ReFlex

Reaction Game

Garrett Brainard and Jessica Gillan

What is ReFlex

- A game implemented both in hardware and software on the Nanocore Board
- “drinking” reaction time game
- LED illuminates the first one to react after that wins

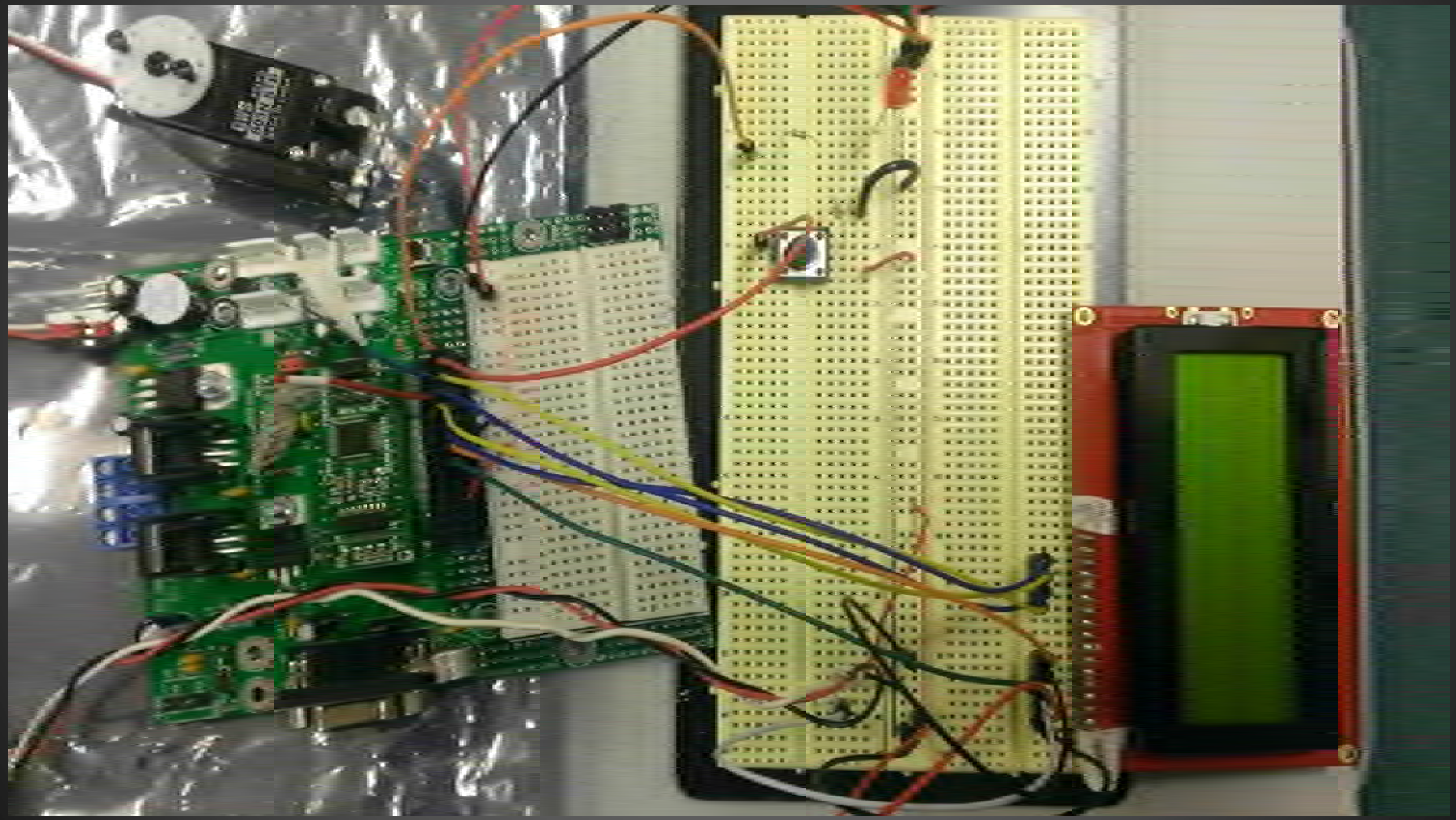
Gameplay

- 2 Players
- Press button to start
- Led lights up, player closes finger on glove as fast as they can react.
- Once a player wins 2/3 rounds a servo turns to pour them a drink.
- Score and information is displayed on LED

