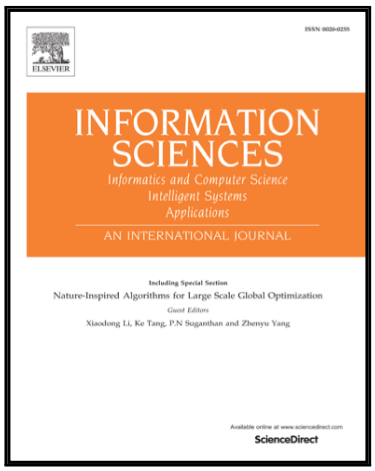

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Minutiae-Based Fingerprint Matching Decomposition: Methodology for Big Data Frameworks

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Abstract

Fingerprint recognition, and in particular minutiae-based matching methods, are ever more deeply implanted into many companies and institutions. As the size of their identification databases grows, there is a need of flexible, reliable structures for fingerprint recognition systems. In this paper, we propose a generic decomposition methodology for minutiae-based matching algorithms that splits the calculation of the matching scores into lower level steps that can be carried out in parallel in a flexible manner. The decomposition allows to adapt any minutiae-based algorithm to frameworks such as MapReduce or Apache Spark. General and specific guidelines to enhance the performance of the adapted matching algorithms are also described. The proposal is evaluated over two matching algorithms, two Big Data frameworks (Apache Hadoop and Apache Spark) and two large-scale fingerprint databases, with promising results concerning the identification time, in addition to the reliability, scalability, distribution and availability capabilities that are provided by such underlying frameworks.

Keywords: Biometrics, fingerprint recognition, fingerprint matching, Big Data, MapReduce, Apache Spark

1. Introduction

Automatic fingerprint recognition has been a hot research topic during the last two decades [17]. As specific hardware becomes more easily available, the number of institutions and companies that use recognition techniques steadily increases over the years, along with the number of people that are to be identified [26]. Fingerprints present various characteristics that make them a good feature for recognition purposes such as uniqueness, size and

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