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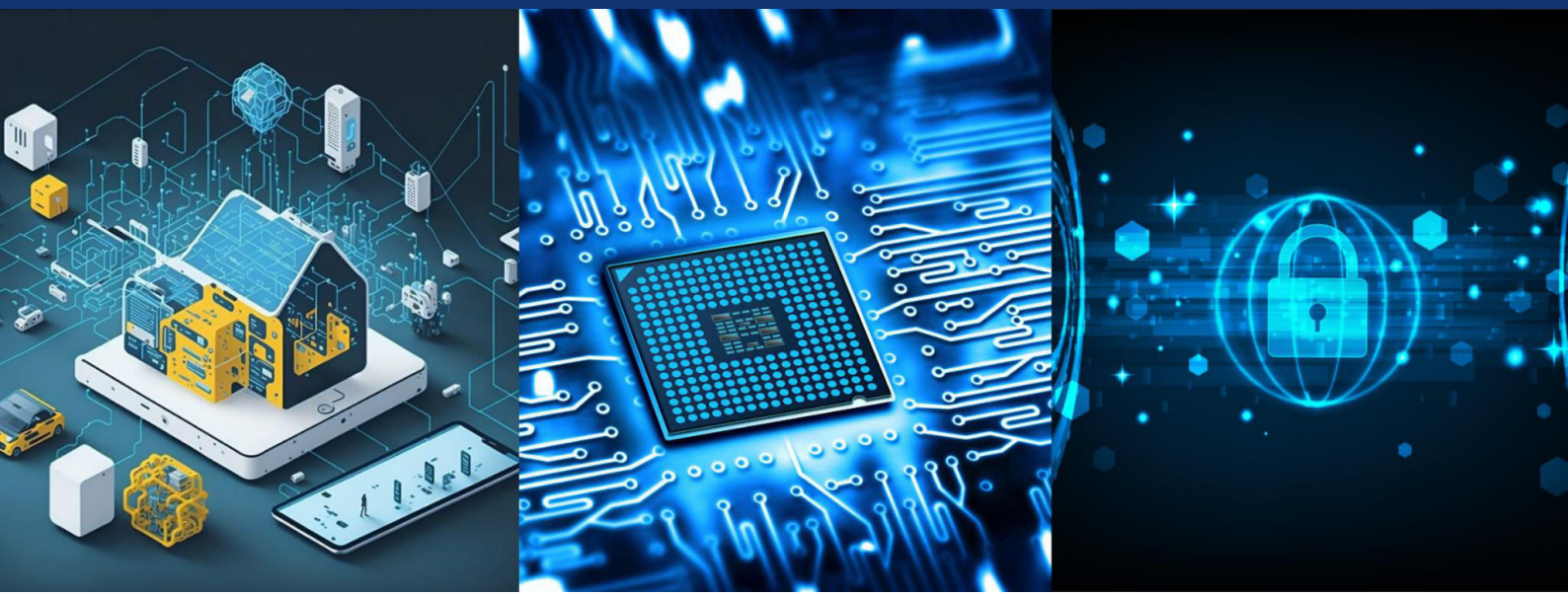

