Exploring implementation of bioinformatics computational spectrum by high performance reconfigurable fpga based accelerators

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Abstract

Recently an exponential progress of biological datasets generated due to genome projects has been observed. Bioinformatics computational spectrum has made substantial efforts in genomics research to drive biological discovery. Advanced computational methods are indispensible for analysis of high dimensional biological datasets. The speed of computation of such large-scale data requires hardware accelerators in Biocomputing applications. The execution of such problems can be accelerated by either designing efficient algorithmic or using high performance computing architectures. Out of several hardware configurations like Graphics Processing Unit (GPU), ASIC, FPGA and multi-core processors, FPGAs have emerged as improved reprogrammability computing accelerators that can implement huge parallelized section of computational algorithms. Several Biocomputing applications with huge data are being implemented in FPGA reconfigurable computing platforms, In this paper, we present a survey of real-time implementation of hardware accelerators for Biocomputing applications.

Keywords: *Digital signal processing, FPGA, reconfigurable, ASIC, SoC, Bioinformatics, parallel processing.*

1. Introduction

Bioinformatics plays significant roles in biomedical applications. The analysis of genomic data helps in determination of disease prediction and pharmacogenomics. Bioinformatics emphases on data mining and its applications (Liang et al., 2019). Recently an exponential progress of biological datasets generated due to genome projects has been observed. Bioinformatics computational spectrum has made considerable devotion in genomics research to drive biological discovery [2].

The software used for data processing of biocomputing applications is very slow because they run in operating systems environment. Signal processing and computational intelligence methods are increasingly used in bioinformatics research [3]. Digital signal processing methods are faster to analyse these data. In the present trend, architecture implementation of DSP is extended from telecommunication systems, image processing, video processing applications, multimedia systems and computer networks to implementation of complex mathematical procedures for Bioinformatics data analysis.

Though use of reprogrammable microprocessors has its own importance; hardware implementation of computational algorithms is essential. Developments in integrated circuits have provided high-speed digital ICs

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