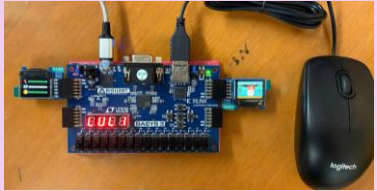




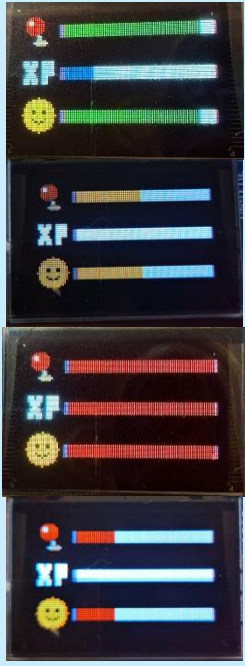
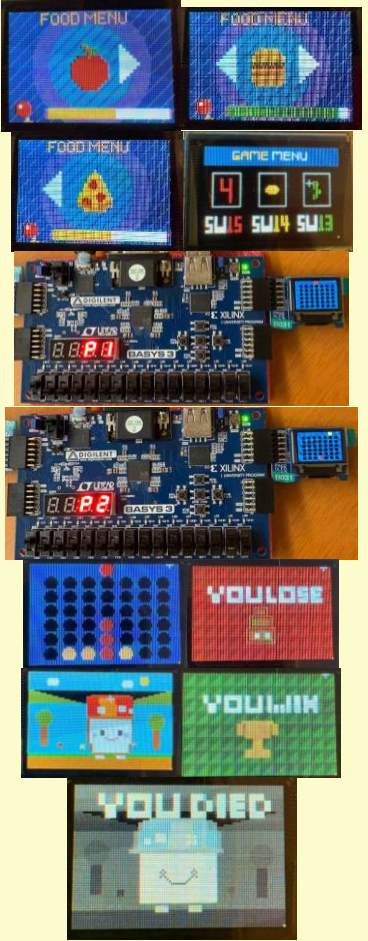



Student and Component Name	Component Description	Images / Photos
<p><b>Team Tamagoonchi</b></p>	<p>Tamagoonchi is an interactive digital pet system built on the Basys-3 FPGA board. It features a virtual pet that users care for by feeding and playing mini-games to maintain its hunger, happiness, and experience levels. The left OLED displays the pet's status and animations across idle, feed, and death states, while the right OLED hosts games like Mushroom Mania, Flappy Bird, and Connect 4 that grant experience points and level-ups. The system integrates real-time state management, sprite animation, and LED feedback for an engaging interactive experience.</p>	
<p><b>Student A: Zhang Yize</b></p> <p>7-Segment display LED warning LED animation Mouse integration Happiness bar logic Pet animation</p>	<p>Components below provide real-time visual and interactive feedback for the virtual pet.</p> <p><u>7-Segment Display:</u> Continuously displays the pet's current level in both Idle and Feed modes. Displays "DEAD" once the pet dies.</p> <p><u>LED Indicators – [15:0]:</u></p> <ul style="list-style-type: none"> <li>Blink at 2 Hz when either Hunger or Happiness <math>\leq 20\%</math>.</li> <li>Blink at 5 Hz when either Hunger or Happiness <math>\leq 10\%</math>.</li> <li>Execute a level-up animation when the XP bar is full and the pet levels up.</li> </ul> <p><u>OLED Display with Mouse Input:</u> At the right OLED Display, the wired USB mouse controls an on-screen cursor. The cursor position calculation converts mouse coordinates (0–4095 range) to OLED screen coordinates (x: 0–95, y: 0–63) with clamping to prevent overflow. When the cursor is near the pet and the left mouse button is clicked, the pet performs a jump animation and its Happiness level increases.</p>	   
<p><b>Student B: Rishabh Ramprasad Shenoy</b></p> <p>Hunger, XP, Happiness Bars logic Dead state/reset logic XP return from games Hunger logic in games Bar sprites Debug games Level up logic</p>	<p>When exiting each game back into game select mode (SW[1] = 1, SW[15:13] = 000)/idle mode directly (SW[1] = 0), the appropriate XP will be awarded.</p> <p>Ham shank icon next to Hunger Bar, XP icon next to XP Bar, Smiley face next to Happiness Bar</p> <p><u>XP Logic:</u></p> <ul style="list-style-type: none"> <li>Connect 4: 40XP for win, 10XP for draw/loss, no XP awarded if game ends prematurely</li> <li>Flappy-Bird &amp; Mushroom Mania: 10XP base reward, with additional 3XP per point scored</li> <li>When XP bar hits max value, reset back to 0 XP + any rollover from the recently exited game, and the character will level up on the 7-segment display.</li> </ul> <p><u>Hunger Bar</u> Deducts 10 points upon exiting any game, regardless of how long spent in game or score achieved.</p> <p><u>Dead State</u> When Hunger or Happiness reaches 0, character will "die" and all 3 bars will turn red. When SW[15:0] = 16'b0, btnC can be pressed to "revive" our character back to LVL 1.</p>	