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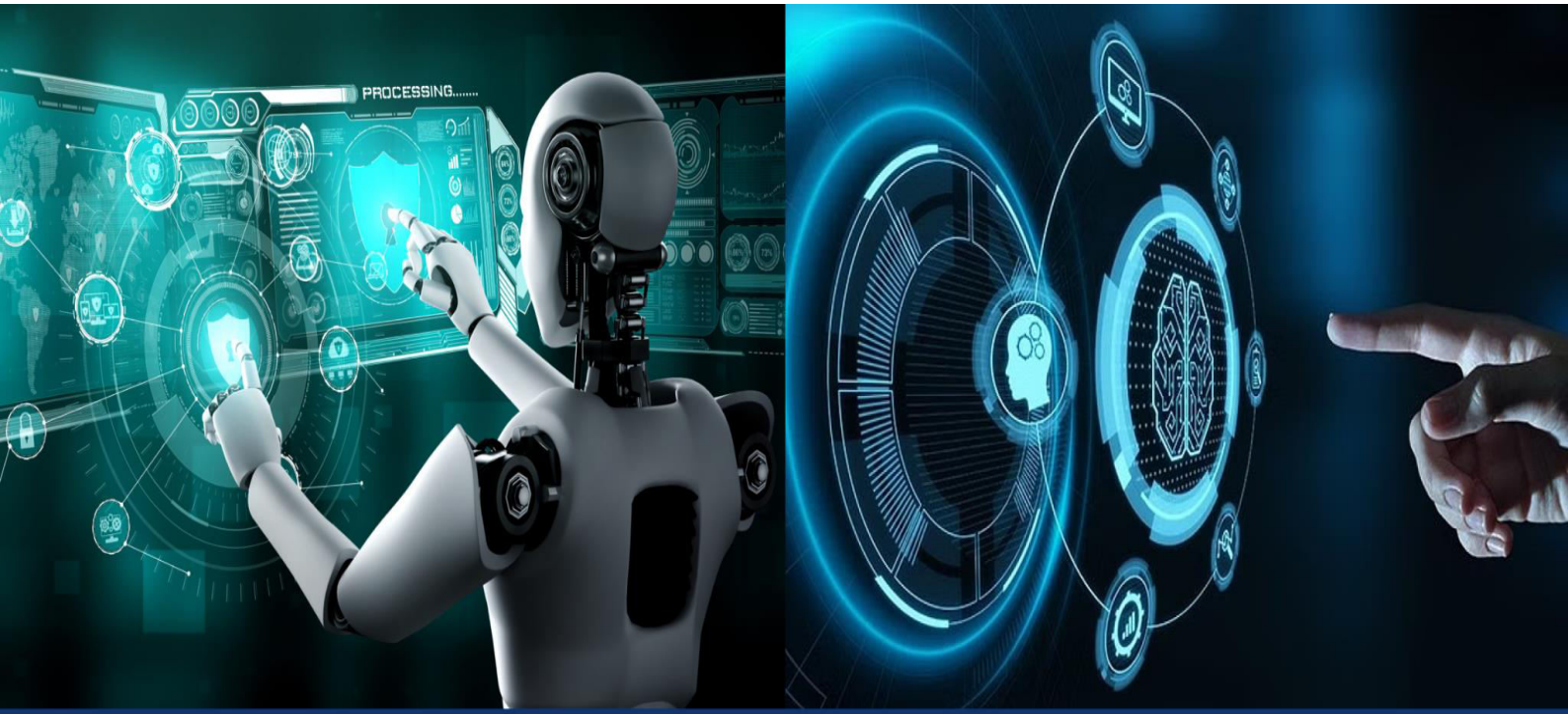

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User Authentication Based on Face and Periocular Regions using Deep Learning Algorithm

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ABSTRACT: The use of biometric for identification purposes requires that a particular biometric factor be unique for each individual that it can be calculated, and that it is invariant over time. Biometrics such as signatures, photographs, fingerprints, voiceprints and retinal blood vessel patterns all have noteworthy drawbacks. Although signatures and photographs are cheap and easy to obtain and store, they are impossible to identify automatically with assurance, and are easily forged. Human iris on the other hand as an internal organ of the eye and as well protected from the external environment, yet it is easily visible from within one meter of distance makes it a perfect biometric for an identification system with the ease of speed, reliability and automation. Iris recognition is regarded as the most reliable and accurate biometric identification system available.

Iris recognition is an automated method of biometric identification that uses mathematical pattern-recognition techniques on images of the irises of an individual's eyes, whose complex random patterns are unique. In this work it is proposed to implement a face and iris recognition system, where Grassmann algorithm, Gabor filter and deep neural network is used to segment the face, eye and iris region. A template of the detected region is created using template matching for recognition is based on features in real time enrolment system. The results shows that the proposed method is efficient for multimodal based biometric recognition.

I. INTRODUCTION

Biometrics refers to metrics related to human characteristics. Biometrics authentication (or realistic authentication) is used in computer science as a form of identification and access control. It is also used to identify individuals in groups that are under surveillance. Biometric identifiers are then distinctive, measurable characteristics used to label and describe individuals. Biometric identifiers are often categorized as physiological versus behavioural characteristics. Physiological characteristics are related to the shape of the body.

Examples include, but are not limited to fingerprint, palm veins, face recognition, DNA, palm print, hand geometry, iris recognition, retina and odour/scent. Behavioral characteristics are related to the pattern of behavior of a person, including but not limited to typing rhythm, gait, and voice. Some researchers have coined the term behavior-metrics to describe the latter class of biometrics.

More traditional means of access control include token-based identification systems, such as a driver's license or passport, and knowledge-based identification systems, such as a password or personal identification number. Since biometric identifiers are unique to individuals, they are more reliable in verifying identity than token and knowledge-based methods; however, the collection of biometric identifiers raises privacy concerns about the ultimate use of this information

Many different aspects of human physiology, chemistry or behavior can be used for biometric authentication. The selection of a particular biometric for use in a specific application involves a weighting of several factors. And identified seven such factors to be used when assessing the suitability of any trait for use in biometric authentication.

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First, in verification (or authentication) mode the system performs a one-to-one comparison of a captured biometric with a specific template stored in a biometric database in order to verify the individual is the person they claim to be. Three steps are involved in the verification of a person. In the first step, reference models for all the users are generated and stored in the model database. In the second step, some samples are matched with reference models to generate the genuine and impostor scores and calculate the threshold. Third step is the testing step. This process may use a smart card, username or ID number (e.g. PIN) to indicate which template should be used for comparison. 'Positive recognition' is a common use of the verification mode, "where the aim is to prevent multiple people from using the same identity".

