

Omi The Trumps

Modernizing Traditional Gameplay with Technology

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IT – Group 34

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Introduction



- **Streamlined Card Distribution**

- Simplifies and accelerates the card distribution process.

- **Enhanced Privacy Features**

- Ensures player confidentiality and prevents unauthorized peeking.

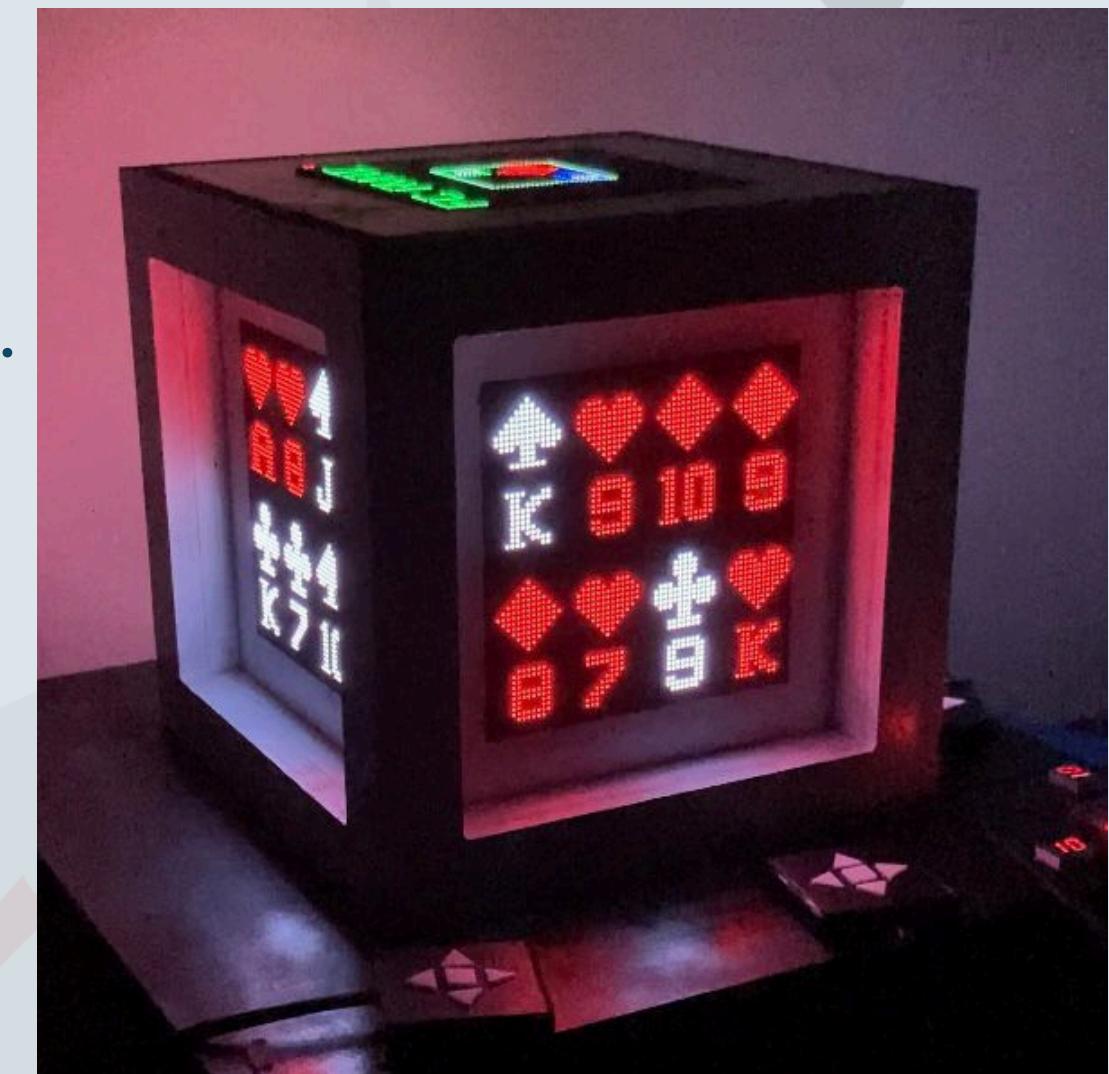
- **Anti-Cheating Mechanisms**

- Implements measures to detect and prevent unfair practices.

- **Blending Tradition with Innovation**

- Fair, efficient, and engaging gameplay.

- Preserves the strategic depth of the original game.



Aim and Objectives



Aim

- modernize the traditional Omi the Trumps game by integrating efficient digital systems that enhance gameplay speed, ensure player privacy, and prevent cheating, while preserving its core tactical essence for a seamless and fair experience.

