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HUMAN BEHAVIOUR RECOGNITION, IDENTIFICATION, AND COMPUTER INTERACTION

Edited by

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Chapter 34

Protein Coding Identification Using Modified Gabor Wavelet Transform on Multicore Systems

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34.1 Introduction

The gene identification problem, which identifies the protein-coding regions (exons) in DNA sequences through computational means, is of great importance nowadays. A DNA sequence can be divided into genes and intergenic spaces. In eukaryotic genes, these regions can be divided into two sub-regions called coding regions (exons) and non-coding regions (introns). The intergenic and intronic regions make up most of the genome. For example, in the human genome, the exonic fraction is as low as 2%. It is well known that protein-coding regions of DNA sequences tend to exhibit a period-3 pattern because of the codon structure involved in the translation of base sequences into amino acids [1-4]. Many researchers have regarded the period-3 property to be a good indicator of gene location.

Previous digital signal processing methods for the identification of exons in DNA sequences include the sliding window discrete Fourier transform (DFT) [1, 2], the anti-notch IIR filter, and the multi-stage bandpass filter centered at $2\pi/3$ [4]. The multi-stage bandpass filter is of particular interest because it can be used to suppress the $1/f$ noise exhibited by DNA sequences of many organisms in general [4, 5].

Previous researches on genomic signal processing used fixed window length, i.e. 351 samples [1], which limited the ability to identify protein coding regions of various DNA sequences. In [6], a new method was introduced based on a modified Gabor-wavelet transform. The method analyzed periodic signal components with independent window length in which it outperformed other methods identification accuracy.

Identification of protein coding regions is a time consuming process, especially on large data sets. Nowadays multicore system which integrates two or more independent cores into a single package becomes common computing platform. To harness the power of multicore