II. SYSTEM ANALYSIS

Existing System:

Using the periocular region to perform biometric recognition has recently gained popularity. By acquiring a region that is similar to that used by iris recognition systems, the key insight is to use not only the discriminating information inside the iris, but also all of the textures from the skin near the eye as well as the shape of the eyelid, the eyebrow and the eyelashes. Over the past few years, identity verification based on facial or eye features has gained a lot of prominence. Several works in literature have suggested novel features and classification techniques that can be used in the case of both these modalities in order to improve their performance. However, most of these approaches work under the implicit assumption that we are able to capture either a very good quality iris image (in the case of iris recognition) or that we are able to capture the entire face of the subject (in the case of face recognition). In such cases it would be very useful to investigate the viability of using only certain portions of the face as a biometric. Specifically, we consider the periocular region of the face, which is rich in texture - eyebrows, eye folds, eyelid contours, amongst others. This could be useful for instance when the person is wearing a mask where he/she exposes only the eyes, or if harsh illumination conditions expose features only in certain portions of the face. Ocular biometrics has made rapid strides over the past few years primarily due to the significant progress made in iris recognition.

Limitations:

Difficult to predict the iris without the advance scanners and we have some difficulty in the Iris features can't extract at the time of degradation factors and the Accuracy can be less at recognition time ,the Complexity is very high

Proposed System:

Multi-modal biometrics is systems that are capable of using more than one physiological or behavioral characteristic for enrollment, verification, and identification. Human identification based on multi-modal biometrics is becoming an emerging trend, and one of the most important reasons to combine different modalities is to improve recognition accuracy. There are additional reasons to combine two or more biometrics such as the fact that different biometric modalities might be more appropriate for unique deployment scenarios or when security is of vital importance to protect sensitive data. Some of these limitations can be addressed by deploying multimodal biometric systems that integrate multiple biometric modalities in a single scan to alleviate the challenges of a uni modal system. First, we form a tangent space from a set of perturbed images and observe that the tangent space admits a vector space structure. Second, we embed the approximated tangent spaces on a Grassmann manifold and employ a chordal distance as the means for comparing subspaces. The matching process is accelerated using a course to fine strategy. Recently periocular biometrics has drawn lot of attention of researchers and some efforts have been presented in the literature. In this project, we propose a novel and robust approach for periocular recognition. In the approach face is detected in real time face images which is then aligned and normalized. We utilized entire strip containing both the eyes as periocular region. For feature extraction, we computed the magnitude responses of the image filtered with a filter bank of complex Curvelet transform algorithm. Feature dimensions are reduced by applying Grassmann algorithm. The reduced feature vector is classified using Back propagation neural network. The experimental results demonstrate a promising verification and identification accuracy; also, the robustness of the proposed approach is ascertained by providing comprehensive comparison with some of the well-known state-of-the-art methods.

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Expected Merits:

It can provide the High level security and this can be works on the Real time camera-based implementation and it can read multiple features at the time, it provides the high level accuracy

III. SYSTEM REQUIREMENTS

Hardware Requirements:

- System : Intel core processor 2.6.0 GHZ
- Hard disk : 160 GB
- Monitor : 15 Inch Color Monitor
- RAM : 1 Gb
- Keyboard : Standard Keyboard

Software Requirements:

- Operating System : Windows OS
- Front End : Python
- Back End : MY SQL
- IDE : PYCHARM

Software Description:

PYTHON:

Python is a high-level, interpreted programming language that is widely used in various domains such as web development, scientific computing, data analysis, artificial intelligence, machine learning, and more. It was first released in 1991 by Guido van Rossum and has since become one of the most popular programming languages due to its simplicity, readability, and versatility.

MYSQL:

MySQL is an open-source relational database management system (RDBMS) widely used for managing and storing structured data. It is based on the Structured Query Language (SQL) and supports a wide range of applications, from small-scale projects to large, complex enterprise systems.

PYCHARM :

PyCharm has a highly customizable user interface, allowing users to tailor the IDE to their specific needs and preferences. This includes customizing the color scheme, key mappings, and even the appearance of the code editor. PyCharm also supports various plugins and extensions, enabling users to add new functionality to the IDE or integrate with external tools and services. In addition to its development features, PyCharm also includes tools for project management, such as version control integration with Git, Mercurial, and Subversion. It also provides support for task management and issue tracking through integration with tools like Jira and Trello. PyCharm has a strong focus on code quality and maintainability, providing tools for code inspections, unit testing, and code coverage analysis. This can help developers catch errors and ensure that their code is maintainable and scalable over time. PyCharm also supports multiple Python versions and virtual environments, allowing users to switch between different versions of Python or create isolated environments for different projects. This can help ensure compatibility and prevent version conflicts between different projects. Overall, PyCharm is a comprehensive IDE that can greatly improve productivity and code quality for Python developers. Its extensive feature set, customization options, and focus on code quality make it a popular choice for Python development.

