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Bioinformatics Study Through Voice Technology

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Abstract

Biometric systems are used for security applications widely. The problems encountered with the biometric system are the single biometric verification dependence. The security problem arises from the original database's biometrics utilization. Biometrics are forever lost in the cases of database attacks. Cancellable biometrics is the emerging security trend to generate fake biometric versions through encryption or non-invertible transform methods for a security guarantee. Four biometrics comprise the unified biometric template for every person through Discrete Cosine Transform compression. The unified biometric template is encrypted through the Double Random Phase Encoding (DRPE) algorithm for the compromised database. The multi-biometric compression is performed through the significant coefficients under the DCT domain for the above four biometrics. The biometric recognition is accomplished through the unified biometric template decryption, and the cepstral approach is applied for the subject verification.

Keywords

Double Random Phase Encoding: Discrete Cosine Transform; Cancelable bioinformatics; Footprint Recognition Biometric System,

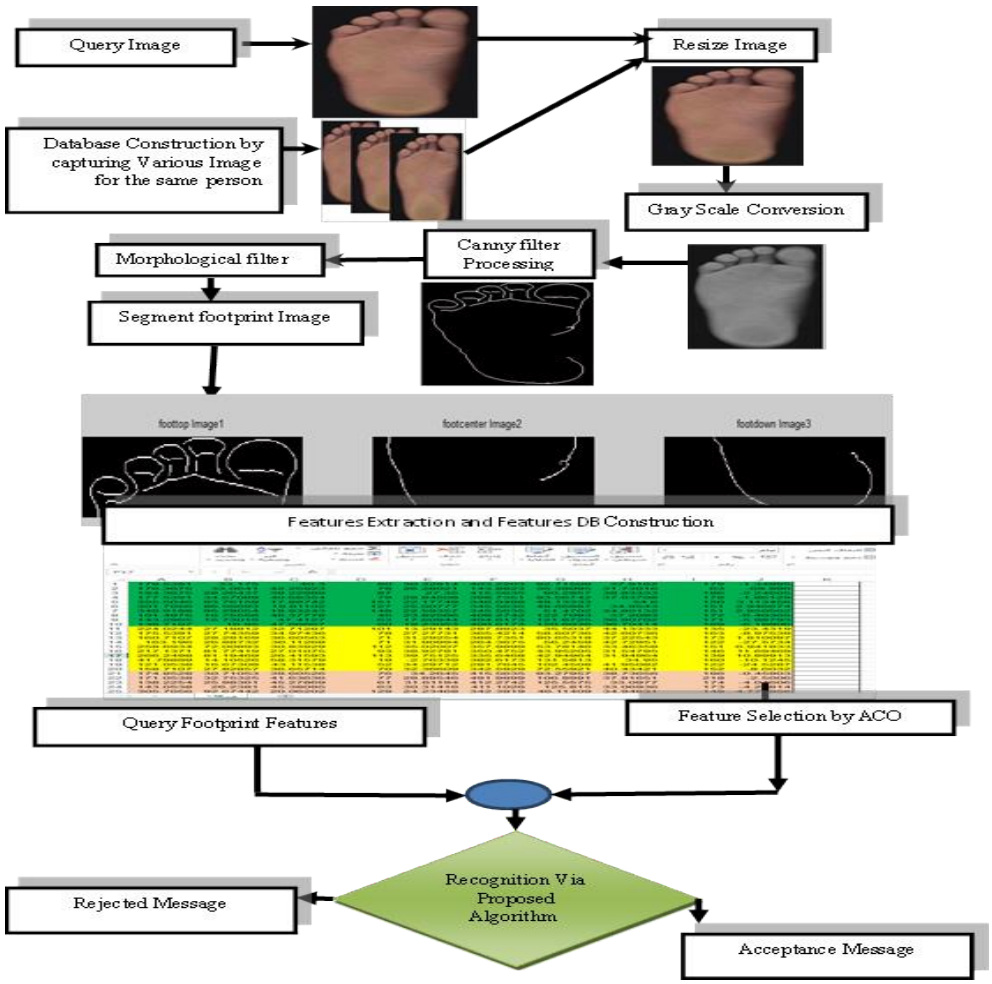
1. Introduction

Biometrics Vision and Computing Voice Dataset are chosen, and the various dataset fields are the voice recordings and voice utterances of up to five different English speech and the translations. The translations are presented in 30 regional languages. The dataset is composed of 300 male recordings and 500 samples, and 200 female recordings. The dataset is labeled based on the classification techniques and the specific regions' speech extraction from the database. pyAudioAnalysis is instrumental as the diverse range in the signal features. The models are trained using pseudo-random methods. Of the entire dataset, seventy percent is allocated towards the training set, fifteen percent is given towards the testing set, and the rest to the validation set. The dataset division might depend on the individual ID. The unique identification number is ruled out as the diverse audios range needs to be consistent through the validation, training, and test datasets. Gender classification is instrumental in studying the English effect and the regional languages over the research dataset and emerged as the critical factor for the models design and the dataset permutation, including the full dataset comprised of English audios and the regional audios dataset. The possibility of reducing the turnaround time is assessed through the Principal Component Analysis of the model. After the related works review, the variance is set to 95% of the optimal results. Analysis of Variance is applied to the feature selection process. The models are trained in three ways with the whole dimension and features; Feature normalization generates the ideal results after the logistic regression model training. Cross-validation is added to the function and is trained by having the essential elements minus the mean. The model is tuned to be time efficient and cost-effective when the classification is limited to incorporating three features, and the output is impressive.

