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3-D Hand Geometry Based Recognition System

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ABSTRACT:

In today's culture, when information security is crucial, biometrics, which may be used to identify people based on their physical or behavioural features, have acquired relevance. Biometrics systems based on hand geometry are becoming more popular in low- to medium-security applications. Identification methods based on hand geometry make use of the geometrical characteristics of the hand, such as the length and width of the fingers, the diameter of the palm, and the perimeter. These hand geometry attributes are used in the suggested system, a verification system, to authenticate users. This project develops a hand geometry-based biometric person authentication system that is affordable, effective, and simple to use. The introduction of hand geometry-related, location independent, feature extraction and identification is one of the peculiarities of this work.

Keywords: CNN(convolutional neural network),SVM (support vector machine),SVR(support vector regression),VR(virtual reality),AR(augmented reality).

Introduction:

The best answer to the security needs is biometric authentication. In addition to being far easier to use than carrying about a card or remembering many passwords, it is also something that cannot be stolen or cracked. The biometric authentication methods rely on human qualities that are individual to each person and cannot be copied or stolen. The future of personal identification is undoubtedly biometric authentication. Systems based on hand geometry and biometry use characteristics of the human hand to verify identity. These techniques are rarely used for applications that require conducting identity identification from a large scale database due to the low discriminatory strength of the hand shape features. Nevertheless, as seen by their widespread implementation, these systems have greatly increased in popularity and public acceptability.

Literature Survey

The article is titled "Reconstructing 3D Shapes From Multiple Sketches Using Direct Shape Optimizatio." Matthias Zwicker, Yu-Shen Liu, Baorui Ma, and IEEE member Zhizhong Han. to contrast the test image's attributes with information already in the database. In order to demonstrate how the system determines whether the owner of the test image is a legitimate user of the system or not. Hand geometry is the Simple and comparatively simple to use. Inexpensive. Typically regarded as being less invasive

than fingerprint, retinal, etc. The skin drying effects of environmental variables like dry weather are not a problem. Through the simultaneous extraction and fusion of 3D and 2D hand geometry data, a novel method for achieving more trustworthy personal authentication has been demonstrated in this project. Our research findings demonstrate

Modeling of the Human Palm Geometry for Biometric Security Systems Agbinya Johnson I. 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. The resurgence of interest in people's digital identities has made numerous previously understudied aspects of biometric analysis more accessible. These fields include the analysis of finger structures, 3D geometry, and hand geometry. There are many aspects of a person that can be used to identify them, but fingerprints, voice, and face have received the most attention. Characteristic measures of their palms were also obtained by examining scanned photographs of their hands.

In AR/VR applications, "FAST LIFTING FOR 3D HAND POSE ESTIMATION" Onur G. In addition to using voice, face, iris, and hand characteristics, electronic technologies also use them as unique keys for identifying persons. The ability of machines to identify humans just based on their hands is relatively restricted. 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 biometric measurement, we presented two new representations, namely finger surface curvature and unit normal vector. A look-uptable-based formulation based on this finding can instantly determine finger postures without having to solve limited trigonometric problems.

An augmented reality tool for learning 3D geometry is called "Hand Control AR." Yue Liu1 Rui Cao1 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. This paper proposes an interactive AR system that enables students to naturally and directly manipulate 3D objects through hand gesture-based interactions and intuitively explore the spatial relationship between spheres and polyhedrons, taking into account that augmented reality (AR) provides an intuitive way to learn geometry. to maintain a database for official records via security-related profiling of citizens. It can function as a mechanism for access control.

Using mechanical rotation, haptic rendering of 3D geometry on a 2D touch surface Byun Kil Han and Seung-Chan Kim, both IEEE members. 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 biometric measurement, we presented two new representations, namely finger surface curvature and unit normal vector. The matching of two 3D hand photographs is proposed using straightforward and effective measures.

Artificial Intelligence:

Artificial intelligence is the simulation of human cognitive processes by technology, particularly computer systems. Some of the particular uses of AI include speech recognition, expert systems, machine learning, and natural language processing. Making it possible for computers and other devices to carry out cognitive tasks like problem-solving, decision-making, perception, and understanding human communication is the primary aim of artificial intelligence (AI). By creating and implementing algorithms in a dynamic computing environment, artificial intelligence (AI) lays the groundwork for replicating the functions of human intelligence. AI is an effort to mimic human thought and behaviour in computers.

PROPOSED METHODOLOGY

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.

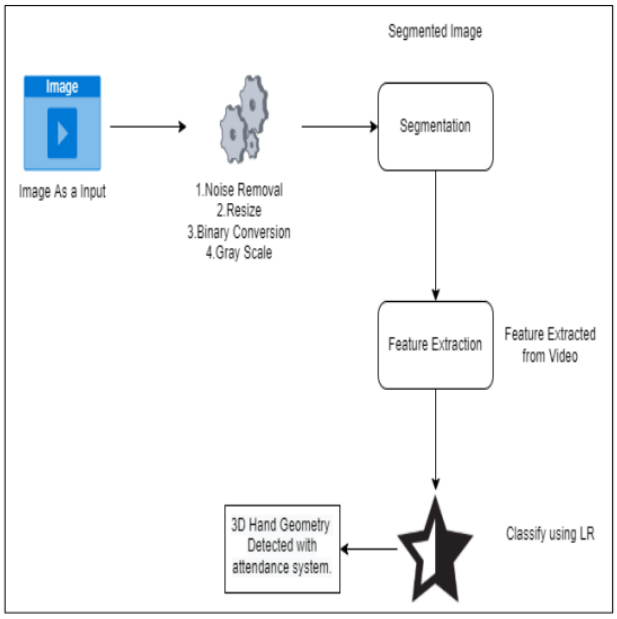
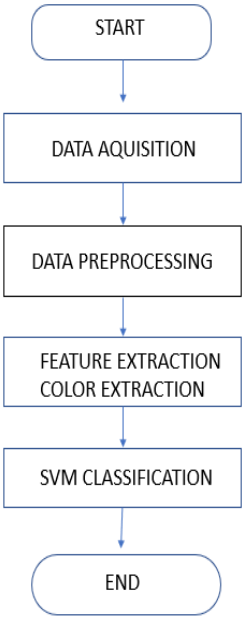


Fig 1.1 Proposed System Architecture

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.



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.

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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