Video Game—Greedy Snake

Design of Embedded Systems-Advanced Course(EDA385)

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Introduction

Greedy Snake is a classic game which was designed first by Nokia. The game was designed to be real-time single player and it involves one snake and one target which in this project could be an apple. The aim of the snake is to eat the apple which was produced randomly in software. The movement of the snake is controlled via keyboard. Points are earned when the snake eat an apple. The game ends when the snake hits walls or himself.

Architecture

The game logic is implemented in software running on the Microblaze processor. The interface of USB keyboard and audio, as its self-explained by the name, are used to gather keyboard input and forward background audio. Both of them will be implemented in software. The VGA Display (Graphics Accelerator) is done in hardware (see figure 1) which is solely for game video display. The BRAM contains some pre-stored image such as the snake and fruit, etc.
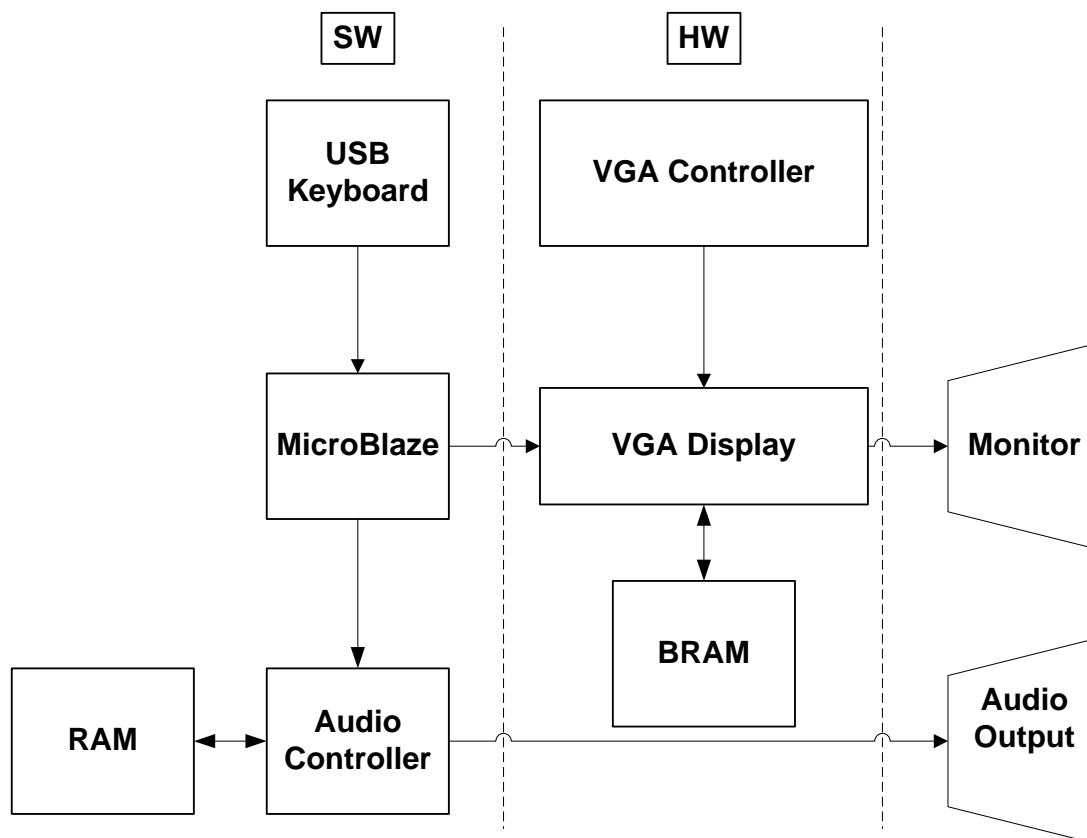

Figure1. Architecture scheme of the Greedy Snake

Microblaze

The minimum object resolution is 16x16 pixels. The main function of the Microblaze is to send the snake position and the apple position to the Graphic Accelerator via the PLB according to the keyboard input.

Keyboard controller

The keyboard controller is an interrupt based PS/2 controller. The controller receives the scan code of a USB keyboard through a USB port. The scan code is analyzed and used as input data for the snake movements and game interface.

Audio controller

The audio controller controls the audio output depending on gaming status. A D/A converter may be added if the audio output device is analog. The controller reads pre-stored data from the RAM depending on input gaming status from Microblaze main function. The audio data from RAM is sent to a digital output or a D/A converter.

VGA Display (Graphics Accelerator)

The graphic accelerator interface with the cpu via the PLB bus. Microblaze will modify the value of the software accessible registers which locates inside the block. Those values contain information about such as the coordinate of the snake and fruit and so. By exacting these coordinates and compare with the counter value generated from the vga controller, the accelerator should be able to find the correct image data from the BRAM and forward the data to VGA. Thus, the video display is accomplished.

Figure2. Entity of the VGA graphic accelerator

Specification

System frequency: 50MHz;
VGA resolution: 40x480 pixels @ 60 Hz.
USB keyboard controlled.
Signal player game.
Audio and graphical output.

Time plan

Name	Liu YuQi	Lian XiangYu	Zhang Jing
Week1	Analyse Architecture	Analyse Architecture	Analyse Architecture
Week2	VGA Development	Keyboard & audio Development	Game logic Development
Week3	VGA Development	Graphic Development	Game logic Development

Week4	Testing	Testing and integration	Testing
Week5	System Verification	System Verification	System Verification
Week6	Report	Report	Report
Week7	Presentation	Presentation	Presentation