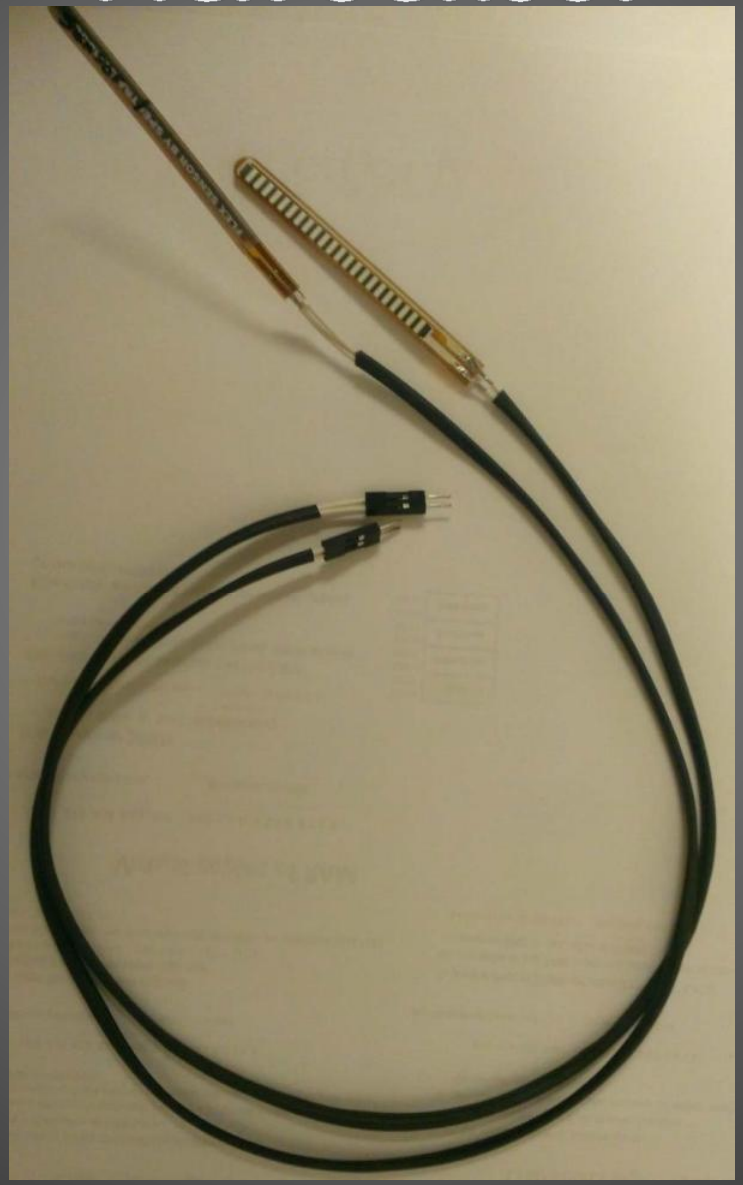
The Hardware

- Nanocore Board
- X2 flex sensors
- Button
- LCD Screen
- Servo
- Pinch Valve
- OpAmp (GL358)
- LEDs & Resistors
- Gloves

