Phoenix Game on DE1-SOC Board CSEE E4840 – Embedded Systems – Spring 2020

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1. **Background:** We plan to implement the 1980s space-themed, fixed shooter arcade game Phoenix originally developed by Taito and Amstar Electronics. In this game, the player controls a spaceship that moves horizontally at the bottom of the screen and fires upwards to kill its enemies (birds). The player loses a life, whenever the ship is hit by an enemy or projectile.

Figure 1. Phoenix game graphics display

2. **Hardware and software description**

    a. Hardware Components:

- DE1 SOC board
- VGA monitor (must support different colors)
- Joystick (alternatively, a keyboard input to control the videogame)
- Speakers
- Accelerometer

    b. Software Components:

- Game logic: Start screen as in [2]. Player's spaceship movement and shooting. Movement of enemies and shooting. Foreground obstacles. Keep track of the current game score and highest score. Scrolling background. Different scenarios and themes. Different levels of difficulty.

    - Enemy movement: Enemies move randomly horizontally and vertically. They never disappear off screen. They automatically shoot downwards to the player's spaceship whenever the spaceship is directly underneath.
    - Player's spaceship movement: May only move horizontally throughout the lowest row of the screen. May not go off screen.
    - Player's shooting and shielding: The player may shoot once vertically upwards at every press of a button. A shield that protects the spaceship from enemy shots activates simultaneously when the player shoots.

- Joystick input: One-dimension, horizontal input.
- Monitor output: Must support color and graphics similar to [2].
- Audio output.
- Accelerometer input.

3. **Milestones**

Milestone 1: Static display of background, spaceship and enemies (one theme). Recognize joystick input.

Milestone 2: Audio output not dependent on game action. Scrolling background, moving bullets and moving players and enemies.

Milestone 3: Final implementation of game logic:

- Start screen
- Shooting destroys and corresponding graphics for enemy/player dies and disappears. Shielding logic.
- Improved graphics throughout the game.
- Keeping track of score and highest score between rounds.
- Audio output varies with game action.
- Different themes, backgrounds.
- Different levels of difficulty

Extra milestones if time permits: Accelerometer substitutes joystick to move player's spaceship horizontally and to shoot.
Menu? Milestone 3 too large? Memory? Graphics?
References:
[1] https://en.wikipedia.org/wiki/Phoenix_(video_game)
[2] https://www.youtube.com/watch?v=vT4-0eJfsto