SNAKE+

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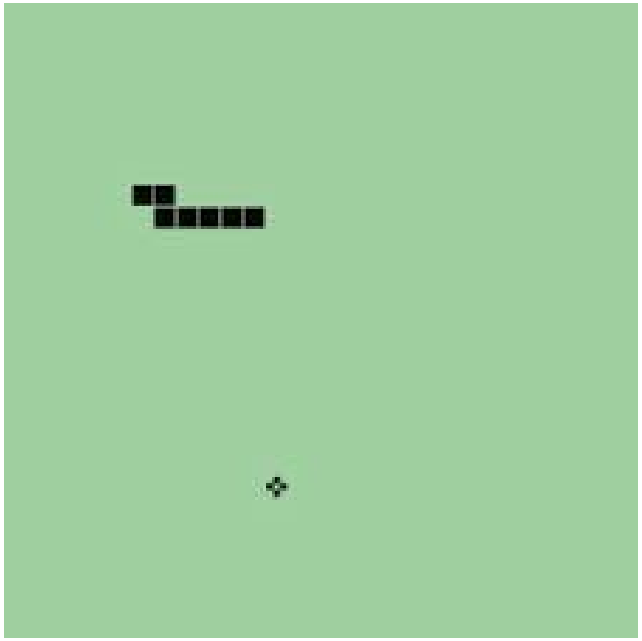
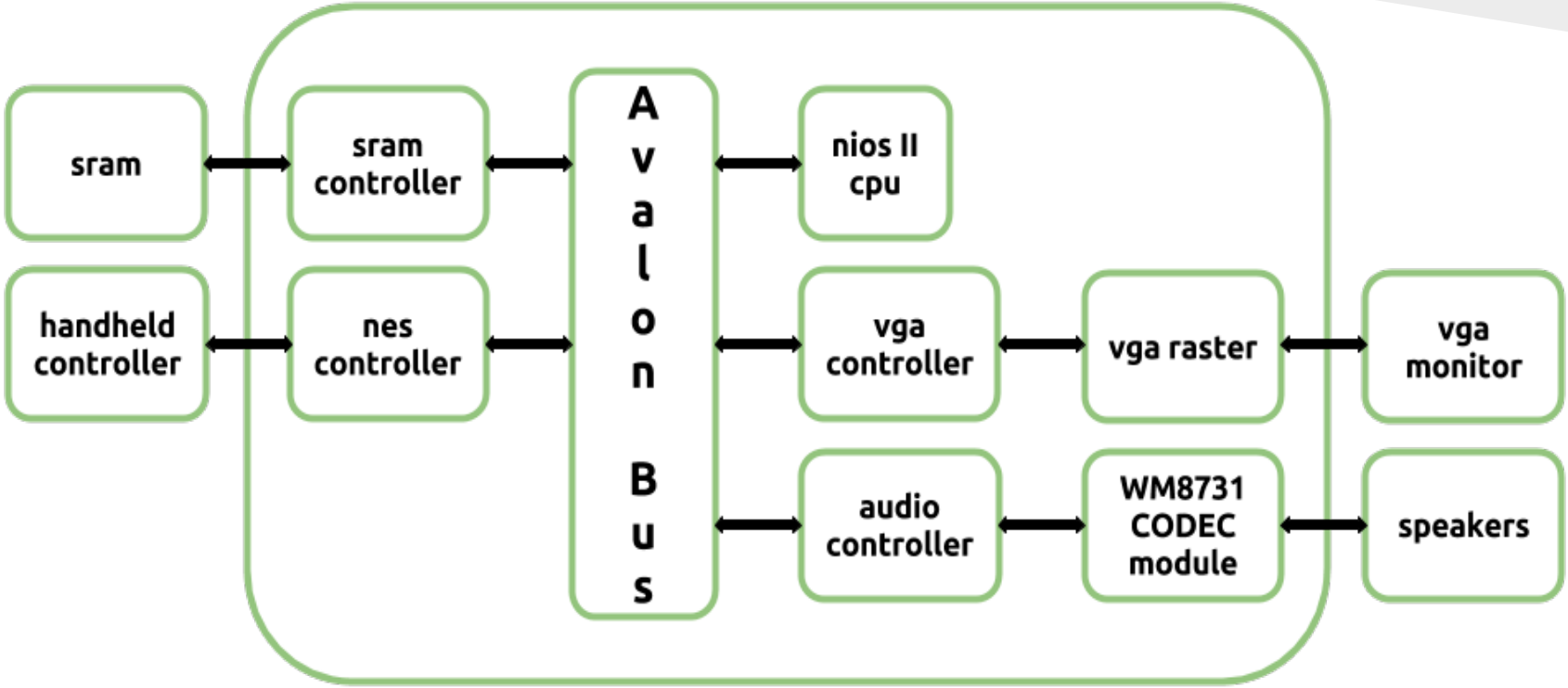
Overview and Objectives

- Remember that addictive Nokia game from the '90s?

