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Gene Prediction in DNA Sequences Using an Ensemble Algorithm Based on Goertzel Algorithm and Anti-Notch Filter

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Abstract : In the recent years, using signal processing tools for accurate identification of the protein coding regions has become a challenge in bioinformatics. Most of the genomic signal processing methods is based on the period-3 characteristics of the nucleoids in DNA strands and consequently, spectral analysis is applied to the numerical sequences of DNA to find the location of periodical components. In this paper, a novel ensemble algorithm for gene selection in DNA sequences has been presented which is based on the combination of Goertzel algorithm and anti-notch filter (ANF). The proposed algorithm has many advantages when compared to other conventional methods. Firstly, it leads to identify the coding protein regions more accurate due to using the Goertzel algorithm which is tuned at the desired frequency. Secondly, faster detection time is achieved. The proposed algorithm is applied on several genes, including genes available in databases BG570 and HMR195 and their results are compared to other methods based on the nucleotide level evaluation criteria. Implementation results show the excellent performance of the proposed algorithm in identifying protein coding regions, specifically in identification of small-scale gene areas.

Keywords : protein coding regions, period-3, anti-notch filter, Goertzel algorithm
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