# Networked Air Hockey Video Game

Aimee Sanchez – ams2300

Ankita Nayak – aan2120

Kapil Verma – kv2208

Vinay Sharma – vs2330

# OVERVIEW

- **Game Play**
  - Two players
  - Paddle control using mouse
  - First player to 8 points wins!

- **Players on separate terminals**
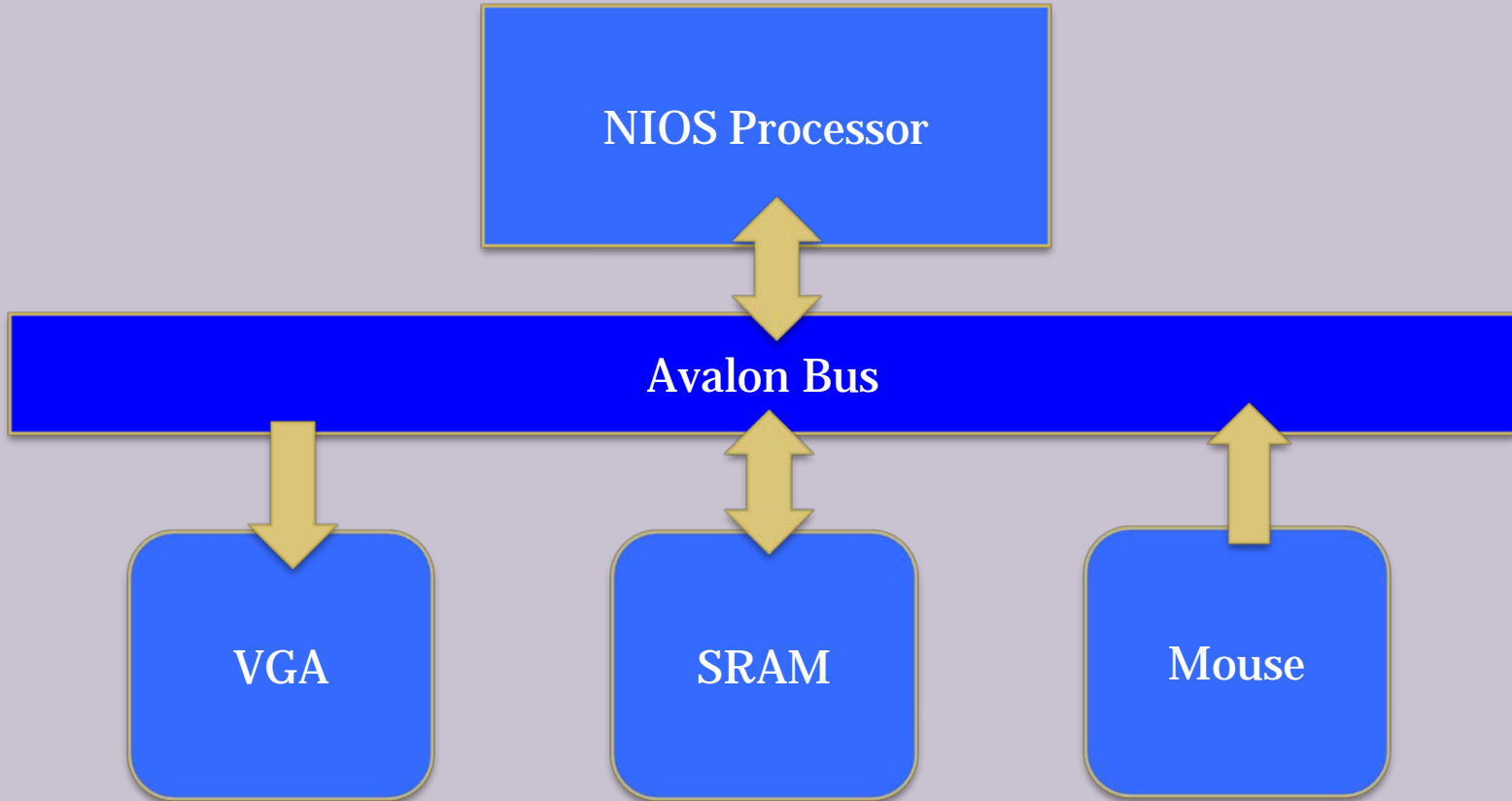  - Communication through Ethernet directly connected network

# OBJECTIVES

- Build the game from scratch that features:

  - Fully integrated system (hardware and software)

