Electrical Engineering and Computer Science
EECS373 - Design of Microprocessor-Based Systems

Real-D Pong

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Introduction: Pong in the real world

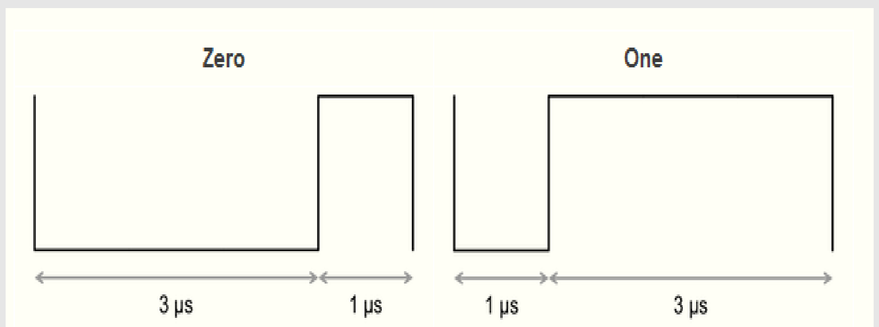
- SmartFusion FPGA powered
- DC motors on gearbelts to move paddles
- Solenoids used to “punch” ball
  - Triggered by laser interrupts
- LCD screen display
  - Score
  - Time remaining
- Wood table and base
- Fun for the whole family

Main Menu

End of Game

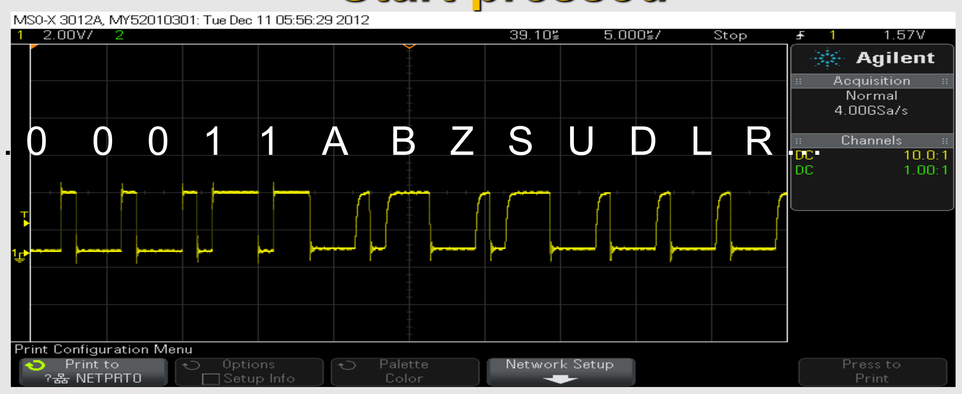
Controls: Nintendo 64 controller

- Bits send in sequence with 4 us period
- Send controller 000000011 to request data
- 32 bits sent back from controller(order seen right)



0	A
1	B
2	Z
3	Start
4	Up
5	Down
6	Left
7	Right
8	/
9	/
10	L
11	R
12	C-Up
13	C-Down
14	C-Left
15	C-Right
16-23	X-Axis
24-31	Y-Axis

N64 feedback with B and Start pressed

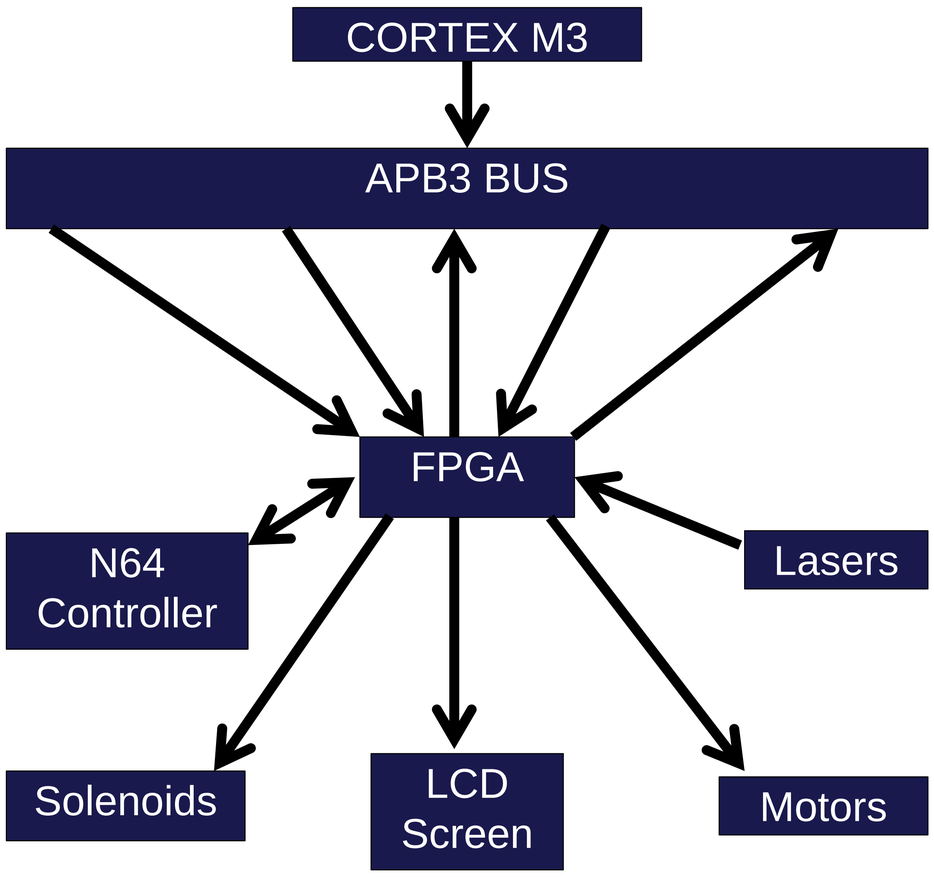


… 0 0 0 1 1 A B Z S U D L R

000000011 to controller---data back from controller

Implementation: Powered by ARM Cortex-M3

Design Structure



DC Motor Control

- Powered by 12 V power supply
- H-Bridge used to control direction
- GPIO pins set H-Bridge when joystick is pressed
- PWM used for variable control with joystick

Solenoid Control

- Powered by 12 V power supply
- Relay used to control power to solenoid
- GPIO pins set relay when laser triggers

LCD Screen

- UART connection to FPGA
- Displays score and time left in game
- Use player 1 (green controller) to navigate menus
  - Start new games
  - Change time of game
  - Change game mode (timed or to max points)

Power Ups (if time applicable)

- Button sequence appears on screen
- First player to press sequence gets power up
  - Temporarily stop opponent’s motor
  - Remove opponents variable control
  - Gain points