A SURVEY ON 3-D HAND GEOMETRY WITH ATTENDANCE SYSTEM BASED RECOGNITION SYSTEM FOR USER AUTHENTICATION USING IMAGE PROCESSING

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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).

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 is neither 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.   LITERATURE SURVEY

1. Title: Human Palm Geometry Modeling for Biometric Security Systems [2019] [1]

Author: Johnson I Agbinya

Description: - — 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. Methodology: - Describes the relationships between the lengths of the hands and their perimeters at the fingertips and the base of the fingers. Characteristic expressions describing the geometry of human hands are proposed. 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, palm print and analysis of finger structures.

2. Title: FAST LIFTING FOR 3D HAND POSE ESTIMATION IN AR/VR APPLICATIONS [2018] [2]

Author: Onur G. Guleryuz and Christine Kaeser-Chen Daydream

Description: - . The observation leads to a look-up table-based formulation that instantaneously determines finger poses without solving constrained trigonometric problems. The result is a fast algorithm running super real-time on a single core. When hand bone lengths are unknown technique estimates these and allows smooth AR/VR sessions where a user's hand is automatically estimated in the beginning and the rest of the session seamlessly continued. Methodology: - The System propose a simple model for the human hand skeleton that is conveniently parametrized for quick estimation. Which provide a lifting algorithm that predicts 3D world coordinates of input 2D camera-plane key points. The 3D hand poses generated by algorithm are compliant with human hand skeletal constraints and with perspective projection constraints. Paper shows that ambiguities related to lifting do not significantly impact the palm under typical poses and likewise affect the finger key points in application wise less consequential poses. Further shows that localization errors for finger-tips serve as a convenient proxy for localization errors for other joints.

3. Title: Hand geometry and palm print-based authentication using image processing [2020] [3]

Author: Laura Guly´as Oldal, Andr´as Kov´acs

Description: - The paper proposes a method for contactless hand geometry and palm print based authentication. The proposed method uses simple image processing algorithms and geometric relations for key point detection and palm image extraction. Methodology: - The proposed method uses simple image processing algorithms and geometric relations for detecting the key points of the hand. The process consists of banalization of hand image with dynamic threshold, followed by noise removal. Subsequently, one-pixel thick edges of the hand are detected using erosion, a morphological operation and subtraction. The proposed method offers a hand key point detecting solution, which would require minimal additional effort for rotation invariance support. The prerequisite of vertical hand orientation is only needed for the final steps of key point detection, as the fingertips and finger valleys are determined by the vertical position of points selecting local maxima and minima.. The measurements calculated for authentication are finger lengths, palm area, finger proportions, and the middle finger length

4. Title: Hand Geometry Based Person Verification System. [2018] [4]

Author: Md. Khaliluzzaman, Md. Mahiuddin, Md. Monirul Islam

Description: - The paper presents a biometric system for person verification based on the hand geometric features. The hand geometric features are extracted from the upper palm including four fingers of the right hand. The main aim of this proposed system is to reduce the feature and database size and improve the performance of the system Methodology: - A Hand geometry feature based person identification method is introduced in 2009. Where, features are extracted from hand through image processing and the features are recognized by utilizing machine learning approach

i.e., artificial neural network (ANN). This method increases the success rate by using complete distance and graph theory based nearest neighbor algorithm. 15 features are extracted from right hand's fingers width, area, as well as circumference. Features are classified through the absolute and Euclidean distance. On the other hand, 14 distinct features are utilized to identify the person uniquely.

