4840 Project Proposal

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1. Introduction

1.1 Purpose

For this project, we aim to implement a game named *simple brick breaker.* The game user interface is displayed via VGA monitor and users can use keyboard to control the game. It includes both hardware and software implementation. We will use software language C to implement the game UI and hardware FPGA to implement the game logic. Since the peripheral keyboard is connected to FPGA, we also need to deal with the communication between FPGA and keyboard.

1.2 Overview

The *simple brick* game is a good practice for embedded system design since it combines both software and hardware. Here is how *simple brick breaker* works. You have layers of colored bricks and a tossed up ball with which to break the layers. Controlling the momentum of the ball (usually a white ball) is a paddle which you have to maneuver from side to side[1]. When the ball is bounced up by the paddle, it will hit a brick and then the brick is gone. After that the ball will come down, if the paddle misses the ball, game is over. Users can use the keyboard to control the position of paddle. The user interface may be similar to the following picture.

Figure 1: Game User Interface

1.3 Tools

We will use FPGA Altera board to build the hardware part of the game. Quartus II will be used to synchronize the system verilog code. And we also need a VGA monitor to display the game user interface. As mentioned before, a keyboard will be used to control the position of paddle. The software development tool will be a Linux environment workstation with proper compiler to compile C code. Our FPGA board will be shown as follows.

Figure 2: FPGA board

2. Project Description

2.1 Software

The software part is in charge of UI display. In order to separate the functions between software and hardware. We choose to use software to realize the logical part of the game. The specific of the rules of the game has not been decided. But it will be similar with traditional breaking bricks games. We will add some tricks after finishing the basic functions. The UI design is one of the most significant mission needed to be completed by software part, especially the display of the ball and the bricks. If time permits, we would embellish our UI.

2.2 Hardware

The hardware components that we want to use are basically USB keyboards, FPGA Altera board, VGA Monitor and mouse if further need is required. Based on lab2, we already had USB keyboard driver and successfully got the correct input and output characters. So, the main function that we want to implement by keyboard here is the control on left and right shift of the moving panel. VGA Monitor, as an output screen, will show the detailed picture, animation and movements of the game. For the reason of user friendly environments and smooth movements, we might need to store and access SRAM memory built inside the FPGA board. This will let us predefine the operation during each clock cycle and get the correct pixel in order to display correct images.

In the middle of the project, we probably need to combine software and hardware components and wrap it up as a whole. I think by the end of lab 3, we will be able to get more insight on this concept.

3. Reference

[1]http://www.makeuseof.com/tag/simple-brick-breaker-the-old-classic-game-remains-as-addictive-as-it-was-before-iphone/