  - Clean, intuitive design

  - Fun game play
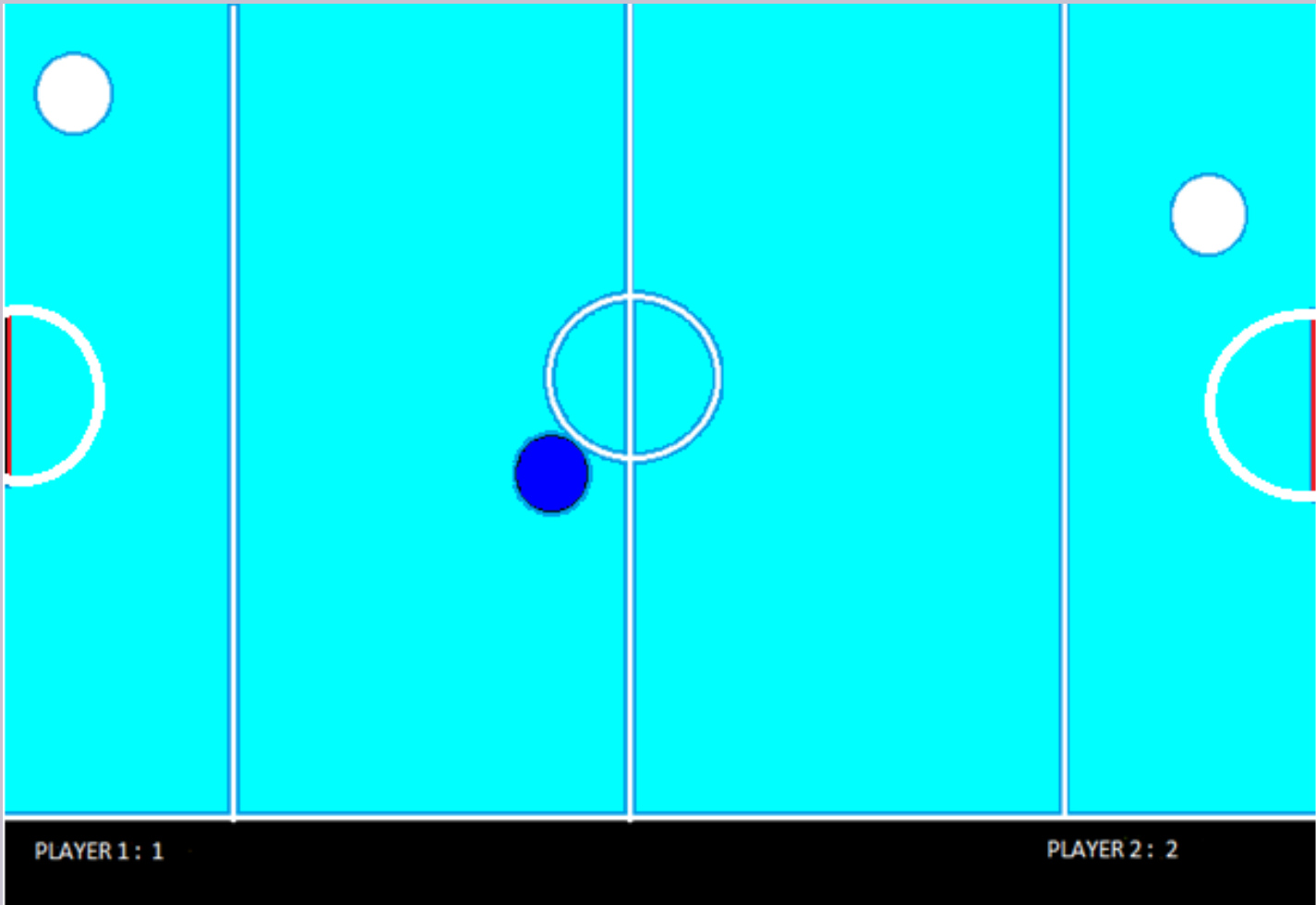
# DESIGN ARCHITECTURE

- Altera Cyclone II FPGA

- NIOS processor
  - CPU
  - SRAM

- Peripherals
  - VGA
  - Mouse
  - Ethernet

# BLOCK DIAGRAM

# VIDEO DISPLAY

# CIRCLE GENERATION ALGO

- Drawing circles require computing the square of the x,y coordinates as well as the radius
- Multiplication is toxic!
- It is possible to generate circles using only lookups and addition:
  - Created array which contains pre-computed squares
  - Lookup into the array to get the square based on the index
  - Use these values as constant for computing the equation of a square

# NETWORKING!

- Point to point ethernet connection established between the players.

- Master – Slave configuration.

- IP packets transmitted.

- Paddle coordinates from slave to master and vice versa transmitted over the ethernet.

- Puck coordinates transmitted only from master to slave.

# PS2 MOUSE INTERFACE

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|
| Byte 1 | Y overflow | X overflow | Y sign bit | X sign bit | Always 1 | Middle Btn | Right Btn | Left Btn |
| Byte 2 | X movement | | | | | | | |
| Byte 3 | Y movement | | | | | | | |
| | | | | | | | | |

- 3 byte serial transmission from the PS2 mouse.
- Data captured continuously from the data register
- Used Altera  alt_up_ps2_port.c functions to capture the mouse data
- Created ps2_mouse.c file from scratch! to handle the directions and positions of the paddles.

# SCORE KEEPING

* Bit maps created for PLAYER: 1 ,2.

* Bit maps created for score from 0 -8.

* Every time a goal is scored by a player, the appropriate bit map location is chosen based on the new score and displayed on the VGA.

* Scores are also transmitted over the ethernet to the other player's display.

# Physics simulation

d

dy

dx
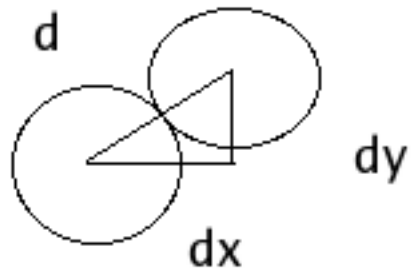
# PROJECT EXPERIENCE

- Worked in parallel

- Lots of collaboration

- Learned to work in distracting environment

# SUMMARY

- ## Lessons Learned
  - Important to understand the details of each component
  - Make use each member's individual strengths
  - Always leave space for adjustments or additions