5. Title: Real-time 3D Hand Gesture Based Mobile Interaction Interface [2019] [5]

Author: Yunlong Che, Yuxiang Song, Yue Q

Description: - Hand gesture recognition is a challenging problem for natural human computer interaction(HCI). Paper address this problem by introducing a real-time human mobile interaction interface with a depth sensor. The interface consists of two components, 3D hand pose estimation and hand skeleton state based gesture description. Firstly, it propose a 3D hand pose estimation method that combines learning based pose initialization and physical based model fitting, which can estimate the per-frame's hand pose that appears in the depth camera's field of view. Methodology: - Hand gesture based interaction interface plays an important role in augmented/ virtual reality(A/VR) applications. Previous works focus on RGB, while it is sensitive to illumination and complicated background. With the advent of consumer depth cameras, a variety of depth based methods have been proposed to solve these tasks, and these methods are more robust and fast. However, flexible hand gesture based interaction still faces severe difficulties, mainly because current works have relatively high computation complexities and need GPUs or high-end CPUs, which is unrealistic for mobile devices with low-end CPUs. Therefore, it is very important to design a real-time robust hand gesture based interaction interface with low computation. Based on the above considerations and inspired by the recent work, the propose a real-time hand gesture based interaction interface for interacting with virtual objects on AR mobile devices. Unlike current works which only focus on gesture classification or pose estimation, we estimate more information of the hand(including the states of fingers and palm), and recognize the.
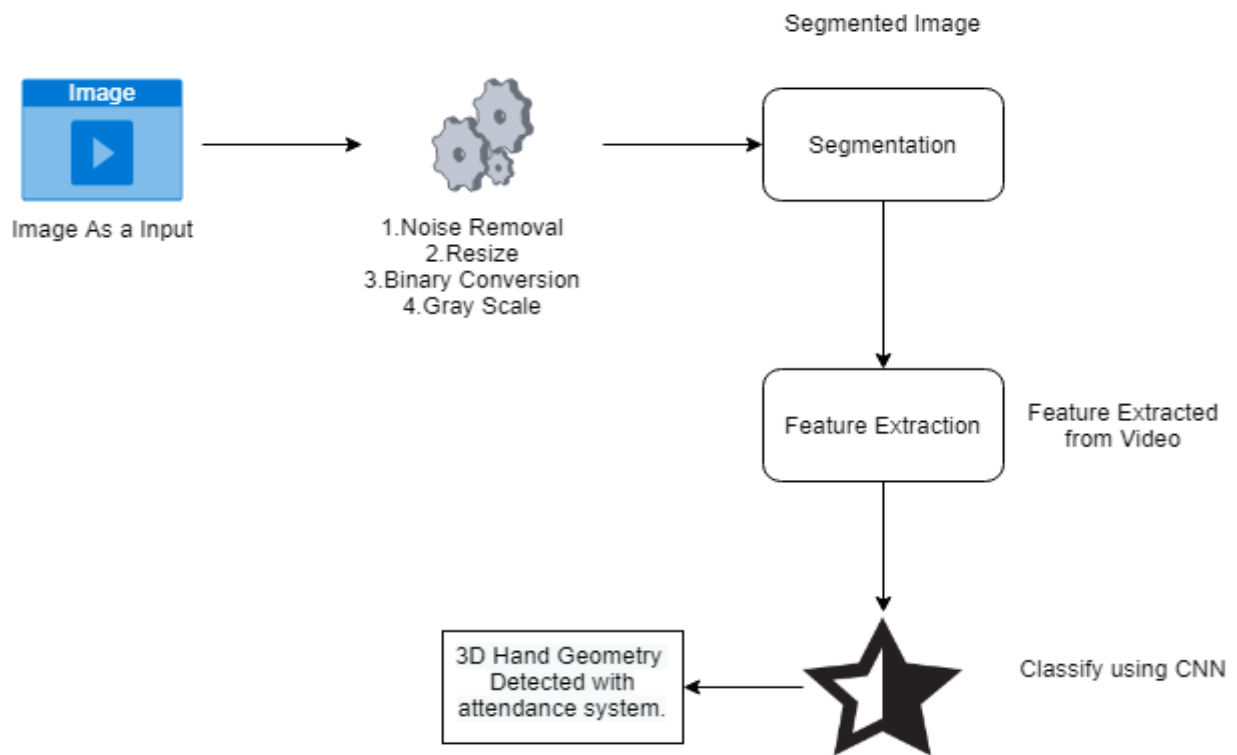
Fig.1: System Architecture

III. OBJECTIVES

- 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 compare the features of the test image from the data existing on the database;
- To show the decision of the system whether the owner of the test image is a valid user of the system or not.

IV. 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. we discussed the way to measure the attendance of students. A preliminary experiment demonstrates a teacher can classify any student's attendance according to their use. Any teacher can take the records and generate graph according to their use.

Acknowledgment

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