IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 1, February 2023
Impact Factor: 7.301

Identity Verification using Geometry of Human Hands

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Abstract: *Biometrics which can be used for identification of individuals based on their physical or behavioural 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. Today students' (class) attendance became more important part for any organizations/institutions. The conventional method of taking attendance by calling names or signing on paper is very time consuming and insecure, hence inefficient. This paper presents the manual students' attendance management into computerized system for convenience or data reliability. So, the system is developed by the integration of ubiquitous computing systems into classroom for managing the students' attendance using palm print scanner. The system is designed to implement an attendance management system based on palm print scanner which students need to use their palm to success the attendance where only authentic student can be recorded the attendance during the class. This system takes attendance electronically with the help of the webcam, and the records the attendance in a database. Students' roll call percentages and their details are easily seen via Graphical User Interface (GUI).*

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

I. INTRODUCTION

The renewed interest in digital identity of people has opened up several areas of biometric analysis which in the past received less attention. These areas include hand geometry,3D geometry and analysis of finger structures. Many characteristics of human beings are used for identification of which fingerprints, voice and face have been the most prominent. Electronic methods also use voice, face, iris and hand features to provide unique keys for people identification. Machines are very limited in terms of their capability to recognise human beings from their hands alone. This limitation is human limitation in the representation and selection of appropriate features. Fingerprint features have been used for decades and biometrics systems based on fingerprints and face features have been in the market the last few years and are gradually gaining acceptance. Despite acceptance of fingerprint access systems, the management of digital identity across distributed networks require more than one metric to provide high identification reliability and low failure rate authentication. In real life, many of the bio metric systems can be defeated. Therefore, the more the number of biometrics applied for identification of a subject, the better the reliability of the system and certainty of recognition. 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..The hand shape and hand geometry only requires the contour of the hand as input. It provides more flexibility to the users and also the number of points to be processed (i.e. only contour points) becomes small which decrease the time complexity of the algorithm. The main problem with the hand shape and

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hand geometry is that the hand contour can differ too much with the movement of the fingers which is solved in this paper by adopting the finger registration concept.

II. LITERATURE SURVEY

Paper Name: Human Palm Geometry Modelling for Biometric Security Systems
Author: Johnson I Agbinya
Abstract: Palm print modelling and recognition systems have been extensively studied. Palm shape or palm geometry has had lesser attention paid to its study because of the difficulties associated with shape definitions and modelling. This paper reports on experimental determination of human palm geometry equations. Experimental determination of human palm geometry was undertaken using measurements of hands of 14 subjects drawn from a mixture of racial and gender backgrounds. By also analysing scanned images of their hands, characteristic measurements of their palms were determined. Characteristic expressions describing the geometry of human hands are proposed. The equations are based on measurements of various parts of the hand cross a broad spectrum of female and male representatives of various ethnic groups. They describe the relationships between the lengths of the hands and their perimeters at the finger tips and the base of the fingers. The relationships lead to a unique expression called the hand geometry equation

Paper Name: ”An Augmented Reality Application with Hand Gestures for Learning 3D Geometry. ”
Author: Hong-Quan Le, Jee-In Kim.
Abstract: Geometry is an interesting area of mathematics. It opens to many different approaches and closely relates to our everyday lives. However, when students recall their experiences of learning geometry, many of them regards it as not only unpleasant experiences but often also difficult experiences. The traditional materials and tools such as pens, papers, blackboards, textbooks and/or classical methodologies like drawing, narrative teaching stills cannot be regarded as a great support for students who learn geometry. In this paper, we propose a framework for learning geometry using a software tool based on augmented reality (AR) [1] and hand gestures recognition technologies [2]. These technologies are combined into a system that can address some current issues in geometry education and provide students with an easier way for studying geometry.

III. SYSTEM ARCHITECTURE

To achieve:

- To compare the features of the test image with the data already present on the database
- To detect the valley and tip point of the image of a hand;
- To extract the features from the hand image;
- To extract depth information from the 3D image;
- To show the decision of the system whether the owner of the test image is a valid user of the system or not.

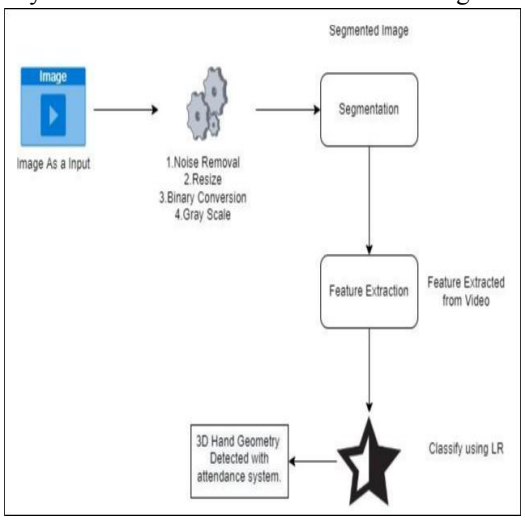

Fig: System Architecture

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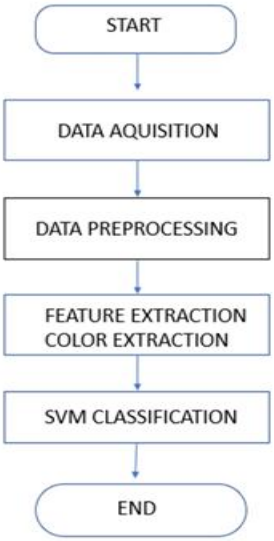

3.1 Algorithms

A supervised machine learning approach called Support Vector Machine (SVM) is used for both classification and regression. An approach for supervised learning called support vector regression is used to forecast discrete values. The SVMs and Support Vector Regression both operate on the same theory. Finding the optimum fit line is the fundamental tenet of SVR. The hyperplane with the most points in SVR is the one that has the best fit line.

IV. MOTIVATION

- Material that is clearly discriminatory. (Includes both 2-D and 3-D features).
- A sanitary contactless approach.
- Performance gains.
- Hard to counterfeit or fake.
- To reduce the time spent taking student attendance.

V. CONCLUSION

Through simultaneous extraction and combining of 3D and 2D hand geometry information, this project has introduced a novel method to achieve more trustworthy personal verification. To achieve high usability and to address hygiene issues, the proposed method captures hand photographs without any physical contact. For feature extraction and matching, simultaneously collected range and 2D images of the hand are processed. For 3D hand geometry based biometrics, we presented two novel representations: finger surface curvature and unit normal vector. measurement. The matching of two 3D hand photographs is proposed using straightforward and effective measures. A very trustworthy authentication system is created by combining the match results from 3D and 2D hand geometry matchers. Our research also indicates that merging hand geometry data from users' 2D and 3D hand photos can result in a noticeable performance boost. We talked about how to assess student attendance. A pilot study shows that a teacher can categorise every student's attendance based on their use. Any teacher can utilise the records to create graphs for their own purposes.

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