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Team No. 10

# Integrated Pool Table

# Project Objective

- **Goals:** Integrate a pool table and make it more modern and twenty first century
- **Functions:** Keep score, track ball movement, and keep track of which balls are in which pocket
- **Features:** Position tracking, lights

# Project Overview

- RFID tags embedded in balls
- RFID reader built into pockets
- Score keeping
- Numpad for user control
- LCD Display
- Illuminated pocket buttons
- Player lights

# Software Portion

- Program integration
  - 8 and 9-ball game play
  - Player light functions
  - LCD initialization
  - RFID reader initialization
  - Keypad initialization

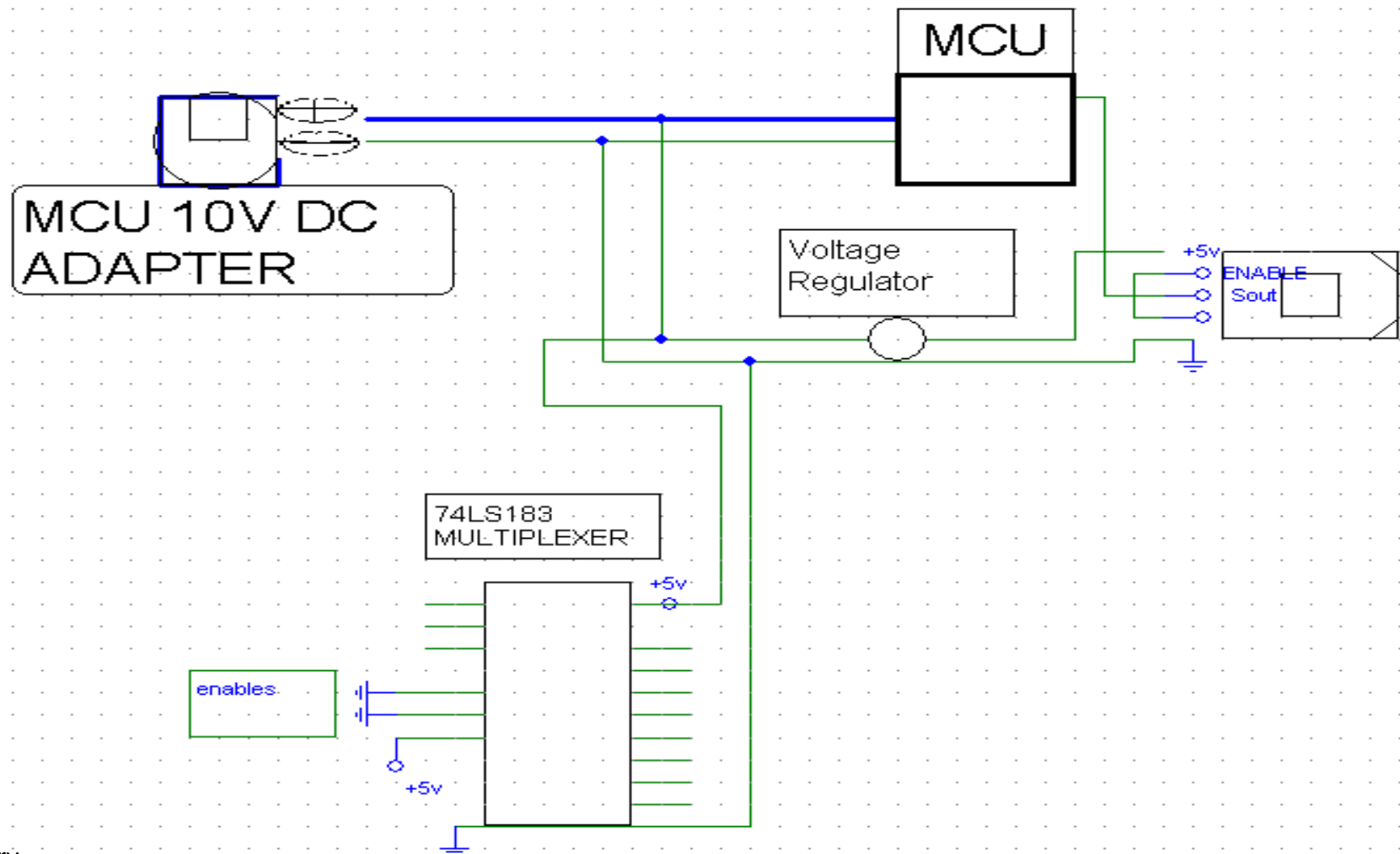
# Hardware Portion

- Hardware integration
  - Transfer rough draft prototype to table
  - Building containment unit for balls
  - Wiring electronic components
  - Mounting LCD, Keypad, and MCU
  - Install pocket button
  - Installing the player and pocket lights

