AMERICAN POOL VIDEO GAME

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CSEE 4840 Embedded System Design
OVERVIEW OF THE PROJECT

- Classic American Pool Game
- VGA display
- Keyboard for customer’s inputs
- Audio play sounds when collide
- Software suitable for FPGA
ARCHITECTURE
WHO DID WHAT?

- Jiawan Zhang: VGA, Software
- Xunchi Wu: Software
- Yichen Liu: Network
- Yuhan Zhang: Software
- Zeshi Wang: Keyboard, Audio
### VGA Controller

The Video display part has 5 sprites (Level 0 to Level 4) concluded as following:

<table>
<thead>
<tr>
<th>Level</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 0</td>
<td>a. Frames of spool table and serve line</td>
</tr>
<tr>
<td></td>
<td>b. Strength bar</td>
</tr>
<tr>
<td></td>
<td>c. Background</td>
</tr>
<tr>
<td>Level 1</td>
<td>a. 6 pockets and around areas</td>
</tr>
<tr>
<td>Level 2</td>
<td>a. 16 balls</td>
</tr>
<tr>
<td>Level 3</td>
<td>a. Pool cue</td>
</tr>
<tr>
<td>Level 4</td>
<td>a. Instruction words</td>
</tr>
</tbody>
</table>
VGA Controller

- Balls’ Rotation
- Use Map to make ball rotate

When the ball moves, we move its bias to the map with an opposite direction.
VGA Controller

- Pool Cue
  - Use 31 images for pool cue. Use mirror to make 120 states.
  - Use Only 2*355 16-bit data for one image, which gives only the start and end positions of the cue in each line of the image.
  - Build an RAM with on chip memory to let the VGA controller use the data in software.
PS2 Keyboard

The keyboard is the only input for the pool video game.

Function for each key:
- Arrow keys: used to move the pool cue and adjust the position of cue ball.
- Space key: used to adjust the strength and place the cue ball.
- Enter key: used to start the game and hit the ball.

Hardware is implemented with the PS2 controller based on lab 3.
Build the “keyboard.h” file in the software for keyboard.
The audio block can generate sounds for collisions

- **sounds**: volume will change according to the speed of the ball.

- **Hardware**: Store the audio information in the on-chip ROM. Triggered with a start signal settling by the writedata.

- **Software**: Choose a sound and write to hardware. according to the speed and collision type of the balls.
SOFTWARE AND ALGORITHM

- The overall game logic control
- The collision algorithm between balls and the moving parameters afterwards
- The collision algorithm between ball and table edges and the moving parameters afterwards.
- The pocketing of the balls and player changing logic.
**NETWORK**

- Partially Finished:
  
  - Established the communication between DE2 board and laptop via UDP protocol using Python programming.

  - Finished the GUI design on laptop using JAVA programming.
CHALLENGES

- **VGA**: Balls and pool cue’s rotation.
- **Software**: Working with low “CPU” speed and low display resolution.
SUMMARY AND WHAT WE LEARNT

- We made our game work as promised except the network part.

- What we learnt except the knowledge of Embedded System.

- Never under-estimate the task you undertake, because things will always be easier said than done.

- Starting early and trying to finish every possible part as soon as you can will always help in such a big and complicated project like this.

- Because you will find a lot of bugs and mismatching incidents later when you try to combine all the parts together.
Enjoy the Game!