<p><b>Student C:</b> <b>Yeo Si Zhao</b></p> <p>Food Menu Hunger logic Game Menu Connect-4 Idle / Dead State</p>	<p><u>Food Menu – SW[0]</u> Use btnL / btnR to scroll through foods and btnC to feed. Pizza restores the most hunger (40), followed by Burger (25), then Apple (10).</p> <p><u>Game Menu – SW[1]</u> With SW[1] on, choose a game using the upper switches: SW[15] – Connect 4, SW[14] – Flappy Bird, SW[13] – Mushroom Mania</p> <p><u>Connect 4 Mini-game</u> Press btnC to start.</p> <ul style="list-style-type: none"> <li>2 players: Player 1 (Red) / Player 2 (Yellow). Use btnL / btnR to move the selector, and btnC to drop a token.</li> <li>The FSM governs gameplay through sequential states: IDLE – PLAYER_TURN – DROP – CHECK_WIN – GAME_OVER.</li> <li>The 7-segment display alternates between “P1” and “P2” on an[1:0] to show whose turn it is.</li> <li>The first player with four connected tokens (horizontal, vertical, or diagonal) wins.</li> <li>“YOU WIN” appears when P1 wins / “YOU LOSE” when P2 wins.</li> </ul> <p><u>Idle / Dead State</u> When not in game / feed mode, the pet enters Idle Mode and moves along the horizontal axis automatically. When it reaches the boarder, the pet turns around and moves the other direction. When the pet dies in place and movement stops, it enters dead state and awaits reset input.</p>	
<p><b>Student D:</b> <b>Wang Chuhao</b></p> <p>Mushroom Mania Mini Game Flappy-mushroom Mini Game</p>	<p><u>Mushroom Mania Mini-game</u> This is a simplified Snake game, controlling our character to collect coins that will spawn randomly. It comes with Idle state, game state, and end state.</p> <ul style="list-style-type: none"> <li>btnC is for global reset. While in idle state, press any other button to enter start state. Direction control is handled with debounced buttons.</li> <li>Seven-segment display presents score and 15-second timer, the system transitions to the end state when the timer expires, or the player hits a border. The OLED displays “GAME OVER,” seven seg will blink at around 3hz, and the final score is used to update the exp bar.</li> </ul> <p><u>Flappy-mushroom Mini-game</u> Flappy bird game featuring three main FSM states: Idle, Game, and End.</p> <ul style="list-style-type: none"> <li>In the Idle state, the system waits for player input. When btnU is detected, a debounced pulse signal triggers the transition into the Game state. btnC functions as a global reset signal.</li> <li>The seven seg shows the score.</li> <li>A detected collision will transition to the end state. This score is transferred to the pet system as earned experience points.</li> </ul>	

References: Claude and ChatGPT for designing sprites and background for e.g. (Help me convert this PNG image to a 16x16 Verilog code)

### **ChatGPT (OpenAI):**

OpenAI. (2025). *ChatGPT (GPT-5)* [Large language model]. OpenAI. <https://chat.openai.com/>

<https://chatgpt.com/share/690f2022-57fc-800c-8dcb-99779b7e81ba>

This prompt is used to help us change colour generated from white/grey to purple.

### **Claude (Anthropic):**

Anthropic. (2025). *Claude 3* [Large language model]. Anthropic. <https://claude.ai/>

Link to our prompt for sprite design generator: <https://claude.ai/share/721eec1d-001d-4c10-b3cc-266b71a2586c>

### **Feedback:**

1. Zhang Yize – The upload of the lectures on Canvas is always either one day before the lab or even after the lab. This makes the labs very confusing and difficult for students to understand. Moreover, I feel that the module did not really teach Verilog coding properly and most of the language learning was done on our own. There were also too many assessments within a tight schedule which seemed very rush. Lastly, I feel that the Verilog PE could have been organized better as the instructions were very confusing during the test. More information should be given to the students before.
2. Rishabh Ramprasad Shenoy – Labs were very difficult and time consuming, would be great if the lectures for part 1 were better at covering what we needed to know for each lab, as we felt very unprepared when doing the lab assignment without understanding much of how Verilog coding is different from normal coding. Include subtitles in lectures, especially part 1. Slides uploaded to Canvas and slides used by the lecturer are too different sometimes, cannot follow the pace sometimes.
3. Yeo Si Zhao – Lectures should include captions for easier comprehension. At times, lectures are uploaded too late as well. For Friday labs, we could not watch the lectures before going to the labs which made it extra challenging. Furthermore, I would rather finals be pushed to the back than it being front loaded. Timing was way too tight. If the project submission was not delayed, there was absolutely no way my group could have finished it as we had 5 other quizzes / tests during the same period.
4. Wang Chuhao – I feel that the lecture should have been uploaded more promptly and have captions. The exams should be a little bit more spread out, e.g. Quiz 2 and Verilog eval is on back to back weeks, I get the idea to have quiz 2 a bit earlier before we forget the content but I think having it in back to back weeks is a bit too rushed especially if we have assignments/exam for other modules also.