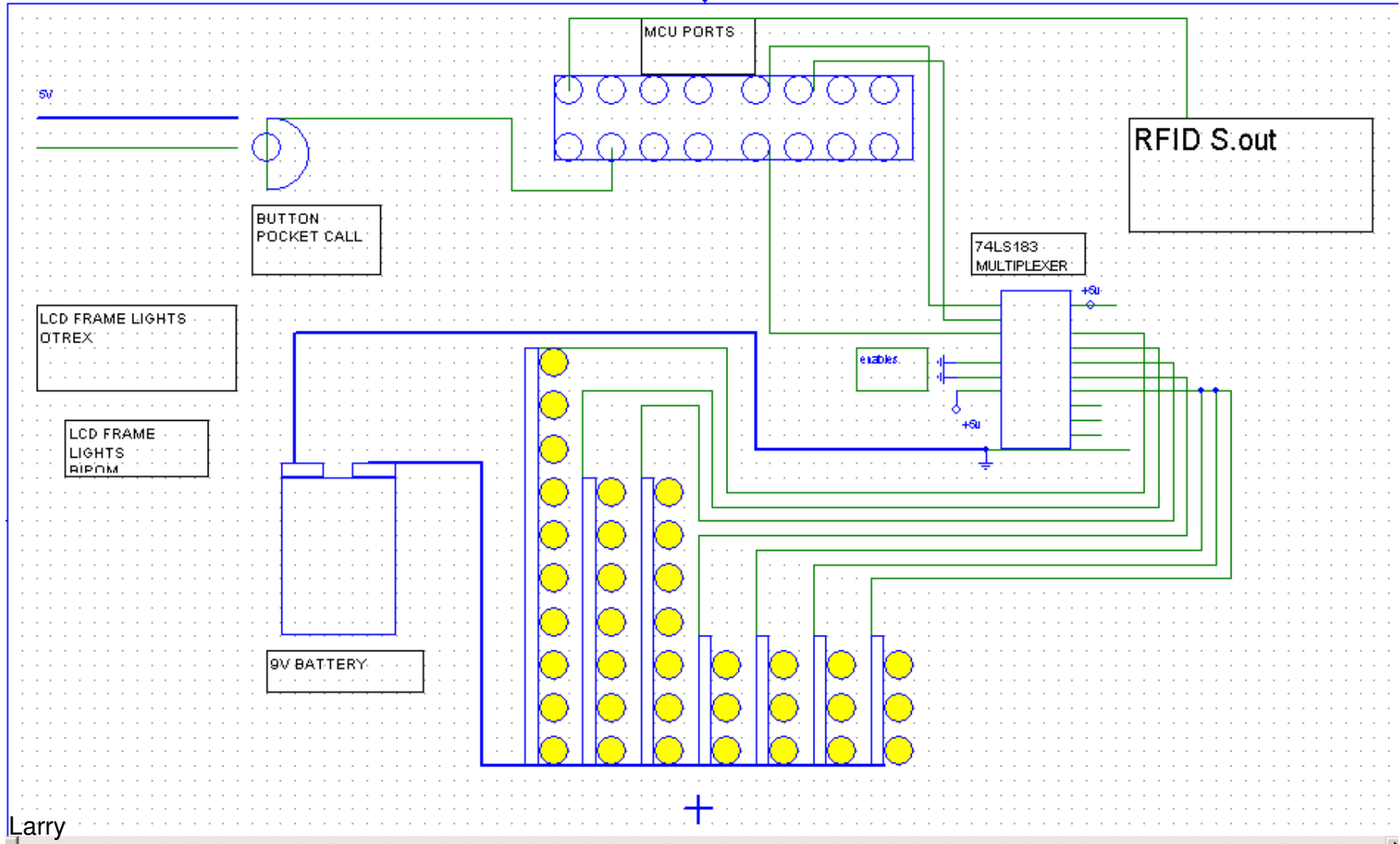
# Hardware cont'

