BURG-TÖEPLITZ APPROACH FOR VOICE-SIGNAL FEATURE SELECTION AND EXTRACTION

DANIEL NMADU, S.L. PRISCHEPA, M.N. BOBOV, A. KOSARI

This work presents new applications of Töeplitz matrix eigenvalues approach in image description, feature extraction and recognition [1]. It discusses the possibility of treating the speech signal graphically in order to extract the essential image features as a basic step in successful data mining applications in the biometric techniques. The considered object here is the human-voice signal. The suggested frequency spectral estimation and Töeplitz-based approach, built on the linear predictive coding principle, has proved the possibility of selecting signal features from the power spectral plot and entering Töeplitz matrix in a manner similar to its application on images of written texts, signature, palm-print, face geometry or fingerprints. These topics have shown a success rate of about 98% in many cases. The extracted feature-carrying image comprises the elements of Töeplitz matrices to consecutively compute their minimal eigenvalues and introduce a set of feature vectors within a class of voices.

The basic idea of the work is derived from applying Töeplitz matrix minimal eigenvalues algorithm to Burg's model. This implies a graphical approach for feature extraction, selection and hence signal-image description confronting the conventional and traditional methods. Töeplitz matrix approach is employed to verify a variety of biometrics, including the recognition of hand and machine written texts, off and on-line signature, face, and voice. In all, it has proved a promising success rate. The same algorithm has also shown its possible application in hybrid systems where multiple forms of classifying and identifying tools are fused in one system. The image of a voice signal in any of its classical forms is rather complicated and usually does not convey exactly similar images of the same signals, even when spoken by the same person.

However, Burg`s model is very fruitful approach for investigation of voice-signal information protection. This fact concerns the possibility of looking at the voice-signal image in a manner similar to any other object image. This enabled extending Töeplitz matrix applications to cover speech signal description, as well.

References

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OPTIMIZE THE SECURITY AND REDUCE THE FAILS DETECTION IN FINGERPRINT BIOMETRIC DEVICES BY USING THE HIERARCHICAL FINGERPRINT MATCHER METHOD

ARASH KOSARI, S.L. PRISCHEPA, M.N. BOBOV, D. NMADU

The main factors responsible for the intra-class variations are: displacement, rotation, partial overlap, non-linear distortion, variable pressure, changing skin condition, noise, and feature extraction errors. Therefore, fingerprints from the same finger may sometimes look quite different whereas fingerprints from different fingers may appear quite similar .The aim of our work is to optimize and improve efficiency of fingerprint algorithms and make it much more secure and create new method to estimate the immunity level of fingerprint facilities of authentication which we call that Hierarchical fingerprint matcher.

The novelty of this matching technique is to use of features (pores and ridge contours) provide complementary information which can be used along with features (minutiae) to lower the error rates, namely FAR and FRR.

We have tried to overcome the real challenges in fingerprint matching namely, non-linear distortion, small overlap between query and template images, error and noise introduced by feature extraction algorithms, error introduced in registration and due to unfavorable skin conditions. Localized matching was used for matching all feature types, in-order to minimize the effects of distortion. Also, rotationally invariant structures (pores and minutia) and features (ridge contours) are used and as a result any type of alignment (registration) is not required at any stage. The use of (pores and ridge contours) features is beneficial in deciding match/nonmatch, with increased accuracy, in case of fingerprints with small overlap, beside that we noticed how to apply some additional information in the field of Timing Analysis without vast any extra timing process. So the proposed hierarchical matcher has a matching time suitable for automated fingerprint verification systems. Pores and minutiae are matched using an elastic string matching algorithm which is capable of overcoming the errors introduced by feature extraction algorithms.

О ДЕКОДИРУЮЩИХ ВОЗМОЖНОСТЯХ НЕПРИМИТИВНЫХ КОДОВ ХЕММИНГА

В.А. ЛИПНИЦКИЙ, Е.Б. МИХАЙЛОВСКИЙ

Защита информации от несанкционированного доступа вызывает наибольший интерес в научных и околонаучных кругах. Однако для всех телекоммуникационных систем (ТКС) наиболее актуален другой аспект защиты информации — противодействие всякого рода помехам и шумам, неизбежно засоряющим реальные каналы передачи и системы хранения информации. Поэтому все современные ТКС (за исключением волоконно-оптических) обязательно функционируют с применением помехоустойчивых кодов, синхронно исправляющих возникающие ошибки и искажения информации.

Применение помехоустойчивых кодов сопряжено с определенной проблемой: повышение кратности исправляемых ошибок влечет за собой снижение скорости декодирующих устройств, что недопустимо при постоянном росте информационных потоков. Разрешение этого противоречия неизбежно приводит к преодолению «проблемы селектора» — необходимости перебора огромного количества возможных ошибочных комбинаций. Исторически первые коды — коды Хемминга, называемые также примитивными [1, 2], несмотря на свою совершенность, исправляют только одну ошибку на каждый блок передаваемой информации.

Непримитивные коды Хемминга, получаемые из примитивных достаточно широкого спектра координат с сохранением цикличности, ведут себя хаотично. Тем не менее, компьютерные исследования показали, что непримитивные коды Хемминга, длины которых не имеют малых простых делителей, могут иметь минимальное расстояние, превышающее конструктивное, равное, как известно, трем [1].

Построен ряд непримитивных кодов Хемминга с минимальным расстоянием, принимающим значения 5, 7, …, 15. Результаты проведенного исследования свидетельствуют о перспективности применения данных кодов в реальных ТКС.

Литература

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