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VLSI Implementation of Tunable Band-Pass Notch IIR Filter for Localization of Hot spots in Proteins

Vikas Pathak, Satyasai Jagannath Nanda, Amit Mahesh Joshi, and Sitanshu Sekhar Sahu

Abstract A tunable band-pass notch (BPN) IIR digital filter (including zero phase filtering) is proposed by Ramachandran et al. in 2009 to detect the hot spot regions in proteins. The hot spots are the locations of amino acids at which proteins communicate with each other to achieve biological functions. In this paper, the tuning technique of above BPN filter is modified as per the characteristics frequency of protein functional group. The VLSI architecture of this tuned filter is developed and synthesized using Artix-7 family FPGA. The implemented architecture performance is compared with that obtained by MATLAB for FGF protein family. It is observed that the hardware provides approximately 51 times faster results than MATLAB run time.

Keywords IIR digital filter · IEEE-754 floating point standard · Proteomics · Protein hot spot detection

1 Introduction

Proteins are the fundamental elements of any living organism, which are generated by combinations of different amino acids [1]. They are formed by a linear chain of 20-amino acids. Every amino acid in any protein sequence is denoted by a character. The protein linear chains of amino acids are folded in a specific way to form complex 3-D structures. Proteins carry out their organic functions with the help of these 3-D structures by making interactions with other proteins molecules called as targets.

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