- Light System specifications
  - Thirty five LEDs
  - Operational voltage
    - Max 12v
    - Min 9v
- 74LS183 [1-8] Decoder/Multiplexer IC
  - Operational voltage – 5v Vcc
- Parallax RFID reader
  - Operational voltage – 5v
  - Typical operational current rating – 90 mA

# Electrical Characteristics



# Electrical Characteristics





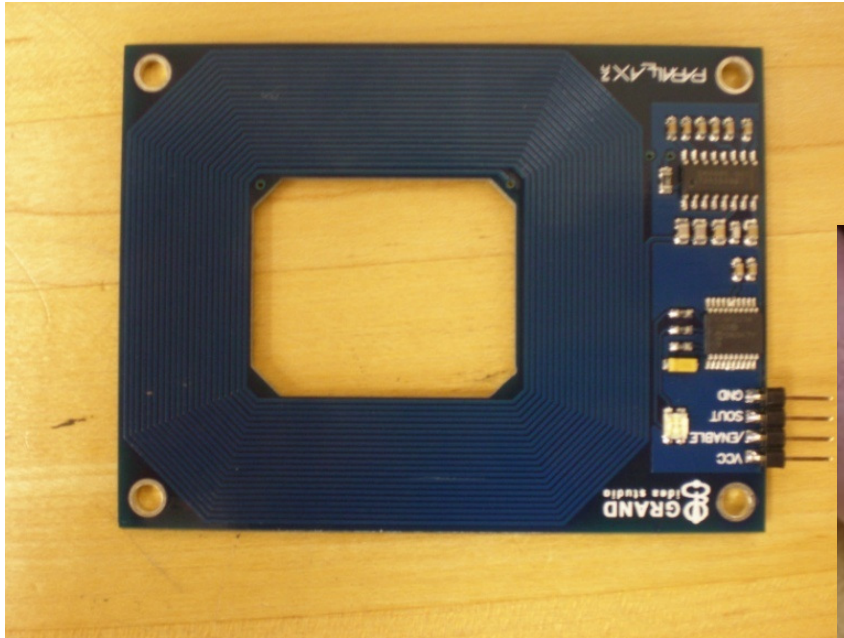
# LCD SELECTION

- Optrex LCD
  - Requires 8 bit initialization and data transfer
  - Advantages:
    - Enhanced display and graphics
  - Dis-advantages
    - Requires majority of 8051 ports to function
    - Multiple Power sources and significant overhead
- Bipom LCD
  - Requires 4 bit initialization and data transfer

