Pac-Man-like video game

Pac-HHZ

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Overview

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 chip and displayed on a VGA screen.

Broad description

The player controls Pac-Man through a maze, eating Pac-dots. When all Pac-dots are eaten, Pac-Man is taken to the next stage. Ghosts roam the maze, trying to catch Pac-Man. If a ghost touches Pac-Man, a life is lost. When all lives have been lost, the game ends. Extra features may be added, e.g. Pac-pellets that enables Pac-Man to temporarily have the ability to eat ghosts.

Sensor data

- Key board:
  1. Arrow keys: used to control the movement of Pac-Man.
  2. Enter: used to confirm system info, e.g. "begin", "stage clear", etc.
  3. *(Optional) Letters & numbers: used to enter name after game if the player achieves top ranking.
- *(Optional) Audio files: used as background music and sound effect.

Outputs

- Video: display game image.
- *(Optional) Audio: play background music and sound effect.

Algorithm

- Use a two-dimension matrix to denote and store maze info;
- In the matrix, each value (i, j) stands for an object, for example:
  0 -> nothing, 1 -> Pac-dot, 2 -> wall, 3 -> Pac-Man, 4 -> ghost, etc.;
- Use arrays of two integers to record Pac-Man and ghosts' positions on the map, if the Pac-Man and the ghost are in the same position, Pac-Man dies (life of

Pac-Man -- and reset position to the start point);

- Use an integer to record the number of Pac-dots remaining, when Pac-Man eats a dot (same position), change the value in that position from 1 to 0 and decrease the number of dots;
- If the number of dots is zero, stage clear; if the life of Pac-Man is zero, game ends;
- Arrow keys control the movement of the Pac-Man, changing value in matrix and Pac-Man's position;
- Use different threads to control the movement of ghosts, sometimes, e.g. when ghosts moves to turning points, pseudo random numbers are generated to select moving direction;
- *(Optional) Use an integer to record the current score, and an array of integers to store the top scores.
- …

Functionality across hardware and software

- Hardware:
  1. Connect key board to FPGA and make sure each key operates the correct function as designed;
  2. Connect screen via VGA and make it functionally correct.
- Software: implements game algorithm and control the display.