



# CE4840 Embedded System SNAPPERS

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# SNAPPERS

- Overview and Objectives
- Design Architecture
- Timing
- Challenge and Difficulties
- Summary

# Overview and Objectives

- SNAPPERS is a keyboard control puzzle game.
- A selected snapper will explode and send four bullets on four directions.
- Once a snapper is hit by the bullet, it will also explode and shoot.
- Game ends when all the snappers explode within certain times of selections.

# Overview and Objectives

- Images Import and Display

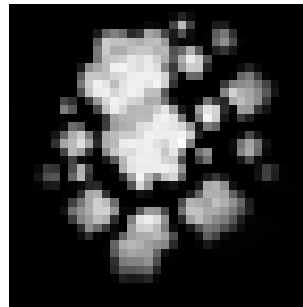
Snappers



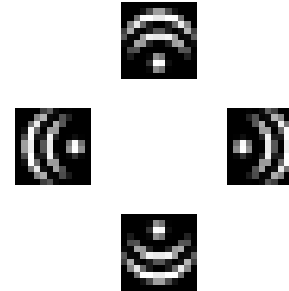
Buttons



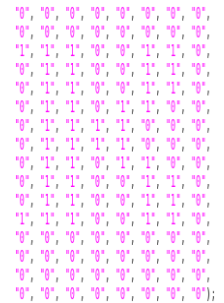
Explosions



Bullets

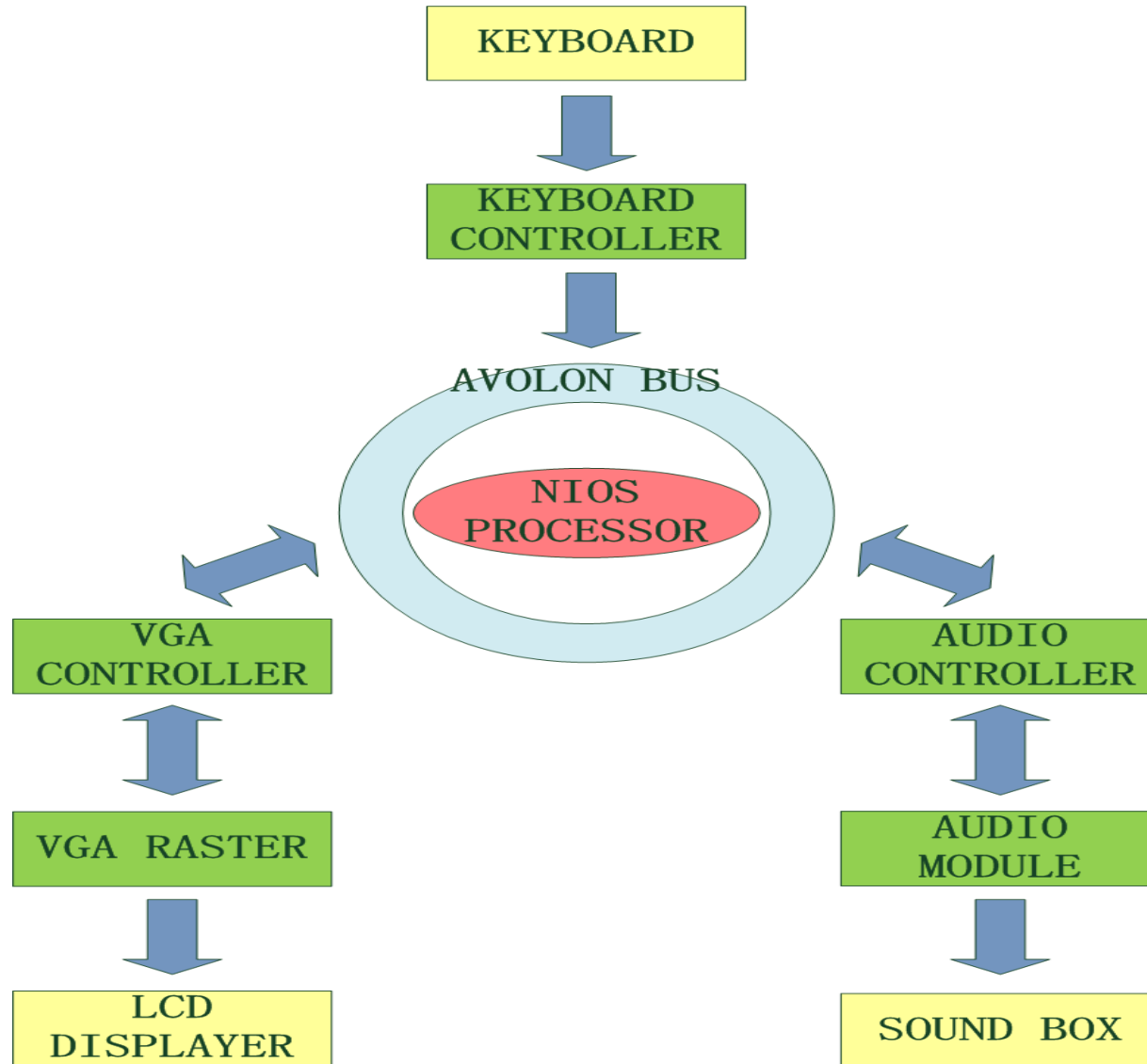


Letters



- Audio Output by Frequency Division
- Function Control by Keyboard

# Design Architecture



# Timing

- Frequency Division for Audio
- Clock analysis in VGA
  - CLK50 and CLK25
  - CLK50 for parameter setting and flag control
  - CLK25 for video output

