PAC MAN-HHZ

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The theme of our project is to create a Pac-Man-Like video game.

The game is like the classical Pac-Man game and it should be running on a FPGA board and displayed on a VGA screen.

Wolfson WM8731 audio CODEC is used to play in-game music.

PS2 key board controller is used to get input from keyboard to control the movement of Pac Man and in-game choice.
VGA DISPLAY
BACKGROUND AND SPRITES

Ghost

Pac Man

Maze
IN-GAME Sound effect stored in ROM

BEGIN and INTERMISSION music stored in SRAM (DIRECTLY CONTROLLED BY CPU)

CPU writes music data directly into audio buffer
SOFTWARE

- Linking Hardware: VGA, Audio, Keyboard.
- Logic: Pacman & Ghost Movement, Game Feature Implementation, etc.
LINKING HARDWARE

- **VGA**
  
  ```c
  #define IOWR_VGA(base, offset, data) IOWR_16DIRECT(base, (offset) * 2, data)
  #define IORD_VGA(base, offset) IORD_16DIRECT(base, (offset) * 2)
  ```

- **Keyboard**
  
  ```c
  IORD_8DIRECT(KEYBOARD_BASE, 0)    // decide whether a key is pressed
  IORD_8DIRECT(KEYBOARD_BASE, 1)    // read the keyboard code
  ```

- **Audio**
  
  - **SDRAM**
    
    ```c
    IORD_SDIRECT(AUDIO_PLAYER_BUFFER_BASE, 0)    // flag, 0 → able to write
    IOWR_SDIRECT(AUDIO_PLAYER_BUFFER_BASE, 0, song[i])    // write song
    ```

- **ROM**
  
  ```c
  IOWR_SDIRECT(AUDIO_PLAYER_BUFFER_BASE, 1, 0x01);    // play song
  IOWR_SDIRECT(AUDIO_PLAYER_BUFFER_BASE, 1, 0x02);    // change indicator
  ```
LOGIC - GHOST BEHAVIOR

- Two Modes: Random or Chasing

- Chasing Mode Policy: if there are available paths towards target select one of them, and if not, randomly select another path, but not backward direction.

- Weak Mode & Eaten by Pacman
LOGIC - GHOST BEHAVIOR

- Chasing Example
Functions:
- `int isAvailable(int ghostNum, int direction)`
- `int randomMode(int ghostNum)`
- `int chaseMode(int ghostNum, int x, int y)`
- `void moveGhost(int ghostNum)`