

FPGA Pong

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INTRODUCTION

This memo outlines the additional features incorporated into the FPGA Pong game for the ECE433 Fall 2023 final project, building upon the existing code developed across several milestones throughout the quarter. The progression of the project unfolded in distinct phases, including adapting the pong game for the Nexys A7 board, implementing and customizing a VGA driver on the FPGA, integrating a speaker output with in-game sounds, and incorporating an on-screen score display. Beyond these essential project milestones, this memo delves into the subsequent enhancements introduced to the game.

NEW LOOK

The first large change was the overall look of the game. I changed it to make it less straining on your eyes and allowed for more attention to be drawn to the ball when it will change colors.

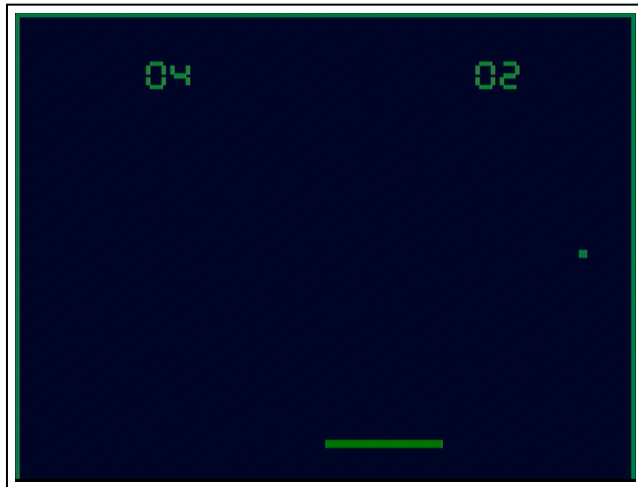


Figure 1. New Look and Highscore Example

This was a simple change to the game RGB output to allow for the changing of the background color

HIGH SCORE

The next large change I made to the pong game was adding a high score output on the left side of the screen. Each time you hit the ball the score on the right will increase and then when you miss if your score was higher than the previous score it will be displayed on the left hand side to encourage you to beat that score. This score can be reset along with the entire game using the reset button.

CUSTOMIZABLE PADDLE

Another feature that was added was the ability to customize the paddle color based on the switch settings as seen below in the figure

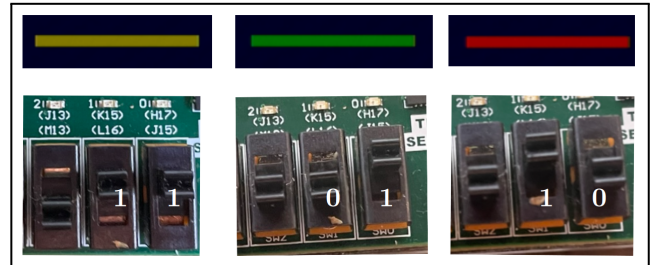


Figure 2. Paddle Selection

REACTIVE BALL

A feature that was added to make the game more exciting is the changing of the ball speed depending on when the ball is hit along with a counter that happens in the background which makes every fifth hit go a bit faster. The ball also changes color to red as seen in the figure below when it collides and is gaining speed.



Figure 3. Reactive Ball

MUTE SWITCH

Though the sounds from the game provide feedback to the user they can sometimes be a bit much, especially when testing the game so I used one of the onboard switches as a mute switch to mute the speaker output.

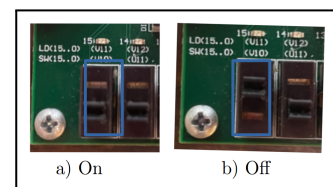


Figure 4. Mute Switch Settings