SpacyBird

The final project provides the experience of playing 2013's most famous game "flappy bird" in zero gravity space station. For the design of the game PYNZQ-Z2 board is programmed by using Verilog.

The design consists of 2 main pillars: game logic and VGA display.

- **VGA DISPLAY**

  To play the game a monitor is utilized by VGA protocol principles, on which our PYNZQ-Z2 programme is built. How the counting process of each pixel on monitor and how color is assigned to each pixel can be followed on design source codes VGA_timings.v and VGA_pattern.V, respectively

  - VGA_timings.v

    Two counters, namely Horizontal and Vertical counters, are used to follow the location of the pixels which will be illuminated.

  - VGA_pattern.v

  Each coordinate provided by VGA_timings and game logic will be assigned with a RGB value that corresponds to multiple colors which will give the illusion of displaying objects such as a bird, pipes, the sky and the ground. Specific location information which defines the order of the objects displayed by a certain group of pixels will be handled and provided by game logic.

- **GAME LOGIC**

  A game is not a game if it does not have rules and rule validations. Game logic is a combination of finite state machines in which green pipes and background are created, and user input is processed , and collision between bird and the pipes are checked , and game state(game init, game pause, game over) is controlled. To increase the variability in the game, a random generator is implemented here.

  - PIPE_state.v , BIRD_state.v

  Depending on which state the game is , state of pipes and bird are determined by this circuit. Mealy type of state machine where output values are determined by both its current state and current inputs.

  - PIPE_postion.v , BIRD_positon.v

  Position of pixels which will form the bird and the pipes are updated by this circuit, and sent to VGA pattern to be displayed on the monitor later on.

  - WINDOW_reg.v , RND_generator.v

  Coordinates of windows through which the bird can fly are determined with pseudorandom circuit by this register circuit.

How to Play

Start the game with Enter (BTN3). Players can press Enter to pause and resume the game.

Move the bird with BirdUp(BTN1) and BirdDown(BTN2) to avoid touching the pipes.

Follow your score in the middle of the screen.

If you hit a pipe, the ground or upper edge , you die. Press Enter to play again.

Switch(SW0) for invincibility.

Reset (BTN4) the game when you want.

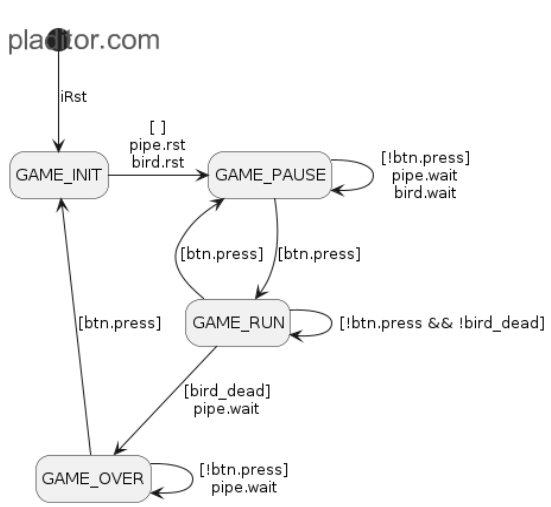

Figure 1:game_fsm

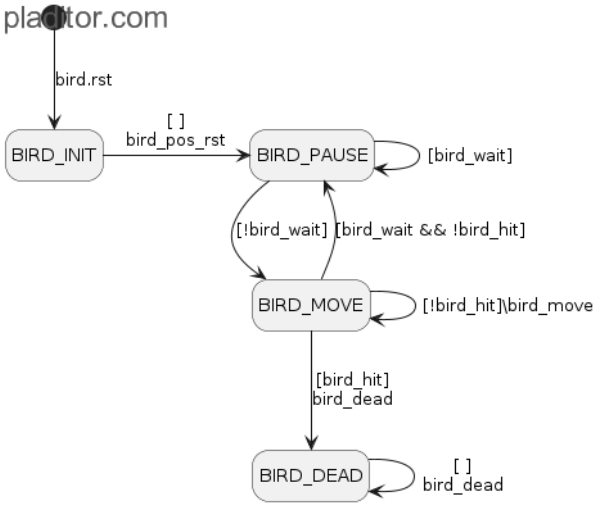

Figure 2: bird_fsm

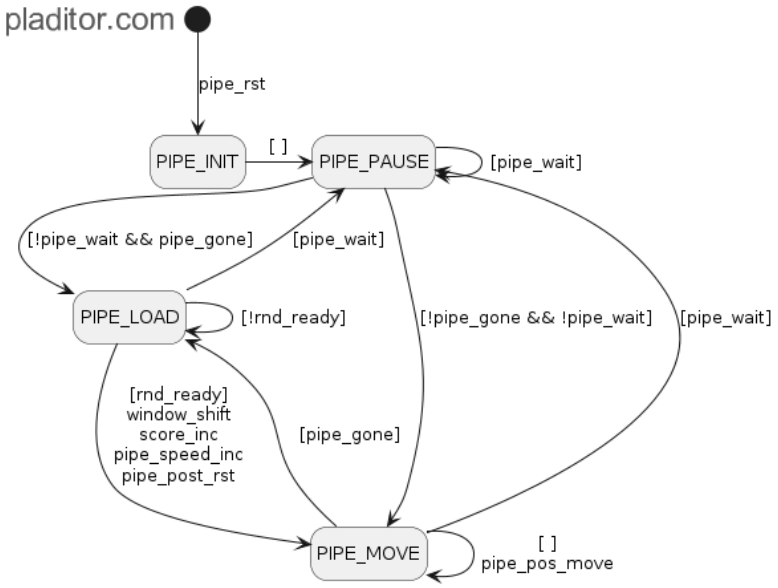

Figure 3: pipe_fsm