CSEE 4840
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Embedded System: Project Presentation:
The Awesome Guitar Game

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Overview

- We created a clone of "Guitar Hero" on a FPGA
- We use with a Playstation II controller that we have customized
- We display the falling beats of the song on a VGA display
- We play the music at the same time
Today’s presentation

1. The overall architecture
2. A two-month adventure!
3. Lessons learned
Architecture

Figure: Architecture of the project
Playing the music
Getting the input from the guitar
Display the falling beats at the right time!
Everything is managed by the NIOS processor, everything goes through it. Our software part is made of:

▶ A set of callbacks for interruptions
▶ An initialization phase which triggers the interruptions and initialize values
▶ An infinite loop that executes various operations
A two-month adventure

We have well divided the project from the start, thus allowing us to
→ Be on several fronts at the same time: parallelize the work was crucial
→ Reuse some components, repeat some patterns
Timeline month 1

Figure: Milestone 1 and 2
Building the guitar 1/3

Figure: Make the beats fall
Building the guitar 2/3

Figure: Make the beats fall
Figure: Make the beats fall
Timeline month 1

Figure: Milestone 1 and 2

- Start
  - Initial design of the project
  - The guitar is bought
  - We encode the sound in several formats
  - Prototype of the sprite system
  - The guitar circuitry is built and completed
  - Design of the sprite system
  - We detect the beats of a song
  - We use the timer through Avalon
  - We display the beats at the right time through the UART
  - We design the scripts to convert the data between all the formats

- Milestone 1
  - We handle push button input
  - We handle GPIO input
Timeline month 2

**Figure:** Milestone 3 and final

- **Milestone 2**
  - The guitar is connected and the different keys are recognized

- **Milestone 3**
  - The sprites are working
  - The sprites are working and stored efficiently
  - We play a music from the flash
  - We redesigned the timer using Altera’s one
  - We display the score on the hex controller

- **Final presentation**
  - Improvement on the script for the sprites
  - First design of a game program that encompasses all we got
  - The game is completed

**Figure:** Milestone 3 and final
The sprites being displayed

Figure: We display the score on the board and an easily readable score on the screen
Timeline month 2

Milestone 2
- The guitar is connected and the different keys are recognized

Milestone 3
- The sprites are working
- The sprites are working and stored efficiently
- We play a music from the flash
- We redesigned the timer using Altera's one
- We display the score on the hex controller
- Improvement on the script for the sprites
- The game is completed

Final presentation

Figure: Milestone 3 and final
Lessons learnt

→ How to work **really a lot**
→ Overcome **technical and practical** challenges: we have greatly improved our problem solving skills
→ Don’t hesitate to try things and refactor or rebuild a lot to have more maintainable and efficient code
→ How to work in a team and make code that integrates well in a big architecture
→ And so many other things...
Thank you for your attention