2. Footprint Recognition Biometric System

Footprint Recognition Biometric System, abbreviated as FRBS, is designed and developed to predict the related work performance by merging the image processing and Ant Colony Optimization Algorithm (ACO). (Israa Mohammed Alhamdani; Yahya Ismail Ibrahim. et al., Oct 2019) ACO selects the features optimally affecting the system type results and creates the Visual Footprint Database. The diagram for the proposed model is displayed below (Fig. 1.).

Fig. 1. Diagram of the Proposed Workflow



3. Analysis and Evaluation of Biometrics

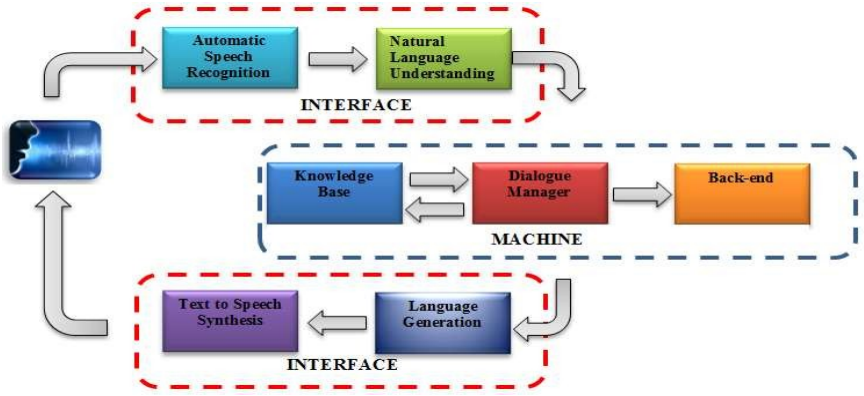
Biometric technologies are classified into two major categories as behavioral and physiological traits. Biometric technologies for authentication and identification are developed based on the characteristics. Physiological traits are related to fixed or enduring human factors, like fingers, fingerprints, geometry, the shape of the face, and DNA samples. (El-Yahyaoui; Omary. et al., Dec 2021) Physiological traits present in each person are distinctive and permanent, except in cases where aging, defects, or accidents are broken or modified. Physiological biometrics derived from the direct measurement of the human body feature are determined through genetics. Authentication systems through fingerprints have been used for more than 100 years. Examples are the iris image, ear, and hand geometry to be collected, measured, and recorded automatically. (El-Yahyaoui; Omary. et al., Dec 2021) Tokyo Industrial Technology develops a novel biometric for recognizing the person from the backside. The unique shape of the butt of a person is identified by creating a system capable of performing the precise person's posterior measurement, the contours, and how the person on the seat applies the pressure.

4. Man Machine Interface (MMI) through Voice Technology

Interactive MMI uses the natural language, which is human, and the conversion control is shared, meaning it answers the questions, and the suggestions are shared through machine learning. The interactive user interface voice needs to be private and personal. (Singh. et al., Feb 2019) Directing the user by the name passes through the emotion analysis to match the user's emotional state; sympathetic MMI displays personal sympathy displaying the users feeling

regarding the presented information. The robust interactive MMI refers to the conversation and needs to be able to answer based on the previous questions like who are you? Where are you? And what are you doing? (Singh. et al., Feb 2019) The transformation from one request to another is customized and needs to be consistent and accurate to gain confidence. The trust level needs to be established between the user and the interactive user interface, and in turn, the confidence level is increased among the users. (Singh. et al., Feb 2019) The vocal machines giving the human voice for the devices are integrated through the Advanced Digital Signal Processors (ASR) software to understand the human language, termed a Natural Language Understanding System. Complex circuits are created, allowing humans to interact with the machines in the natural language. The pictorial representation is shown in Fig. 2,

Fig. 2. Block diagram for speech synthesis and man-machine interface



5. Modeling Algorithms and Feature Extraction for MMI Application

ASR is a mathematical algorithm-based computer system designed to independently recognize the speaker voice-operated through human intervention. (Singh. et al., Feb 2019) The ASR system admin adjusts the algorithm parameters and compares the speech segments, and the users have to provide the speech signal for the ASR system. Humans are good at differentiating between voiced and non-voiced signals, which is critical in recognizing forensic speakers. Considering the excessively degraded speech signal condition, feature detection and extraction from the speech segment are crucial. Voice Activity Detection (VAD) algorithm is used though the accurate unsupervised solution has successfully emerged for various ASR applications under diverse audio conditions. Gaussian Mixture Model (GMM) applications are practical for acoustic modeling for shaping short-term functionality. The average behavior is the expected short-term spectral features dependent on the speakers rather than the temporary features. GMM is the mixture of the Gaussian probability density functions, parametrized by the mean vectors, the individual mixture components, and covariance matrices. The template is treated as the personal PDF weighted sum. The gaussian mixture density is the weighted M component sum densities and is mathematically represented below,

$$p(\vec{x}|\lambda) = \sum_{i=1}^{M} p_i b_i(\vec{x})$$

6. Conclusion

Voice data analysis has received immense traction in today's marketplace with the increasing importance of voice processing. Studies reflect that more words are heard or spoken by the person than the count of typed terms. The above shifted the focus to studying the audio tracks, and the patterns are interpreted as voice data. The research employs the machine learning approach for classifying the voice data. The strategies are designed for age, gender, and identity classification for the multilingual dataset. The Support Vector Machine (SVM) and Random Forests (RF) classifiers achieve the best results.

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