- Remake it on an FPGA, but do it better:
  - better graphics
  - multiple players
  - nes controllers!
  - power-ups
  - obstacles

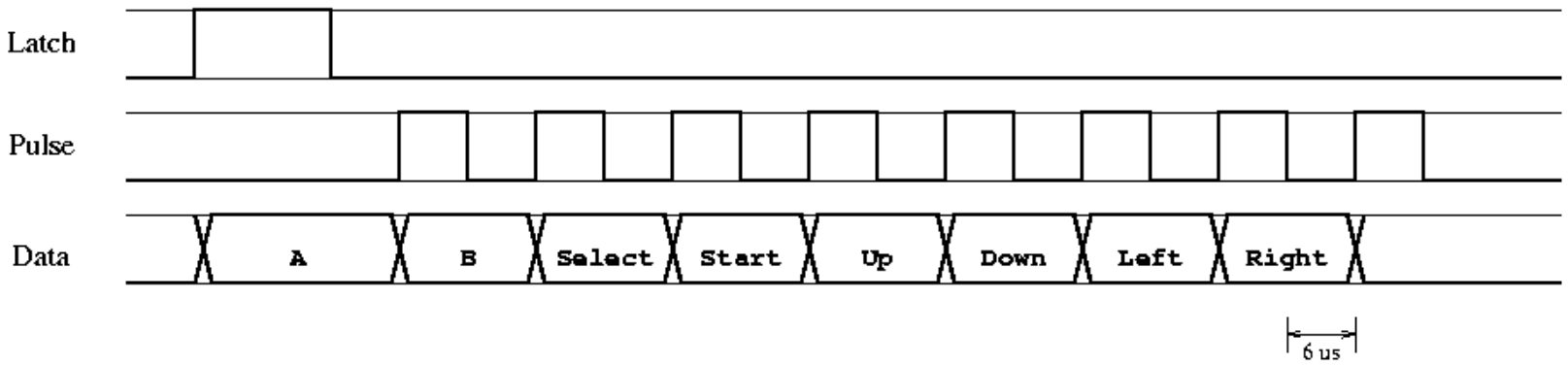


Design Architecture



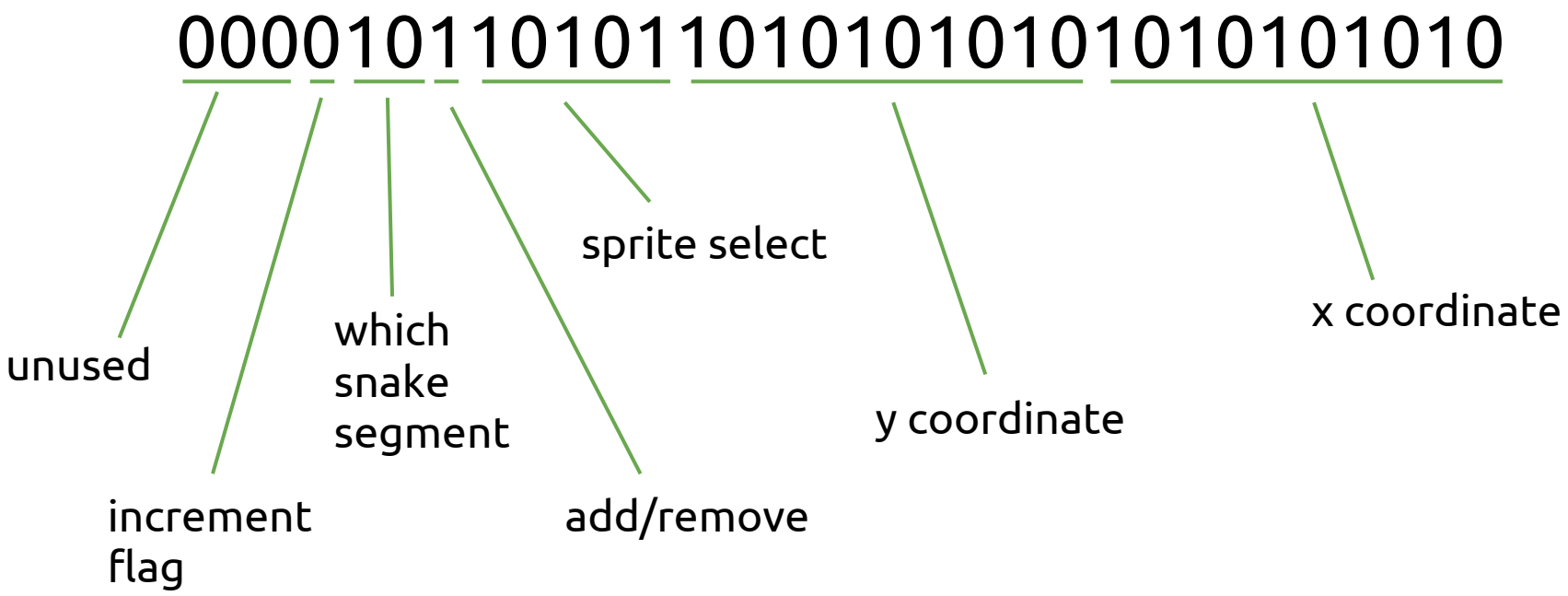
Design Architecture

NES Controller Protocol

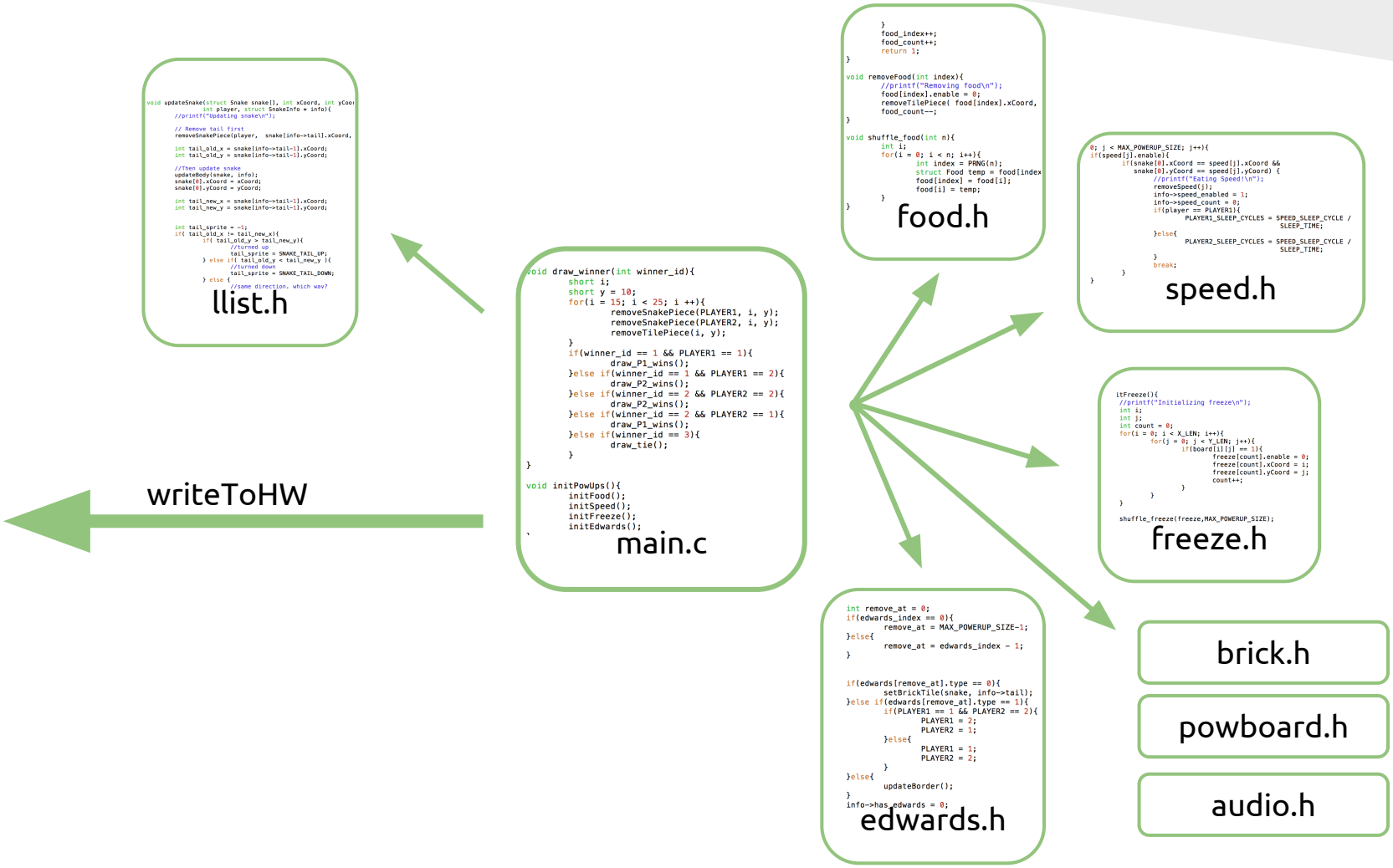


Design Architecture

Writing to hardware



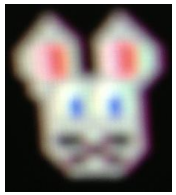
Game Software

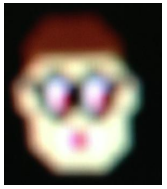


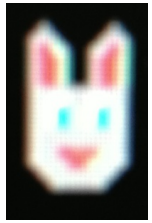
