

Chapter 57

Exploring New Handwriting Parameters for Writer Identification

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ABSTRACT

The automatic processing of handwriting samples is part of the computational biometric. It applies qualitative and quantitative techniques by means of capturing, visualizing, and analyzing handwriting. The main applications are writer identification and text understanding. Two significantly different situations appear: online and offline data capturing. In the former, the samples are obtained in a dedicated framework, where the writing instrument and the surface have several sensors. In the latter, the unique information available comes from the residues left on paper. This chapter deals with the second situation. Width, grey value, direction, and other parameters of the residual manuscript text are influenced by the psychomotor characteristics of the writer. Some of these personal parameters may be estimated from the observable properties of the written text.

INTRODUCTION

In the XIX century, Giovanni Morelli -Verona, February 25th 1816 – Milán, February 28th 1891- introduced a paradigmatic change in the detection of forgery of famous paintings (Ginzburg & Davin, 1980). Before him, famous picture authentication was based on global indicators such as general illumination, perspective, body position, smiles, and gaze direction, among others. However, such well known characteristics are easy to imitate.

On the contrary, Giovanni Morelli believed that forgeries should be detected watching minor details, such as those less influenced by the pictorial school to which the artist belonged. Every artist automatically produces, almost unconsciously, some details such as nails, fingers, toes, earlobes. These details

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were considered by Morelli as notoriously revealing, since they appear when the artist's control relaxes and individual impulse take control of his or her actions. Following his conceptual model, Morelli created a large catalog of the minor details of many artists such as Boticelli, Leonardo, Rafael and others. Obviously, trained observers were needed to apply the comparisons advocated by Morelli.

Morelli's method has had a cultural influence over many fields where the search for identifying details began. This change of paradigm led to the use of smaller details in many fields such as people identification. Later, the necessity for better people identification techniques increased. In 1879, Alphonse Bertillon (1893) created an anthropometric method based on many physical measurements. A few years later, Francis Galton proposed a simpler identification method based on fingerprints. This miniaturization process reached a possible end when started the use of DNA for people identification.

In the specific field of handwriting recognition domain, the evolution followed the same pattern, since old practices, based on global characteristics, such as geometric observable information was replaced by new practices based in parameters which are the result of measurements of smaller characteristics. This chapter proposes some new smaller characteristics, barely observable even by zooming of captured images of the manuscript text.

The automatic processing of handwriting samples is part of the computational biometric. It applies qualitative and quantitative techniques by means of capturing, visualizing and analyzing handwriting. The main applications are writer identification and text understanding. Two significantly different situations appear: on line and off line data capturing. In the former the samples are obtained in a dedicated framework, where the writing instrument and the surface have several sensors. In the latter, the unique information available comes from the residues left on the paper. This chapter deals with the second situation. Width, gray value, direction and other parameters of the residual manuscript text were influenced by the psychomotor characteristics of the writer. Some of these personal parameters may be estimated from the observable properties of the written text.

Any automatic or semi-automatic handwriting recognition process is always composed by at least two activities: i) recognition parameters calculation and ii) comparison of sample parameters with a data bank of registered parameters. Parameter calculation and parameter comparison are quasi independent activities, since almost every parameter set may be used by almost every comparison technique. Very infrequently a better efficiency and efficacy may be obtained by combining certain parameters sets with a given comparison technique. This chapter proposes some new parameters and enhances the understanding of some already in use parameters, leaving the choice of the comparison technique to later studies. The authors believe that the major contribution of the research whose results are presented in this chapter is the better comprehension of the mechanism that creates the residues left on the paper, since some unproven and largely used hypothesis are criticized in some degree.

BACKGROUND

The information recovered off-line from the static residues left on the paper is called pseudo-dynamic. It is clearly different from the actual dynamic information captured on-line during the writing activity. There are many contributions proposing different pseudo-dynamic characteristics, most of them oriented to signature authentication, which is a sub-problem of identification of the author of free text. Some of them are summarized in the next paragraphs.

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