

Recognizing Sequences of Letters in Mixed-Script Handwriting

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Abstract

A new approach to mixed-script recognition is explored. Words are inspected through a fixed size window and sequences of letters are identified by slowly moving the window on the word. From the sequences of letters found, the word length can be estimated, and letter candidates for each position within the word can be proposed. Six writers participated in an experiment. Each wrote a training data set of 250 words and a test data set of 275 words. The recognition of each sequence of letters seen through a window is performed by a correlation with the patterns from the training set kept in memory. Results are presented on estimation of word length, and on letter recognition rates.

1. Introduction

Handwriting recognition is a very broad field in which different approaches are followed to solve various types of problems. Some applications need an optical approach, like recognition of addresses on envelopes, or amounts of money on bank checks. Others, like those based on an electronic tablet for data or text entry, need an on-line solution. This paper focuses on this second type of problems.

An electronic pen-pad is actually in development at Laboratoire Scribens (Plamondon 1991d). Different aspects are being considered: editing (Guerfali 1991), capital letter recognition (Nouboud 1991), writer-independent cursive script recognition (Parizeau and Plamondon 1991) and writer-dependent mixed-script recognition (Barrière 1991).

A person taking notes on an electronic pen-pad will want to write in a natural style. Many people don't write pure cursive script or pure discrete letters, they use a mixture of both. This paper describes part of the mixed-script recognition system, which globally aims at recognizing natural mixed-script handwriting in an on-line writer-dependent environment. This system will realize all the following steps: acquisition of a word, segmentation of the word in strokes, recognition of sequences of letters in the word with a correlation method, estimation of the word length, proposition of letter candidates for each position within the word, generation of pseudo-words, dictionary validation of the pseudo-words.

The work actually completed and tested is presented here in detail, and the other topics in development are briefly introduced. Therefore, the following sections explain the different steps leading to the proposition of letter candidates for each position within a word, using the correlation method for recognition. A testing protocol is described and results are reported in the last section.

2. Acquisition

The acquisition of words is done on an electromagnetic digitizer (Penpad 310, Pencept Corporation). The writing surface has an area of 11 inches x 11 inches (27.94 cm x 27.94 cm), a thickness of 0.5 inch (1.27 cm) and a maximum resolution of 1000 points per inch (394 points/cm). When the pen is within 0.5 inch (1.27 cm) of the tablet, coordinates of the pen tip are sent to the host computer at a frequency of 100 points per second. Information on the pen