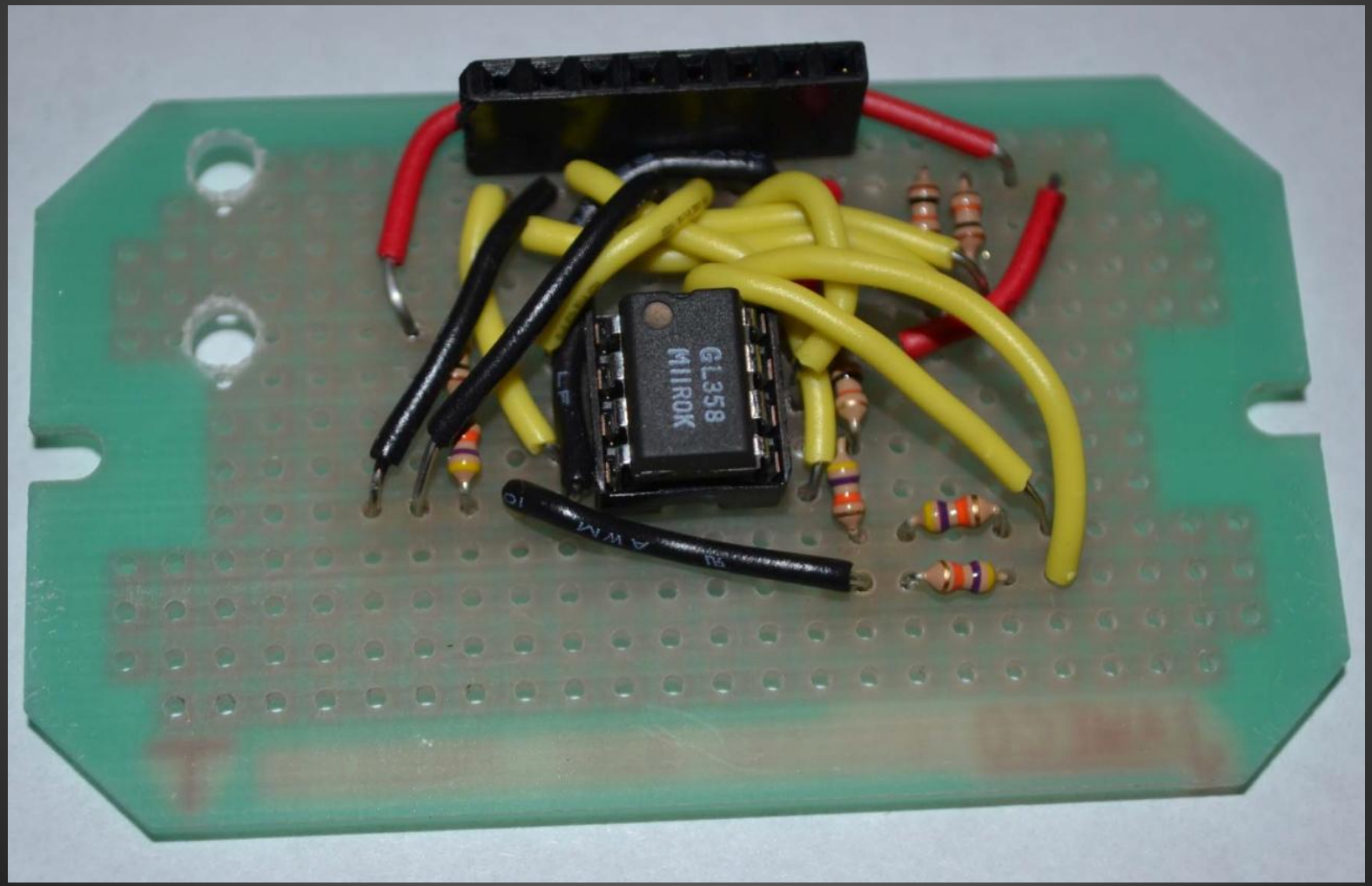
The Hardware



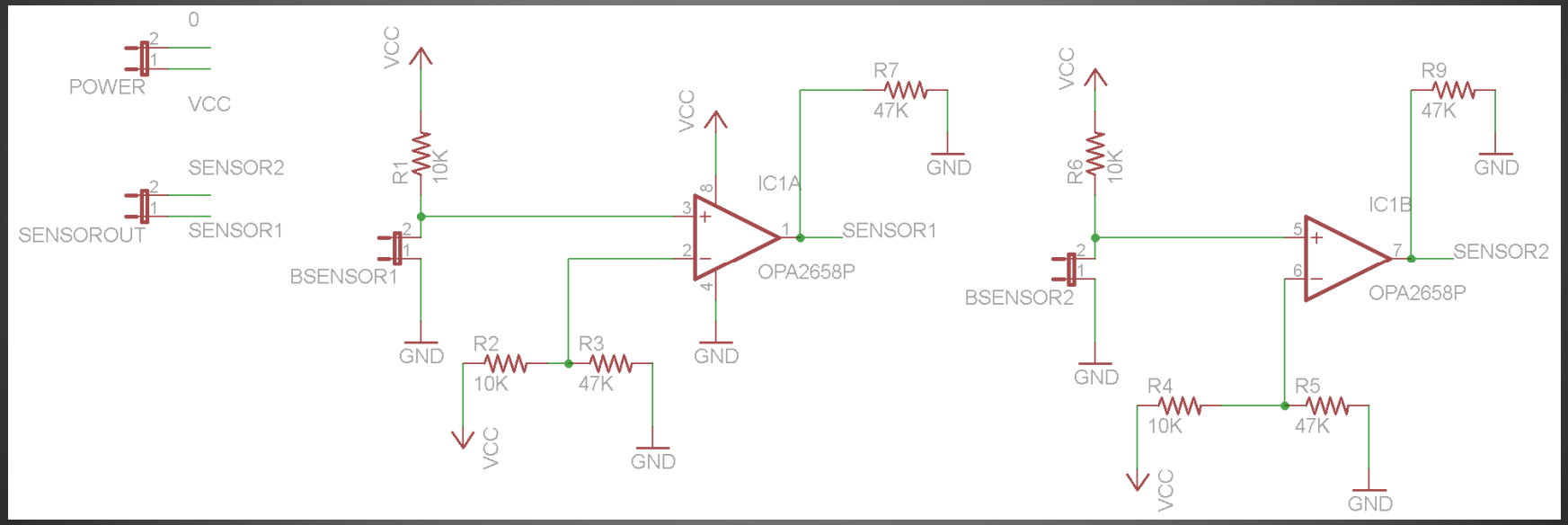
Flex Sensor



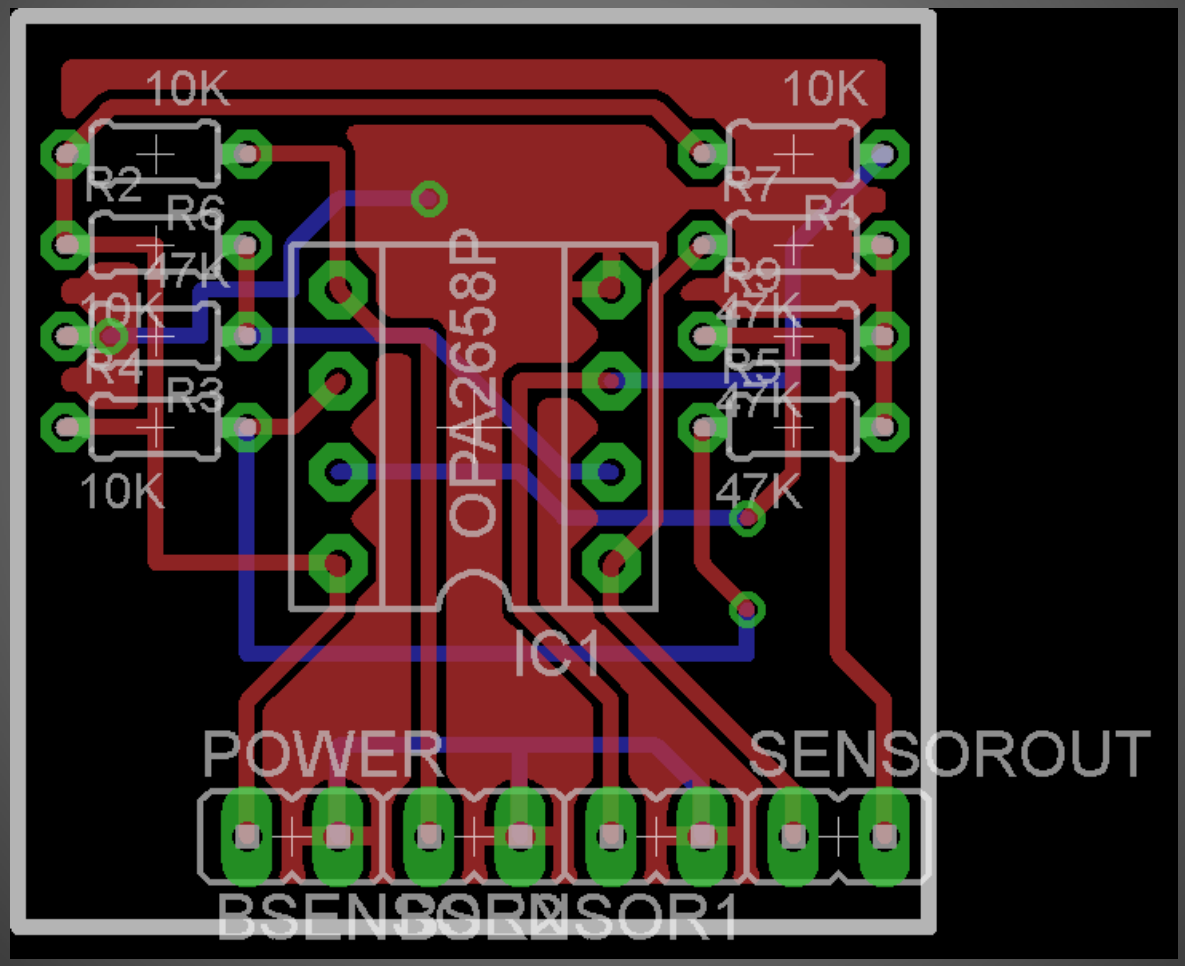
Analog to Digital Switch



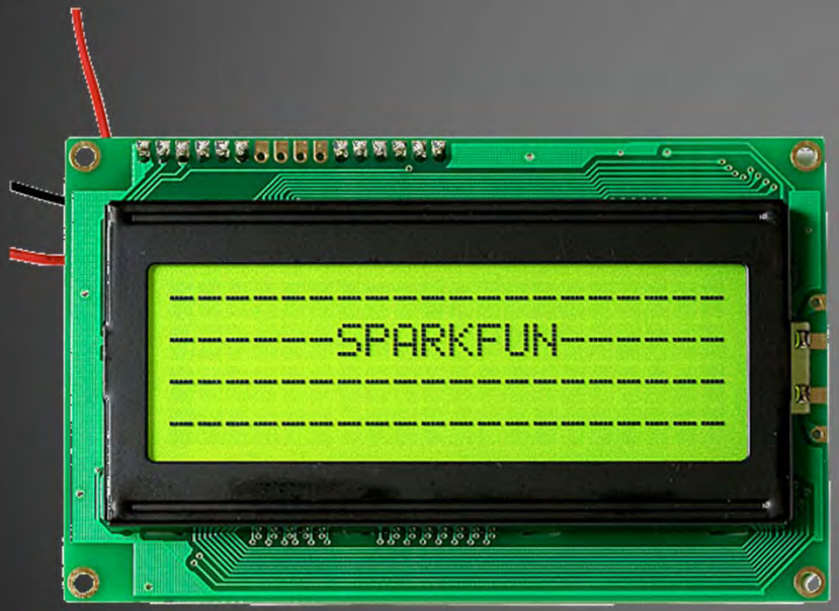
A-D Switch Schematic



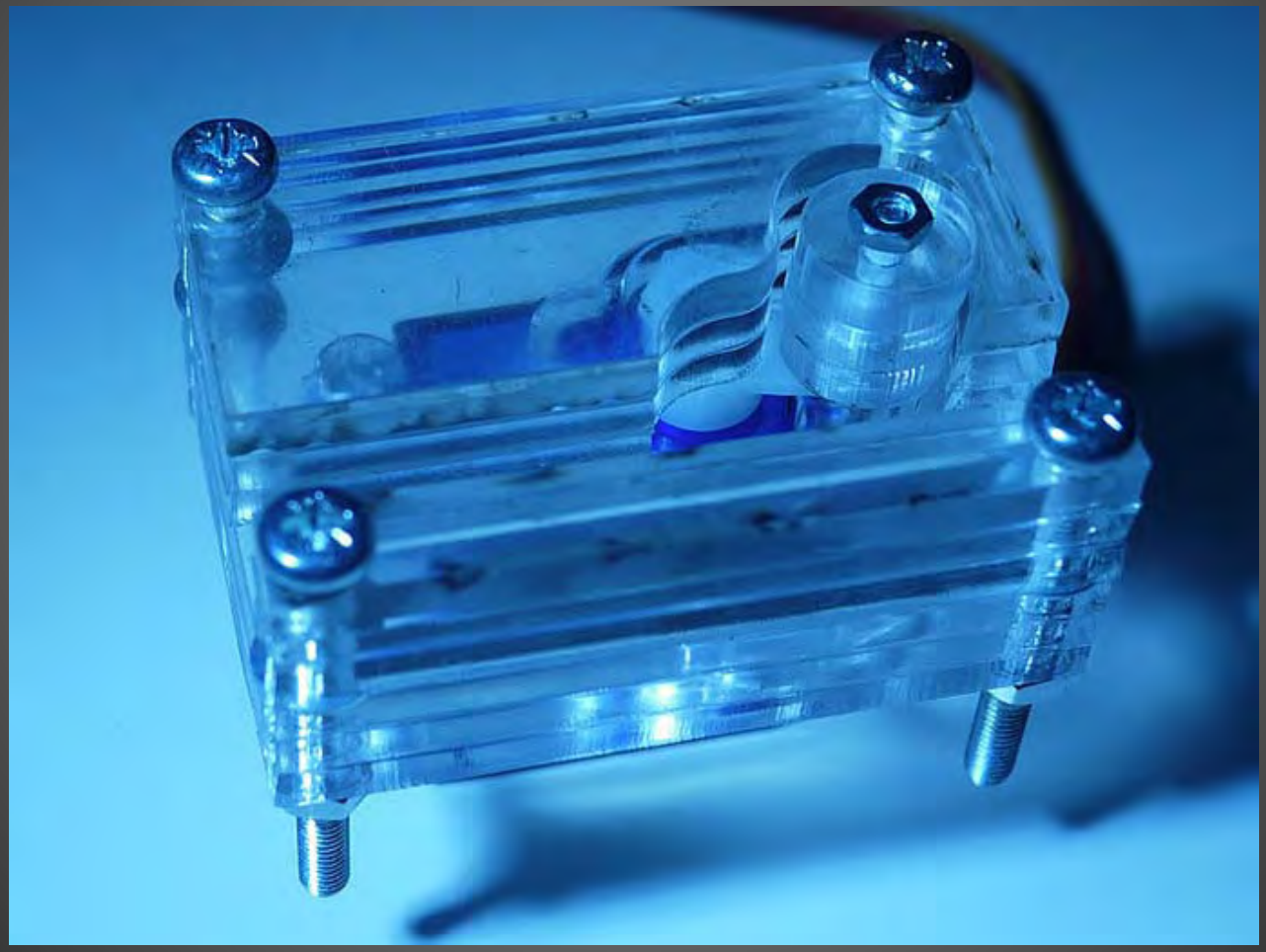
A-D PCB


10K
10K
R2
R6
47K
10K
R4
R3
10K
R7
R1
R9
47K
R5
47K
47K
OPA2658P
IC1
POWER
SENSOROUT

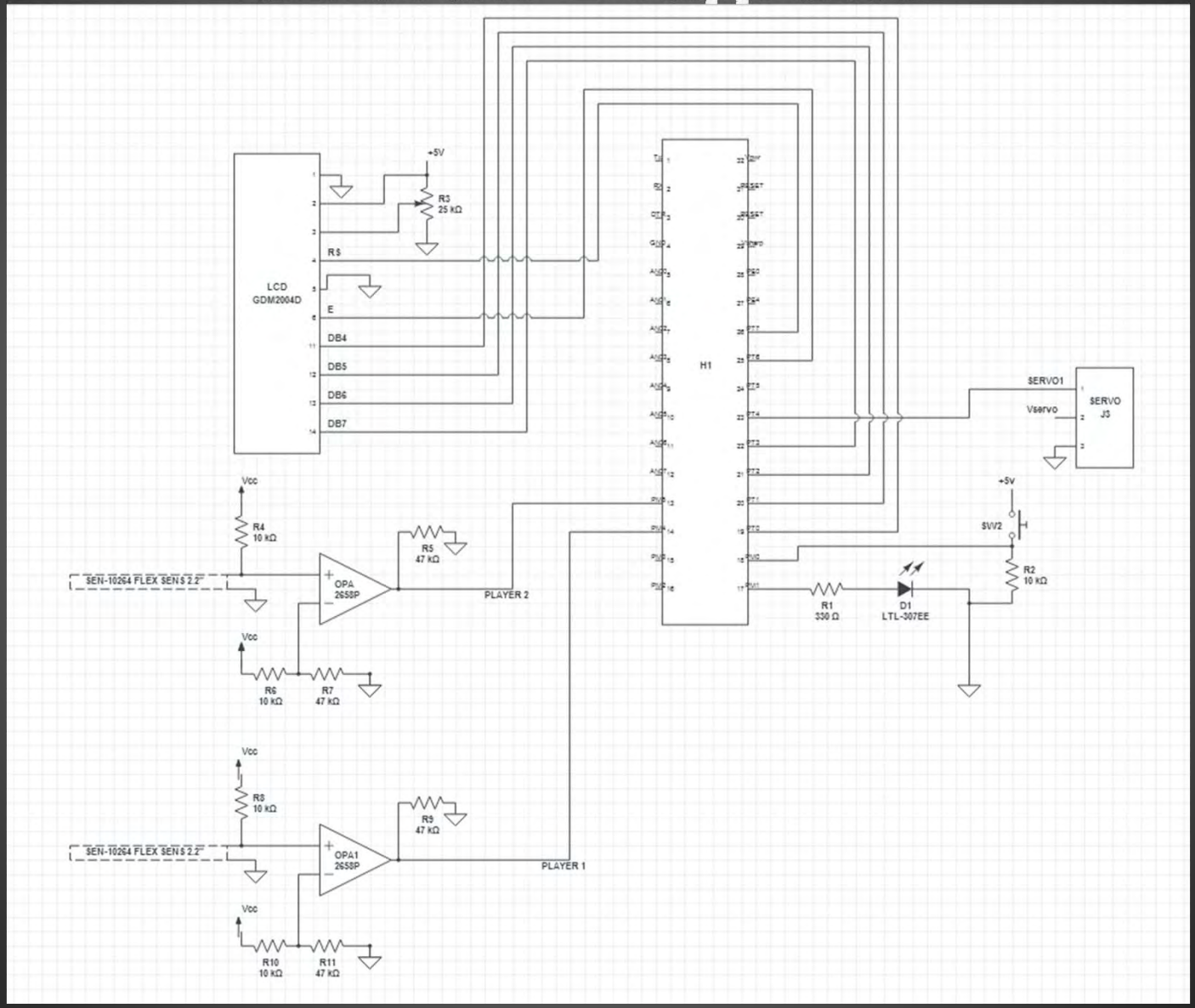
LCD and Servo



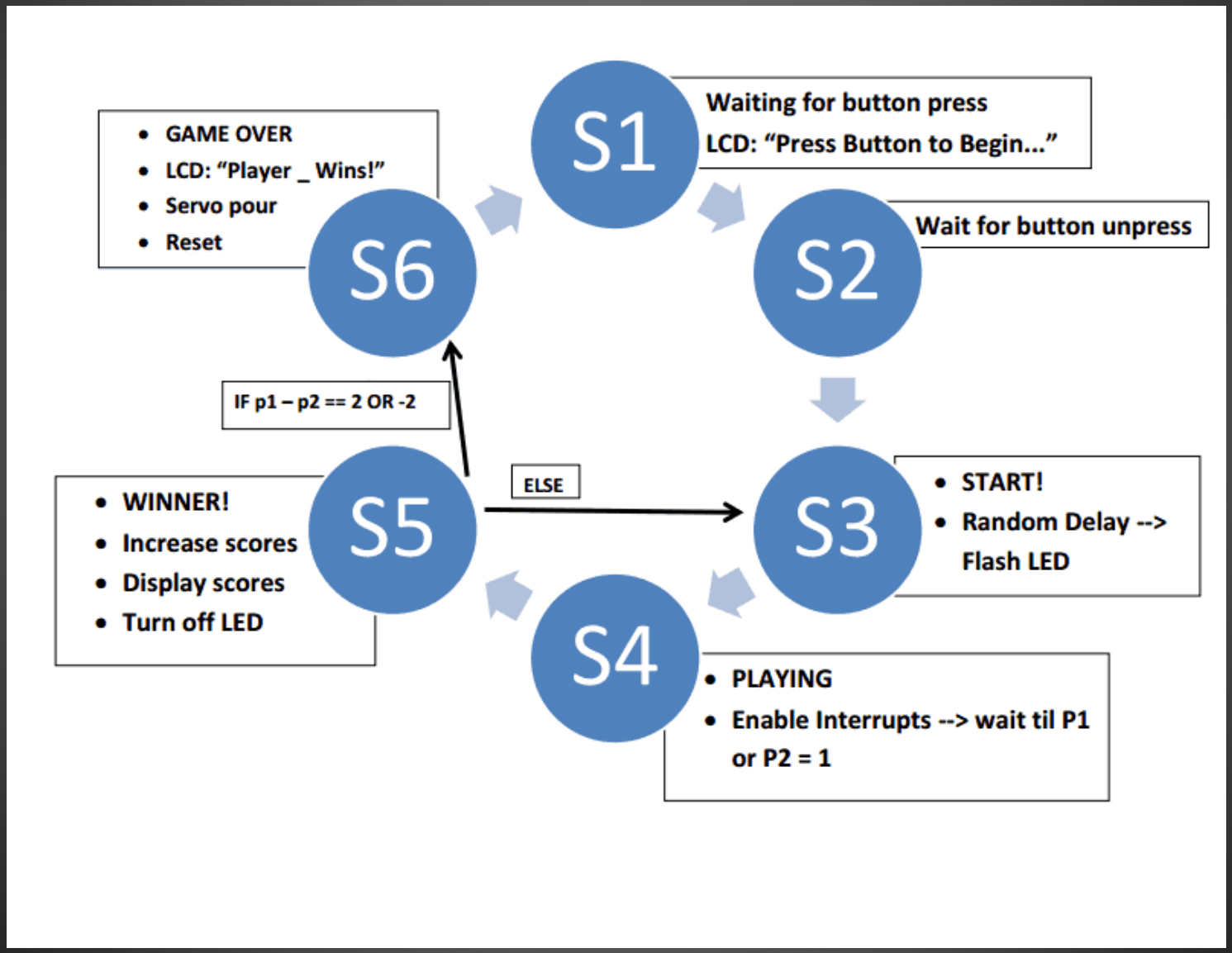
