Snake Game – Project Report

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Group Contribution

This project was completed collaboratively. Both members contributed to hardware design, Verilog coding, debugging and running the final design on the DE10-Lite board. Mateo contributed by implementing the snake movement and VGA output and Nabeel contributed by developing the food logic and collision detection.

Design Description

Our design implements a basic Snake game on the DE10-Lite FPGA using VGA output. User input from the board's switches controls the snake's direction. The system updates the snake's position based on the four switches, detects food consumption, increases the snake's length, and checks for collisions with game boundaries. A simple state machine handles gameplay flow (playing, game over, reset). VGA logic is used to draw the snake, food, and borders on screen.

The game divides the pixelated screen into 16x16 pixel blocks. This yields a 40x30 block display area. The main game engine works using this. With the use of pseudo-random values, the apple is generated with coordinates on the screen. The game engine will check if the head of the snake has the same coordinates (i.e. collides with it) to increase the snake length and generate new food. The tail's position is done using packed arrays for the x and y coordinates of each segment. Using a for loop, the segments are updated using the one before it.

References

- DE10-Lite User Manual (VGA timing and hardware specs)
- Course lecture slides on combinational & sequential logic
- Gundesha J. [Jjateen]. (2025). *Snake Game Verilog*. Github Repository. https://github.com/Jjateen/Snake-Game-Verilog/tree/main.
- Meads D. [dominic-meads]. (2020). *Quartus Projects*. Github Repository. https://github.com/dominic-meads/Quartus-Projects/tree/main.
- Meads D. [Dom]. (2020, November 8). *VGA image driver (make a face) on an Intel FPGA* [Video]. YouTube. https://www.youtube.com/watch?v=mR-eo7a4n5Q.
- Kanoun A. [ahmadbakesbread]. (2024). *PongFPGA*. Github Repository. https://github.com/ahmadbakesbread/PongFPGA?tab=readme-ov-file.

Video Link:

https://youtu.be/-J0djAjLM6k