Gameplay

Edibles

- food (rabbits + mice)
- speed power-up
- freeze power-up
- edwards power-up

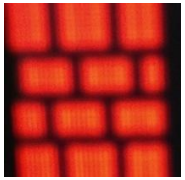




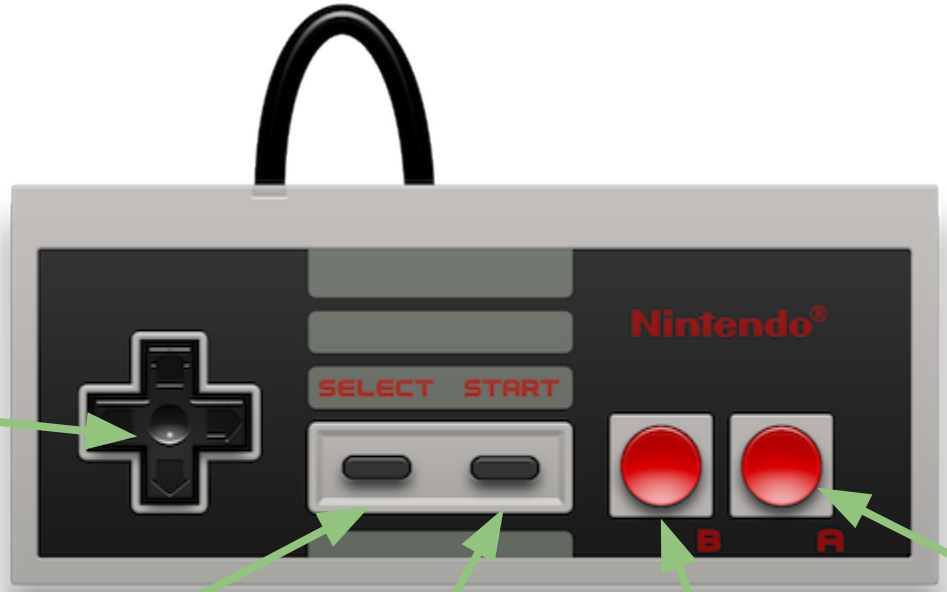


Obstacles

- bricks + walls
- your own tail
- other players



Controlling Your Snake



move your snake

pause

start

use edwards power-up

use freeze power-up

Challenges

- Connecting NES controllers
  - Using universal I/O pins
  - Have their own serial-bit protocol
- Tracking snakes' locations
  - Snakes are just linked lists
  - Software knows where everything is
    - Hardware just draws it
- Efficient storage of sprites
  - Binary encodings, broken up by color
- VGA Raster
  - Unexpected colorings

Summary

Lessons Learned:

- Working with embedded systems is tricky, yet rewarding
  - Lots of possibilities and methods of implementation
  - ...Which means a lot of learning from your own mistakes

Completed Game:

- Brought Snake into the 21st century
  - Added in idea of NES controllers
  - Two players (or more)!

Thanks for Listening!