

COUPLING VISUAL AND DYNAMIC
FEATURES TO STUDY HANDWRITTEN SIGNATURES

Jean-Jules Brault et Réjean Plamondon

Laboratoire SCRIBENS
Département de Génie Electrique
Ecole Polytechnique de Montréal
Montréal, Québec H3C 3A7

RESUME

Un outil informatique est proposé dans le but de permettre l'étude interactive des caractéristiques spatio-temporelles des signatures manuscrites. L'outil permet de faire le pont entre l'aspect visuel d'une signature et les caractéristiques dynamiques reliées à son exécution. Des commandes d'édition graphiques et de traitement numérique sont disponibles à l'utilisateur pour respectivement manipuler et modifier à l'écran les différentes représentations reliées à une signature donnée.

ABSTRACT

A software tool is proposed for interactive study of spatio-temporal characteristics related to handwritten signatures. The tool fills the gap between visual and dynamic aspect of signature with specific graphic editing commands that can be used to manipulate on the screen the various representations of features related to a given signature. Also, useful data processing commands allow modification of the content of these representations.

I- INTRODUCTION

Handwriting is a rather complex mechanism which results in the generation of line images. These images can be analysed by different recognition techniques based either on the visual output of the process¹ or on the dynamic information acquired by specific set up during the process itself. Among the different class of problems dealing with handwriting recognition, signature verification has been given a growing attention in the past ten years in the field of computer security. Indeed, with the increase in the number of electronic funds transfers and any other computer access, the need for an Automatic Personal Identification (API) system has become a major priority.

Signature verification techniques offer different advantages over other identification techniques² (passwords, PIN's, magnetic card, finger print, voice,...). It is an accepted and easily tested method. Signature cannot be lost or stolen and it can hardly be imitated dynamically. In the past fifteen years, intensive research has

been made^{3,4,5,6,7,8} to implant an API systems based on signature. But none of the systems already proposed in the literature has put the final point on the subject. Indeed, handwritten signature is a complex task requiring a high muscular skillfulness and we believe that further fundamental research is needed on the handwritten phenomenon to improve the performances of the systems.

Different tools and methods exist that help research in handwriting. In psychology⁹, for example, measurement of reaction time or movement time are often used to verify presumptions about specific handwritten task (e.g. identification of a movement unit in handwriting; the stroke). In this paper, we present an interactive software tool based on the possibility to do time coupling between visual information (that is the signature itself on the paper) and any type of dynamic information based on data sampled during the execution of the handwritten task.

In this contribution, we recall in section II the two class of features involved in signature verification (visual and dynamic) and point out their complementarities. We present in section III an overview of the features (technical and functional) implanted in the software tool. In section IV, we give a typical application showing the utility of the tool in interactive analysis of handwritten task, specifically signature.

II- VISUAL VERSUS DYNAMIC INFORMATION

Two major class of features dealing with signature can be used as input for an API system:

- the visual information (that is the final result on the paper).
- the dynamic information (that is the sequence in time of any measurable (but meaningful) characteristic).

Optical analysis of signature is a useful technique in off-line verification application like document expertise. But, sometimes, in order to pronounce a correct verdict about the authenticity of a signature, an expert needs to gather dynamic features from the static representation of a signature by examining it under microscope (the aspect of the paper fiber where the pen had passed, the variation in the thickness of the line,...). However these techniques cannot be automated (at least in a near future) and are thus unusable for API applications.