Pinch Valve



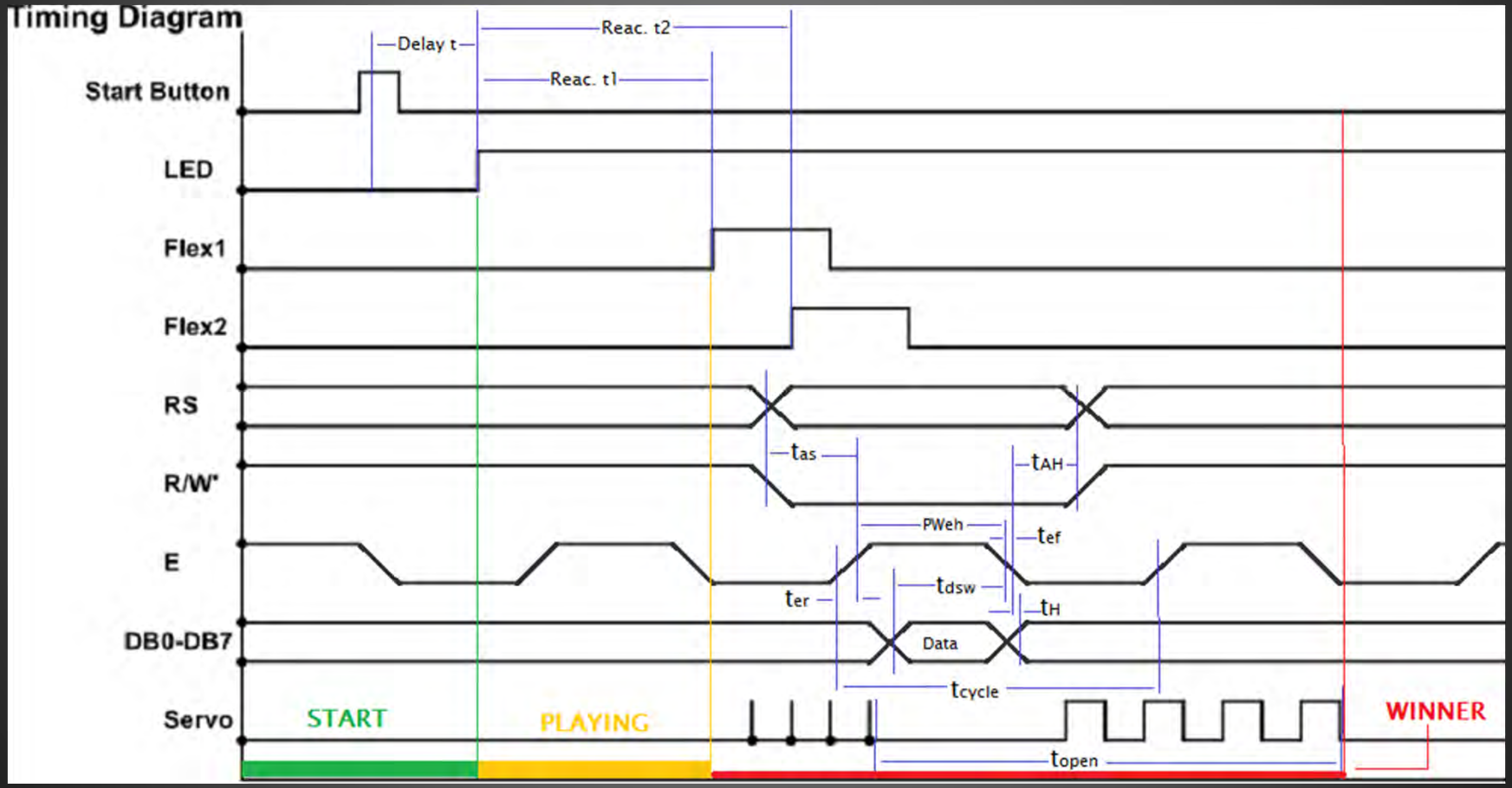
Overall Diagram



Flow Chart


S1
Waiting for button press
LCD: "Press Button to Begin..."
S2
Wait for button unpress
S3
START!
Random Delay --> Flash LED
S4
PLAYING
Enable Interrupts --> wait til P1 or P2 = 1
S5
WINNER!
Increase scores
Display scores
Turn off LED
S6
GAME OVER
LCD: "Player _ Wins!"
Servo pour
Reset
IF p1 – p2 == 2 OR -2
ELSE

Timing Diagram



Pseudo Code

```
Initialize: -LCD