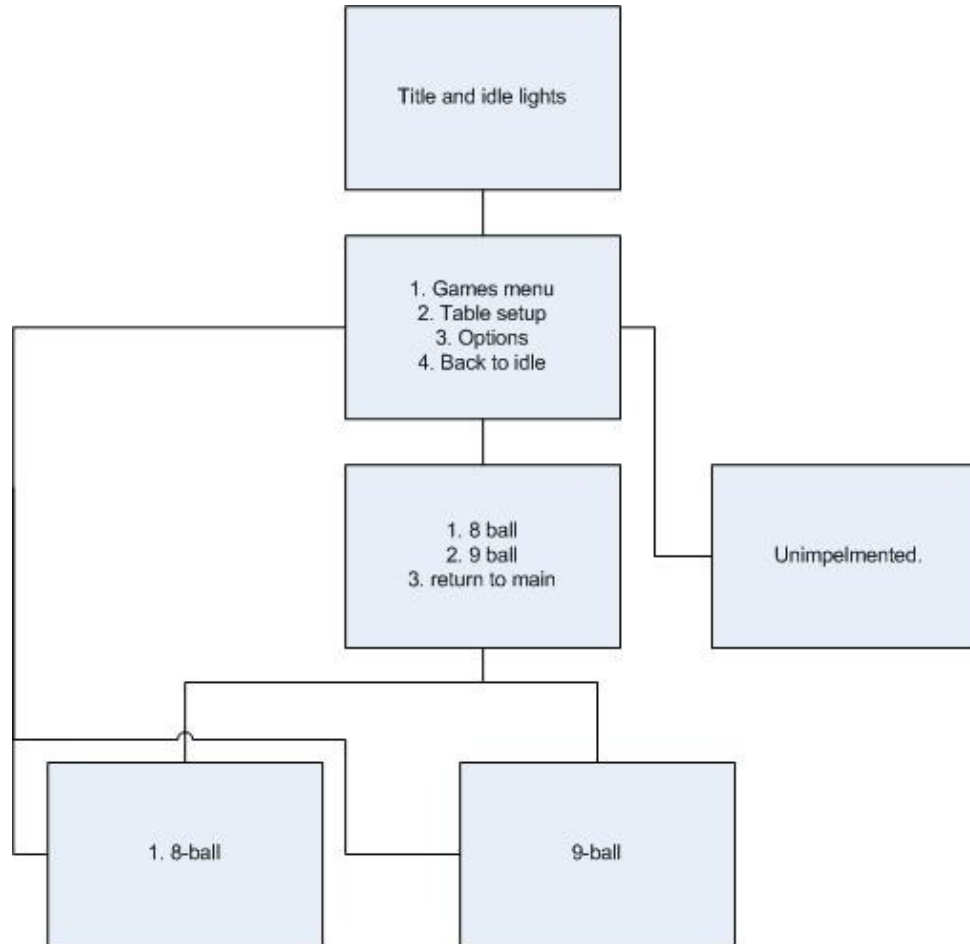
# LCD SELECTION cont'

- Advantages:
  - Port availability
  - Less overhead
  - Libraries written by default
- Dis-advantages:
  - Limited text and graphics

# RFID Reader and RFID Tag



# Software Overview



# 8 Ball

- Check for RFID or User input
  - Tutorials
  - Trivia
  - Return to main menu
- Check for pocket called
- Check for balls made
- Check if 8-ball has been made

# 9 Ball

- Check for number of fouls
- Check for balls made or user input
  - Assignment of fouls
  - Clearing of fouls
  - Returning to main menu
  - Tutorials
  - trivia
- Check for 9 ball pocketed

# Common Functions

- RFID()
  - Seized in while loop and exits when:
    - 12 Characters read
    - ScanKeypad() doesn't return 0
  - Waits for RI to be high
    - Stores the byte in an array
- UpdateBalls()
  - Checks the ID from RFID against known list
  - If a character doesn't match the next ID is checked
  - If no IDs match returns -1
  - If ID matches returns the ball's number
- Ballcheck()
  - Checks to see if ID of last ball matches ID of current ball
    - Stops refreshing of the display
  - Outputs what balls has been pocketed
  - Updates number of solids and stripes pocketed

# BiPom functions

- LCD functions
  - LCD\_Init()
    - Initializes LCD for communication
  - LCD\_WriteCtrl
    - Tells the LCD what to do
  - LCD\_printf()
    - Tells the LCD what to print
- ScanKeypad()
  - Returns a character corresponding to keypad input



# Cost Analysis

Component	Name	Quantity	Cost
MCU	Mini-max/51-C2	1	\$69.99
Training Board	TB-1	1	\$39.99
RFID Reader	Parallax Serial RFID	1	\$45.99
RFID Tag	Ampoule Tag	4	\$23.51
LCD	LCD DMF5005N	1	\$9.99
Pool Table	Child's Pool Table	1	\$40.00
Total			\$229.47

# Did We Reach Our Goal

- Accomplishments
  - Interfacing all necessary components
  - Player lights
  - Different game variants
- Challenges and Issues
  - Toshiba T6963 controller pins damaged

# References

- How to Cheat at Deploying and Securing RFID. Dr. Paul Sanghera, Frank Thorton, Brad Haines, John Kleinschmidt, Anand M. Das, Hersh Bhargava, Anita Campbell. Syngress. ISBN: 978-1-59749-230-0
- RFID Sourcebook. Sandip Lahiri. IBM Press. ISBN: 0-13-185137-3