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FPGA PIANO - Project Proposal

Design of Embedded Systems - Advanced Course (EDA385)

Department of Computer Science

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1 Introduction

This project proposal is submitted as part of the Design of Embedded Systems - Advanced Course. This is about designing and implementing a Piano on a Digilent Nexys2 development board (FPGA) using the Xilinx EDK. The implementation would be in both software and hardware. It will use both VHDL and C programming language for the implementation. The main components of the project will be

1. PS2 Keyboard : Used to play the piano
2. VGA Monitor : To display the notes which are being played
3. Digilent Nexys 2 board : Board with Xilinx Spartan 3E FPGA
4. PmodAMP1 Speaker/Headphone Amplifier : To amplify the frequency signals from the board
5. Speaker/Headphone : To play the music

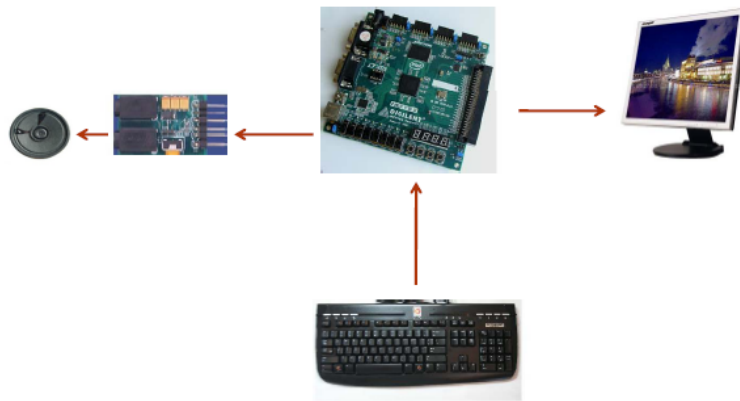


Figure 1: Basic Interface Diagram

2 Architecture

The main blocks of FPGA piano are

1. PS2 controller
2. VGA controller
3. Note decoder
4. Frequency generator

The PS2 controller will read the keys from the PS2 keyboard and send the ASCII codes to the Note decoder. The Note decoder will decode the ASCII code and decide which frequency needs to be generated. Also the Note decoder sends the signal to the VGA controller so that

it will display the corresponding Note in the monitor. The main part of Frequency generator is a clock dividing circuit. Based on different keys the note generator will generate the divisor for the clock dividing circuit. The basic block diagram for the FPGA piano is shown in figure 2

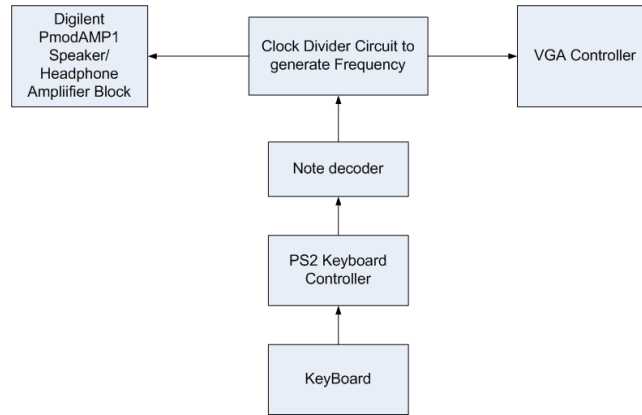


Figure 2: Block Diagram

The implementation will be done both in hardware and software. The PS2 controller, VGA controller and the clock dividing circuit will be done in hardware. The Note decoding logic and the main controlling logic will be implemented in the software.

3 Time Plan

A time plan of the works to be carried out in each week is presented in the table 1

Week	Amir	Hemanth	Sherine
Week 1	Design	Design	Design
Week 2	PmodAMP1	Keyboard Controller	VGA controller
Week 3	PmodAMP1	Keyboard Controller	VGA controller
Week 4	Note Decoder	Note Decoder	Note Decoder
Week 5	Testing	Testing	Testing
Week 6	Further Improvements	Further Improvements	Further Improvements
Week 7	Report	Report	Report

Table 1: Task Schedule