does not significantly change after ageing.

III. CONCLUSION

This project has presented a new approach to achieve more reliable personal authentication using simultaneous extraction and combination of 3D and 2D hand geometry features. The proposed system acquires hand images in a contact-free manner to ensure high user friendliness and also to address the hygienic concerns. Simultaneously acquired range and 2D images of the hand are processed for the feature extraction and matching. We introduced two new representations, namely finger surface curvature and unit normal vector, for 3D hand geometry based biometric measurement. Simple and efficient metrics are proposed for the matching of pair of 3D hand images. Match scores from 3D and 2D hand geometry matchers are combined to obtain a highly reliable authentication system. Our research also suggests that significant performance improvement can be achieved by combining hand geometry information extracted from user's 2D and 3D hand images.

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