PREFACE

Today, almost every VLSI design team applies programmable logic devices to facilitate the overall design process and to minimize the final cost. The configuration of digital logic and the ability to change this logic are the most important advantages of systems with programmable logic. The latest inventions in the field of programmable logic systems, like CPLD (Complex Programmable Logic Device) and FPGA (Field Programmable Gate Array), allow the implementation of soft processors whose logic is configured in such systems. The dynamic nature of the FPGAs offers many opportunities in the exploration of novel computing structures and problem-specific processors.

FPGA is a reprogrammable and reconfigurable semiconductor device i.e. the customer or designer can configure it after manufacturing, hence the name "field-programmable". A single FPGA chip can replace thousands of components by incorporating millions of logic gates in a single integrated circuit (IC). FPGAs support parallel processing; hence, different operations do not have to compete for the same resources. Consequently, the performance of one part of the application remains unaffected when additional processing is added.

Heart monitors are some of the most popular purchases, especially those who are athletes. This is a personal monitoring device which allows measuring his or her heart rate in real time or recording his or her heart rate. As the electronics components are more complex now, new functionality and flexibility on hardware and software are required other than time measurement, waveform display update and visualization. Although many heartbeat monitors are already available in the market, there are still room for improvement on techniques of acquiring the analogue signal waveform and pre-processing of digitized data in FPGA chip.
The sensor is tested and a program is developed in VHDL to read the digital input from sensor and display the heartbeat on LCD. This system able to detect heart beat pulses of a person through a sensor, process the sensed signal to compute the heart rate in intervals of real time and display numeric reading on the LCD panel. The advantage of such a design is that it can be expanded and can easily be connected to recording device for further analysis of the data.

It is concluded that, a simple technique which integrates the heart variability measurement is very useful. This device is economical and user friendly to detect the flow of blood through thumb. The heart beat measurement of different people is measured and found that the results are accurate. This device would benefit the user where they can monitor their heart rate at home or any place, and easy to use, also portable.

**Chapter 1** gives an overview of Programmable Logic Devices (PLDs), FPGAs, VHDL (Very High Speed Integrated Circuits Hardware Description Language).

**Chapter 2** describes the review of work carried out and it is presented in the form of literature survey and introduction to the Heart Beat measurement system.

**Chapter 3** presents the hardware and software details of FPGA based Heart Beat measurement system. The hardware design consists of heart beat sensor, signal conditioning circuit, FPGA, Flash PROM, JTAG and LCD display unit. The necessary code is written in the hardware description language, VHDL. Integrated Simulation Environment (ISE) version 9.1i suite is used for software development which is one of the Electronic Design Automation (EDA) tools offered by the Xilinx Company.

**Chapter 4** deals with results and discussions.