DESIGN AND ANALYSIS OF LOW POWER SEQUENCE GENERATOR MODULE FOR DNA FRAGMENT ASSEMBLY

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ABSTRACT

This thesis presents the design and analysis of low power Sequence Generator Module (SGM) for DNA Fragment Assembly. The objectives of this project are to construct DNA Fragment Assembly module using Euler algorithm and optimize power consumption of the module. Another objective is to simulate and verify the module in FPGA and ASIC. Power become a primary consideration in design and develops process of a system. DNA fragment assembly system needs a low power consumption since a genome have a large scale of information waiting for decode. Low power techniques were implemented to determine the best approach of standard low power method. The SGM was analyzed using various constraints including clock gating technique to find the lowest power consumption in the module. The design and analysis process successfully done with Xilinx's software, Verilog Compiler Synopsys(VCS), Design Compiler(DC), Power Compiler(PC) and PrimeTime(PT). The major finding of this analysis is the combination of clock gating technique and power compiler constraints contributed the lowest power consumption in SGM by reducing 98% compared to the analysis of SGM without those techniques. A low power SGM had successfully been developed.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Every device in the market went through the design process flow. Any device must fulfill the users' requirements which are smaller in size, portable to everywhere and has long battery life. The power consumption in devices must be minimized by time to have a long life battery. The phenomena made power as a primary consideration in design process. Therefore, DNA fragment analysis used low power techniques approach to have low power SGM. There are low power techniques in both of FPGA and ASIC design flow. Low power techniques had been proven to have the most efficient performance when the techniques were applied in RTL stage. The significance of low power technique in design process could not be denied anymore.

Rapidly growth of technology contributed to biology field. Bioinformatics field appeared with the technology growth. The algorithms were used in solving problems that were related to biology and science. Therefore, this project used Euler path and de Bruijn algorithms to design the SGM since the algorithms have the ability to speed up data processing. This project analyzed the SGM with low power techniques to find the lowest power consumption of SGM.