            -Port T
            -Port M
            -RTI System
            -Servo PWM System


Initialize STATE to S1
WHILE (TRUE) DO
      IF (STATE = S1) THEN
            Print to LCD, "Press Button to Begin"
            Delay
            IF (Button) THEN
                  state = S2;

      ELSE IF (STATE = S2) THEN
            IF (!Button) THEN
                  STATE = S3

      ELSE IF (STATE = S3) THEN
            Print to LCD: "Get Ready..."
            Delay Random t
            Turn on LED
            STATE = S4
```

Pseudo Code Cont.

```
ELSE IF (STATE = S4) THEN
      Turn on interrupts
      IF (P1 OR P2) THEN
            Turn off interrupts
            STATE = S5

ELSE IF (STATE = S5) THEN
      Turn Off LED
      Add P1 and P2 to Score1 and Score2
      Print scores to LCD
      Delay
      IF (Score1 - Score2 = 2 OR -2) THEN
            STATE = S6
      ELSE
            IF(p1 AND p2) THEN
                  Print to LCD: "TIE"
           ELSE IF( p1 )THEN
                  Print to LCD: "Player 1 wins the  round!");
            ELSE
                  Print to LCD: "Player 2 wins the  round!";
           STATE = S3;
            reset p1 and p2 to 0
            Delay

ELSE IF (STATE = S6) THEN
      IF( p1Score > p2Score )THEN
            print to LCD: "Player 1 WINS!!"
      ELSE
            print to LCD: "Player 2 WINS!!"

      Command servo to 90°, delay, 0°
      Reset variables to initial values (0)
      STATE = S1;

ELSE
      invalid state
      -try to recover
```

Challenges

- Hardware VS Software Implementation
- Time
- Valve Design
- Protoboard Design
- Non electric hardware design
- Debugging

REflection

- Reflex uses the HCS12 microcontroller to implement a reflex game
- Allowed us to implement a number of class concepts
- ReFlex has proven to be a well mixed combination of both hardware and software
- Questions