

# **Hand Geometry Based Recognition System – A New Method with no Constraints on Image Acquisition**

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Hand recognition systems are among the oldest biometric tools used for automatic person authentication. Access control devices have been manufactured and commercialized since the late 1970s. Several patents have already been issued for hand recognition devices and live applications have been launched and used in nuclear plants, airports and hotels over the last 30 years. Hand-based recognition is reliable, low-cost, intuitive and non-invasive. It is a viable solution for a range of access control applications.

However, recognition systems based on hand geometry are still far from the favouritism that other types of systems already possess. This unpopularity is related with the restrictions imposed on acquisition of images to use on the Recognition or Identification phase. Despite of the performances stated by the state-of-the-art, there are still many limitations on the hand positioning upon the acquisition. In some systems pegs are used to force the user to place his hand in a certain position [1]. However, in addition to being uncomfortable, these pegs cause deformations on hand, which subsequently will influence the feature extraction. Other systems use a peg-free methodology [2], which allows a little more of freedom to the user, but at the same time it is imposed to the user a predetermined hand position.

In this work we propose to design a system capable of showing an acceptable performance for a bigger universe of users and also eliminate all or, at least, most of the restrictions imposed on the acquisition. The exclusion of restrictions on the acquisition will enable a significant advance evolution of these systems, mainly because they will become simpler to use, with a considerable improvement in the interaction with user.

Thus, we developed a new algorithm that uses the skeleton of the hand binary image to detect the 5 fingertip's points. For detection of the 4 valleys between fingers, this algorithm uses an edge following algorithm. This method has reached a rate of 97% accuracy on the detection of the desired points, and was applied to images without restrictions on the acquisition. After point detection, 21 features are extracted and then a recognition algorithm, based on feature-matching, is applied. This system presents a Genuine Acceptance Rate of 73% with a False Acceptance Rate of only 8%.

Within this work, a new image database was also created with images acquired without restrictions to the hand positioning. Besides being public and without antecedents, this database also allows a greater motivation on the study of such systems and their constraints.

## **References:**

- [1] Marcos Faundez-Zanuy and Guillermo Mar Navarro Mérida (2005), *Biometric Identification by Means of Hand Geometry*, Computational Intelligence and Bioinspired Systems and a Neural Net Classifier, Personal Psychology, 22 (2), 391-413.
- [2] Jurgurta Montalvão, Lucas Molina and Jânio Canuto (2010), *Robust hand image processing for biometric application*, Pattern Analysis & Applications, Volume 13, Number 4, 397-407.