# Challenge and Difficulties

- Difficulties in VGA
  - Memory: store the figure in to ROM and use controller to connect it with the vga file.
  - Need many objects exist on the screen and different objects have different feature. We use a big for loop to achieve this which cost memory.
  - Time synchronize.

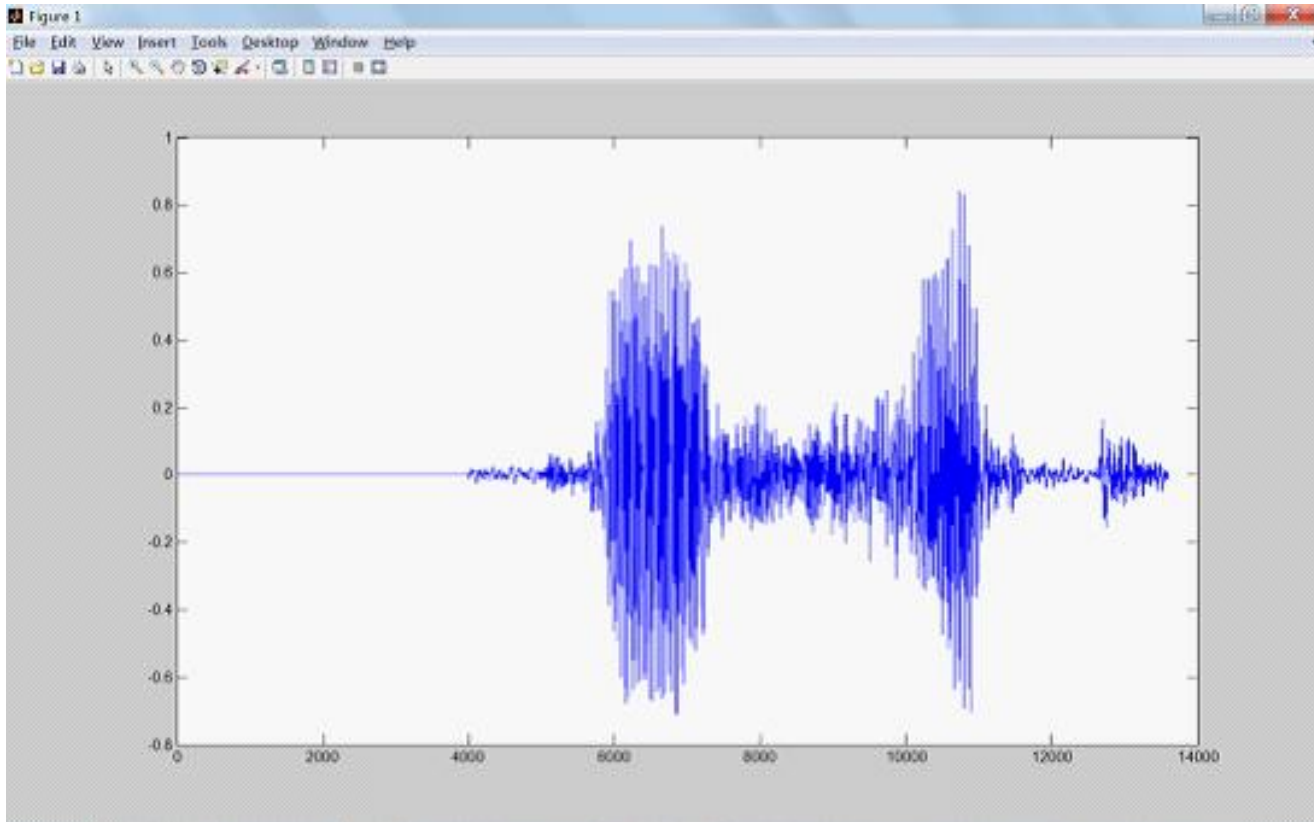
# Challenge and Difficulties

- Difficulties in Audio
  - Background music is the musical setting of the ODETO JOY by Beethoven. The sheet music is recorded in hardware.
  - When the player chooses one snappers, it will scream because of fear.
  - When the chosen snapper explodes, it will sound like a bomb.
  - Audio sample frequency is 8000Hz



# Challenge and Difficulties

- Difficulties in Audio



# Challenge and Difficulties

- Difficulties in Software
  - Image control with hardware.

# Summary

- We made Snappers Work!
  - Hundreds of ROMs for VGA display
  - Different sounds with different motion and background music
  - Software implement all the game function