

Human-Perception Handwritten Character Recognition using Wavelets

SUZETE E. N. CORREIA¹, JOÃO M. DE CARVALHO¹, ROBERT SABOURIN²

¹ Universidade Federal da Paraíba - Campina Grande - PB - Brasil
{suzete, carvalho}@dee.ufpb.br

² ETS École de Technologie Supérieure - Montreal - Canada
sabourin@gpa.etsmtl.ca

Abstract. The human vision system effortlessly recognizes familiar shapes despite all changes and distortions found in the retinal images. This work proposes a novel approach for recognition of handwritten characters which is based on human perception. The wavelet transform is used to simulate the multiresolutional capability of the vision and to extract features such as fixation points and image details at horizontal, vertical and diagonal directions. A previous system [1] which uses wavelet directional features yielded a recognition rate of 98.25% using NIST numerals database.

1 Objective

To develop a system based on human visual perception which is able to efficiently recognize handwritten characters.

2 Human Visual Perception [2]

- Eyes move and fix successively at the most informative points of an image;
- Eyes actively perform a selective and problem-oriented collection of information from the visible world;
- Neurons in visual cortex perform direction oriented selectivity by the detection of edges and local bars.

3 System Modelling Principles

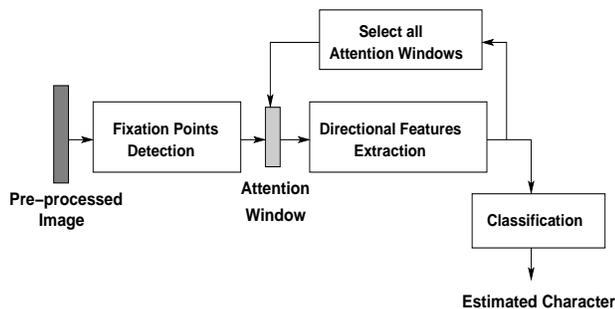


Figure 1: Architecture of the human-perception character recognition system.

- Character image is initially pre-processed by slant and size normalization methods;
- Zoning by “attention windows” at each fixation point simulates eye movement and enables local selective directional features extraction;
- Fixation points (“where” information) for zones (attention windows) are determined either by zero crossings of wavelet transform or at fixed positions;

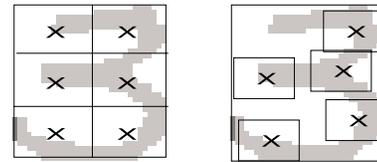


Figure 2: Example of fixation points and their respectively attention window: at fix coordinates and at the character singularities.

- The zero-crossings of a wavelet transform provide the locations of the signal sharp variations at different scales [3];
- 2D wavelet transform extracts directional features for each zone (“what” information) [3];
- Neural network processes extracted information and performs character classification.

4 Acknowledgements

The authors would like to express their thanks to CAPES and CNPq for the financial support of the research.

References

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