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**Editors: Nikos Mastorakis, Valeri Mladenov,
Carlos M. Travieso-Gonzalez, Michael Kohler**

**Recent Researches in
Circuits, Systems,
Communications & Computers**

- **Proceedings of the 2nd European Conference of Systems (ECS '11)**
- **Proceedings of the 2nd European Conference of Circuits Technology and Devices (ECCTD '11)**
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Plenary Lecture 1

Intra modalities on Hand-based Biometrics: A powerful approach



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Abstract: This abstract wants to show the use of biometrics as an important way to apply on security technology and in particular, for the person identification. The role of the hand-based biometrics can be showed as a powerful approach due to its number of intra modalities: palmprint, fingerprint, geometry, silhouette, veins, knuckle, etc.

The biometrics recognition of individuals constitutes a specific field within the area of signal processing and pattern recognition in which an enormous amount of progress and scientific and technological contributions have been made over the last decade. This has led several international technological bodies, including the North American NIST (National Institute of Standards and Technology) to the conclusion that biometrics recognition technologies are now sufficiently mature to be applicable to commercial solutions. Great expectations have thus been generated with respect to the implementation of such systems.

Nevertheless, the progress made by biometrics systems towards industrial applications is seemingly well below the forecasts which were made just a few years ago. This cooling off in terms of application expectations is due to several different factors of a diverse nature, amongst which are the following:

- o The reliability of the systems, including those denominated "high security" (such as those which are based on the fingerprint or the iris), which have to date failed to achieve the operational levels expected by both industry and users.
- o The lack of realism derived from the error rates obtained in laboratories (in the form of false rejection and acceptance errors), rates which increase significantly in real applications.
- o The intrusiveness of the sensors in particular modalities, which forces users to be highly cooperative.
- o The vulnerability of the systems to specific malicious attacks.

This proposal aims to approach biometrics recognition in an innovative manner, providing technological solutions which remove the above mentioned negative factors. To this end we make the following proposals:

- o The use of biometrics schemes which significantly reinforce recognition reliability. By biometrics schemes we mean all those which make use of: i) recognition operations carried out several times on the same trait (multi-operation systems), different sensors used for the same single trait (multi-sensor systems), iii) several different biometrics modalities used on the same individual (multimodal systems), iv) different instances of the same modality, for example, fingerprints for two fingers (multi-instance systems), and v) different algorithms for the same trait (multi-level, multi-representation or multi-algorithm systems). We will also investigate the introduction of quality measures for biometrics signals in multibiometric systems.

- o The use of high transparency, high acceptance and low intrusiveness modalities. For this purpose we propose using four biometrics modalities, two of which are regarded as being highly transparent, namely the face in human presence applications, and the voice in telephone applications; and two high acceptance level modalities, namely the hand and the written signature.

- o The creation of an unsupervised multimodal database in a real functioning environment, so that it is possible to develop recognition schemes adapted to realistic data. Up to the present, R&D groups have relied for the creation of such databases on data acquired in supervised laboratory environments. In this proposal the aim is to obtain an unsupervised multimodal database, applied in a realistic environment which enables us to collect data similar to that which would be obtained in a real industrial application. In this way it will be possible to establish strategies for guiding the user in situations where the biometrics samples obtained are not of sufficient quality (Failure to Acquire) and also how to use model retraining strategies to avoid any shifting in the system with the passing of time.

- o The development of hardware and software designed for the use of match-on-card techniques, with a view to countering any vulnerability on the part of the algorithms developed and the data obtained. For this purpose we will use a smart card which will physically accommodate the personal biometrics pattern. Thus the biometrics recognition will be able to avoid external access (both local and distant) and will dramatically reduce the system's vulnerability allowing the matching process to be produced physically on the card itself.

o The elimination of technological dependence by means of free code availability developing drivers and API's using the GNU philosophy. The reference algorithms used in the parameterization, training and comparison processes will be incorporated within these API's. Special attention will be given here to recent efforts carried out in the field of international interface standardization and biometrics API's (for example ISO SC37).

Brief Biography of the Speaker:

Carlos M. Travieso-Gonzalez received the M.Sc. degree in 1997 in Telecommunication Engineering at Polytechnic University of Catalonia (UPC), Spain; and Ph.D. degree in 2002 at University of Las Palmas de Gran Canaria (ULPGC-Spain). He is an Associate Professor from 2001 in ULPGC, teaching subjects on digital signal processing and machine learning. His research lines are biometrics, biomedical signals, data mining, classification system, signal image and video processing, and environmental intelligence. He has researched in more than 25 International and Spanish Research Projects, some of them as head researcher. He is co-author of 2 books, co-editor of 3 Proceedings Book, guest co-editor of two international journals and co-author 8 book chapters. He has over 150 papers published in international journals and conferences. He has been reviewer in different international journals and conferences since 2001. He is member of IASTED Technical Committee on Image Processing from 2007 and member of IASTED Technical Committee on Artificial Intelligence and Expert Systems from 2011. He is NoLISP 2011 General Chair and was Co-Chair on 39th Annual 2005 IEEE International Carnahan Conference on Security Technology. He was Vice-Dean from 2004 to 2010 in Higher Technical School of Telecommunication Engineers in ULPGC.

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