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IV. LITRETURE SURVEY

- **TITLE** : Feature fusion methods for indexing and retrieval of biometric data Application to face recognition with privacy protection
- **AUTHOR** : Drozdowski, Pawel
- **CONCEPT:** A multi-stage search structure is formed by fused features of an intelligently coupled set of templates
- **LIMITATION :** Recognition rate is low to predict face regions
- **REFERENCE :** Drozdowski, Pawel, et al. "Feature fusion methods for indexing and retrieval of biometric data: Application to face recognition with privacy protection." IEEE Access 9 (2021): 139361-139378.

- **TITLE** : Stable hash generation for efficient privacy-preserving face identification
- **AUTHOR** : Osorio-Roig, Dailé
- **CONCEPT** : Suggested a face identification system that protects privacy and indexes and retrieves protected face templates using a Product Quantization-based hash look-up table
- **LIMITATION :** Time elapsed between enrollment and identification phases
- **REFERENCE** : Osorio-Roig, Dailé, et al. "Stable hash generation for efficient privacy-preserving face identification." IEEE 6 Transactions on Biometrics, Behavior, and Identity Science 4.3 (2021): 333-348.

- **TITLE** : Biometrics and privacy-preservation: How do they evolve?
- **AUTHOR** :Tran, Quang Nhat
- **CONCEPT** : A taxonomy and synopsis of the state-of-the-art biometric matching techniques has also been produced, as the techniques employed in privacy-preserving biometric authentication systems rely on or integrate with generic biometric matching techniques.
- **LIMITATION :** Difficult to implement practical authentication systems
- **REFERENCE :** Tran, Quang Nhat, Benjamin P. Turnbull, and Jiankun Hu. "Biometrics and privacy-preservation: How do they evolve?." IEEE Open Journal of the Computer Society 2 (2021): 179-191.

- **TITLE** : A review of homomorphic encryption for privacy preserving biometrics
- **AUTHOR** :Wencheng Yang
- **CONCEPT** : Various HE methods to biometric security are analysed and discussed in detail based on the categories of distinct biometric features.
- **LIMITATION** : Restricts to biometric region authentication for pose and illumination invariance using geometrical attributes
- **REFERENCE :** Yang, Wencheng, et al. "A review of homomorphic encryption for privacy biometrics." Sensors 23.7 (2023): 3566. preserving 7

- **TITLE** : Towards better performance for protected iris biometric system with confidence matrix
- **AUTHOR** :Chai, Tong-Yuen
- **CONCEPT** : Suggested method is trainable and doesn't call for any additional changes to the secured iris biometric templates
- **LIMITATION :** Does not support complex authentication scenarios
- **REFERENCE :** Chai, Tong-Yuen, Bok-Min Goi, and Wun-She Yap. "Towards better performance for protected iris biometric system with matrix." Symmetry 13.5 (2021): 910.

V. CONCLUSION

In conclusion, this project is the development of a robust multimodal biometric recognition system that leverages periocular biometrics for enhanced accuracy and reliability in human identification. By integrating multiple biometric modalities and utilizing advanced algorithms, the system aims to address the limitations of unimodal approaches, such as susceptibility to noise, variability in environmental conditions, and limited accuracy in challenging deployment scenarios. The proposed approach involves real-time face detection, alignment, and normalization, followed by the extraction of robust features from the periocular region using a complex Curvelet transform algorithm. The dimensionality of the extracted features is effectively reduced using the Grassmann algorithm, ensuring computational

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efficiency without compromising performance. The resulting feature vectors are classified with a Back propagation Neural Network, delivering high verification and identification accuracy. This project is anticipated to contribute to the advancement of biometric technologies by offering a reliable solution for secure and accurate human identification.

REFERENCES

1. Drozdowski, Pawel, et al. "Feature fusion methods for indexing and retrieval of biometric data: Application to face recognition with privacy protection." IEEE Access 9 (2021): 139361-139378
2. Osorio-Roig, Dailé, et al. "Stable hash generation for efficient privacypreserving face identification." IEEE Transactions on Biometrics, Behavior, and Identity Science 4.3 (2021): 333-348.
3. Tran, Quang Nhat, Benjamin P. Turnbull, and Jiankun Hu. "Biometrics and privacy-preservation: How do they evolve?." IEEE Open Journal of the Computer Society 2 (2021): 179-191
4. Yang, Wencheng, et al. "A review of homomorphic encryption for privacypreserving biometrics." Sensors 23.7 (2023): 3566.
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