

New Advances and New Challenges in On-Line Handwriting Recognition and Electronic Ink Management

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7.1 Introduction

The main goal of this chapter is to make an overview of new advances in on-line handwriting recognition systems, electronic ink management systems, open problems, new challenges and new perspectives.

In the recent years, several papers dealing with surveys or states of the art in on-line handwriting recognition have been published; namely:

- for western languages by Faure and Lecolinet [29], Guyon and Warwick [37], Plamondon [74], Guyon, Schenkel and Denker [36], Plamondon, Lopresti, Schomaker and Srihari [75], Plamondon and Srihari [76]; a study on the question of “handwriting recognition or reading?” has also been proposed by Lorette [54];
- for Chinese by Liu, Jaeger and Nakagawa [51];
- for Japanese by Jaeger, Liu and Nakagawa [41].

During the last years the main new trends in on-line pen-based digital devices were:

- extension of on-line handwriting recognition to the recognition of large or very large vocabularies;
- widening of the domain from on-line handwriting recognition systems to the composition of on-line composite documents containing handwriting, graphics, drawings and symbols;
- ink management in documents, i.e. edition of documents by graphic gestures, annotation of documents;
- more involvement of the HCI community in the domain of pen-based systems.

This chapter is organized as follows. In the first section, the generic architecture of on-line handwriting systems is presented. In the second section, new advances for each module of the recognition process are described more in details. In the third section, electronic ink management systems are highlighted. New pen interface systems, graphic gesture recognition and electronic ink processing are investigated.

7.2 On-Line Handwriting Recognition Systems

7.2.1 Main Features

The use of an on-line handwriting recognition system (HRS) must not be tedious or cumbersome since they are mostly used as part of mobile pervasive computing and facilitate ubiquity. The quality and usability of on-line handwriting recognition systems are conditioned by some main characteristics and constraints:

- the usability of the user interface and its acceptability by the user;
- the necessity of a sufficient value of the initial recognition rate of a writer-independent system. Otherwise, the system would be rejected by any new user;
- an efficient adaptability to each new user;
- the use of a limited amount of data needed to learn a new handwriting style;
- a fast recognition, i.e. a small running time to recognize a character or a cursive word;
- the use of limited computing resources for on-line HRS embedded in handheld or mobile devices.

To date, these features have not always been considered altogether for designing every new device.

7.2.2 General System Architecture

Classically, the general architecture of an on-line HRS consists in a linear succession of stages or modules: acquisition, pre-processing, character and cursive word segmentation, feature extraction, classification and linguistic post processing. The reader interested in it can refer to the previous papers [41, 52, 75, 76] to get more details on the different approaches, methods and processing techniques.

7.3 New Trends in On-Line Handwriting Recognition

7.3.1 Classical vs. New Acquisition Devices

For a wide part, progress in on-line HRS was conditioned by the quality of the input signal acquisition issued from the handwriting. This improvement