

Interim Progress Design Report:

The IT Crowd

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Game Strategy, Design Specifications and Plans:

To implement the game Flappy Bird we will be programming a Terasic DE0 Board in VHDL. The board will provide the key interfaces such as a PS/2 for mouse, VGA for the monitor, DIP switches, push-buttons, and an FPGA in which will carry out the game logic. The game will be displayed on a VGA screen with a resolution of 640 x 480 pixels.

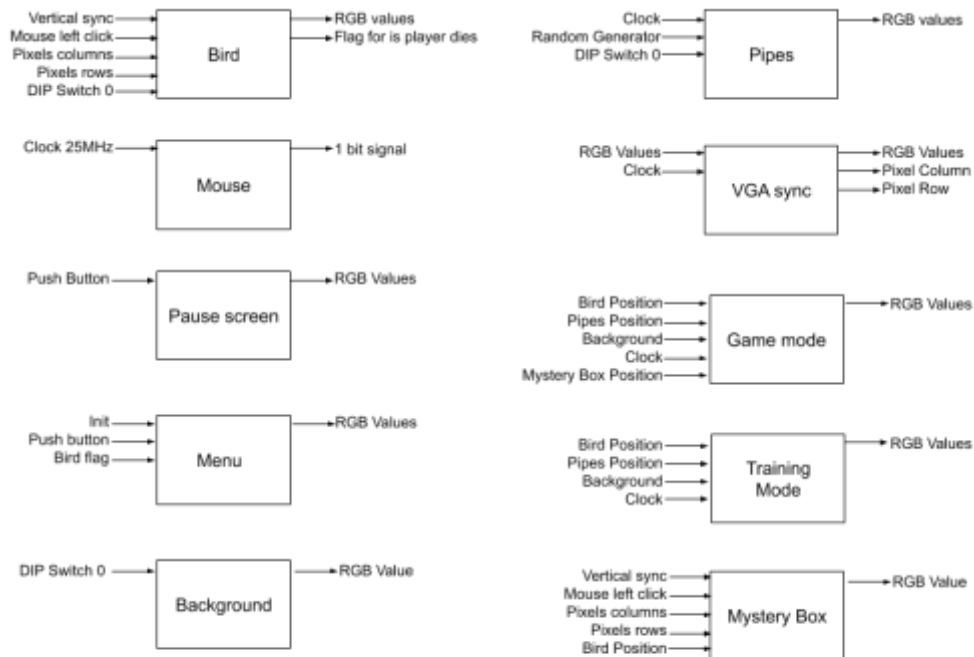
The objective of the game is to keep the bird alive as long as possible by avoiding the pipes and sky/ground boundaries. The player does this by left-clicking on their mouse, timing it carefully in order for the bird to fly in between the pipes. If the bird is not flying it will free-fall towards the ground.

We plan to implement two modes in which the player can choose from using the DIP Switches; training mode or single-player mode. Training mode is at the lowest level and will run until the bird dies. It will have pop up instructions, in the form of text displays, to teach and familiarise the player with the basics of the game. These instructions will pop up as the player progresses, explaining the objective, obstacles and any gifts that come along the way. If the player should die, a screen will appear asking them if they would like to restart training mode or head back to the main menu.

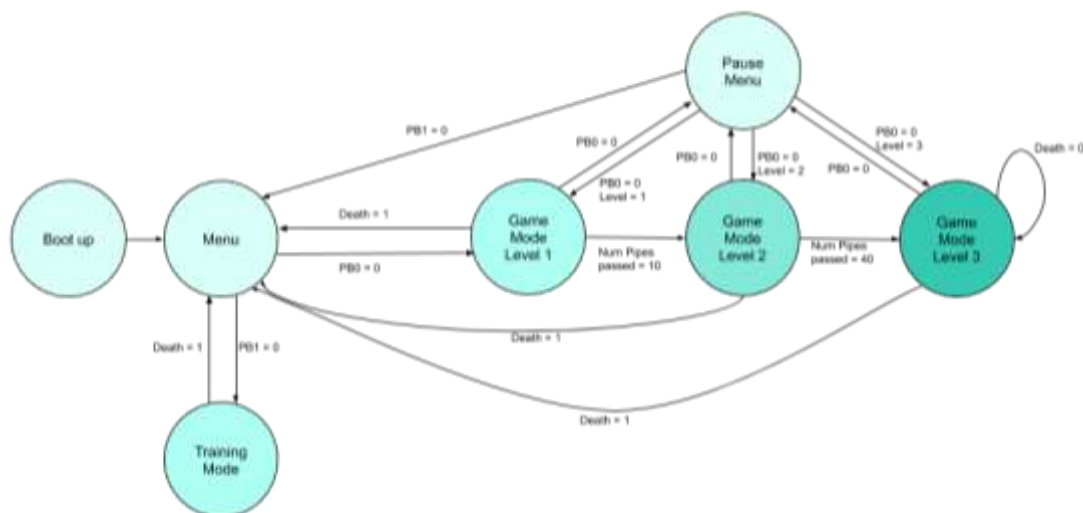
In single-player mode, the player will be given three lives at the start of the game. For our obstacles, we will be generating pipes on the VGA screen using the Galois LFSR (linear-feedback shift register). This will generate pseudo-random numbers which correspond to the gaps between the pipes. If they hit an obstacle, such as the pipes, or the sky/ground boundaries, the bird will lose a life and respawn at the point where the life was lost. The game will run as long as the bird has at least one life. Should the player lose all three lives a pop up will appear displaying their score, and prompting them to either "Play Again" or "Return to Menu".

Unlike training mode, in single-player mode, the level of difficulty will increase by raising the speed as the player completes each level. The player will earn 1 point for every pipe successfully crossed and their accumulated points will be displayed on the VGA screen. In this mode, we have decided to include invincibility as a gift. Should the player collect this, the bird will change colour and it will give them the power of invincibility for 15 seconds, allowing them to go straight through pipes. As a bonus feature, the user can choose Daytime or Nighttime colour schemes using DIP switch 0.

Block diagram:



The high-level state machine of the game:



The users will navigate through the game using push buttons to move between screens.