Chapter 2
Writer Identification in Old Handwritten Music Scores

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ABSTRACT

Writer identification in handwritten text documents is an active area of study, whereas the identification of the writer of graphical documents is still a challenge. The main objective of this work is the identification of the writer in old music scores, as an example of graphic documents. The writer identification framework proposed combines three different writer identification approaches. The first one is based on the use of two symbol recognition identification methods, robust in front of hand-drawn distortions. The second one generates music lines and extracts information about the slant, width of the writing, connected components, contours and fractals. The third approach generates music texture images and computes textural features. The high identification rates obtained demonstrate the suitability of the proposed ensemble architecture. To the best of our knowledge, this work is the first contribution on writer identification from images containing graphical languages.

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INTRODUCTION

Document Image Analysis and Recognition (DIAR) is an important field in Pattern Recognition, whose aim is the analysis of contents of document images. It has three main research directions: text recognition, graphics recognition and layout analysis. The recognition of graphical documents has been an area of intensive research, which has been applied to a large number of domains like engineering, architecture, software modeling, music, cartography, etc. (Lladós, Valveny, Sánchez, & Martí, 2002). Each kind of graphic-rich document has associated its specific graphical language, which convey important information. Graphical languages are expressive and synthetic tools for communicating ideas in some domains, and allow users to describe complex models with compact diagrammatic notations. A graphical language consists of an alphabet of symbols (defined as synthetic visual entities) and rules or productions referring to the relationships between the symbols. Thanks to the recognition of the alphabet of symbols of these graphical languages and their relations, combined with domain-dependent knowledge, the whole document has a meaning, allowing its automatic processing.

Document analysis in handwritten historical documents has attracted growing interest in the last years, whose aim is the conversion of these documents into digital libraries, helping in the diffusion and preservation of artistic and cultural heritage. In addition to the preservation in digital format, the interest of applying DIAR to historical handwritten documents is twofold. The first is the recognition and transcription of the document to a machine-readable format, while the second consists in the classification of the document, such as the identification of the authorship of the document (namely, writer identification).

Writer identification consists in determining the author of a piece of handwriting among a set of writers. It is an important task for the automatic processing of documents, allowing applications such as forensic document examination, in which the handwriting can be used for identification (such as the signature verification in bank checks, or the recognition of the voice, face, iris and fingerprints), and the analysis of digital libraries (e.g. classification of documents, retrieval by content). Writer identification in handwritten text documents has been an active area of study since many years (Said et al., 2000; Schlapbach & Bunke, 2008; Schomaker & Bulacu, 2004), whereas the identification of the writer of graphical documents is still a challenge. Graphic documents make use of graphical languages (composed by symbols and combination rules) for describing ideas in a compact way. Referring handwritten ones, writer identification can be performed analyzing the symbols appearing in these documents, because it has been shown that the author’s handwriting style that characterizes a piece of text is also present in a graphic document.
Fuzzy Logic for Machining Applications: Review
Advanced Fuzzy Logic Approaches in Engineering Science (pp. 341-361).
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