Objectives

- Streamline card distribution to save time.
- Integrate anti-cheating mechanisms for fair play.
- Combine traditional gameplay with modern innovations.
- Provide a user-friendly, engaging gaming experience.





Problems and Solutions



Problems



- **Time-Consuming Manual Card Management**
 - Prone to human errors, disrupting the game flow

- **Lack of Privacy**
 - Players can unintentionally or intentionally view others' cards.
 - Compromises the integrity of gameplay.

- **Cheating Risks**
 - No secure mechanisms to prevent dishonest practices

- **Absence of Technological Integration**
 - Makes the game less appealing to modern audiences



Proposed Solution



- The Omi the Trumps project introduces an innovative approach to the classic Omi card game.
- By integrating hardware features and advanced game logic, it creates a fair, engaging, and modernized gameplay experience.





Features of the Proposed Solution



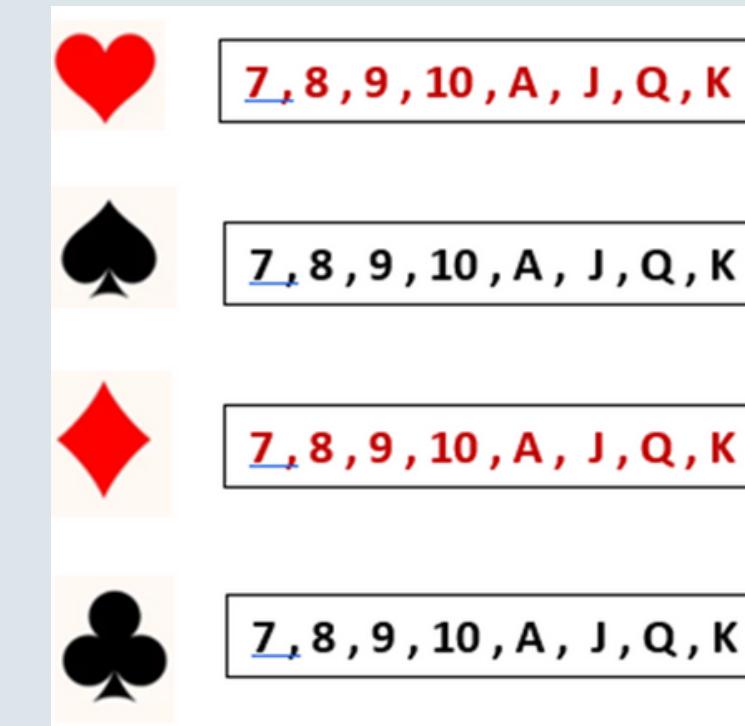
Private LED Panels



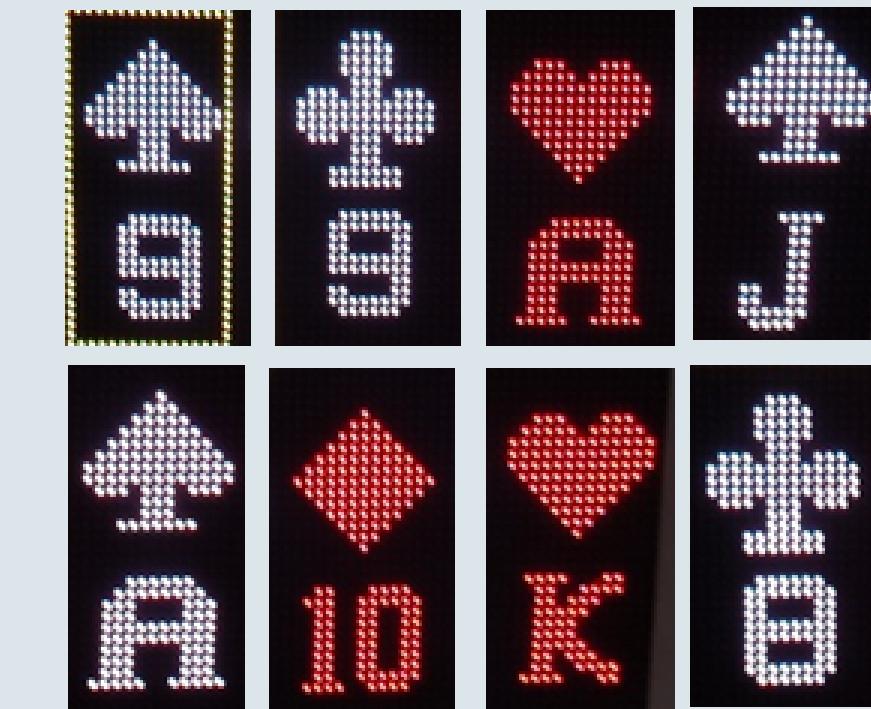
- Each player has an individual display to view their cards securely.



64*64 RGB LED Matrix Panel



Four Suits



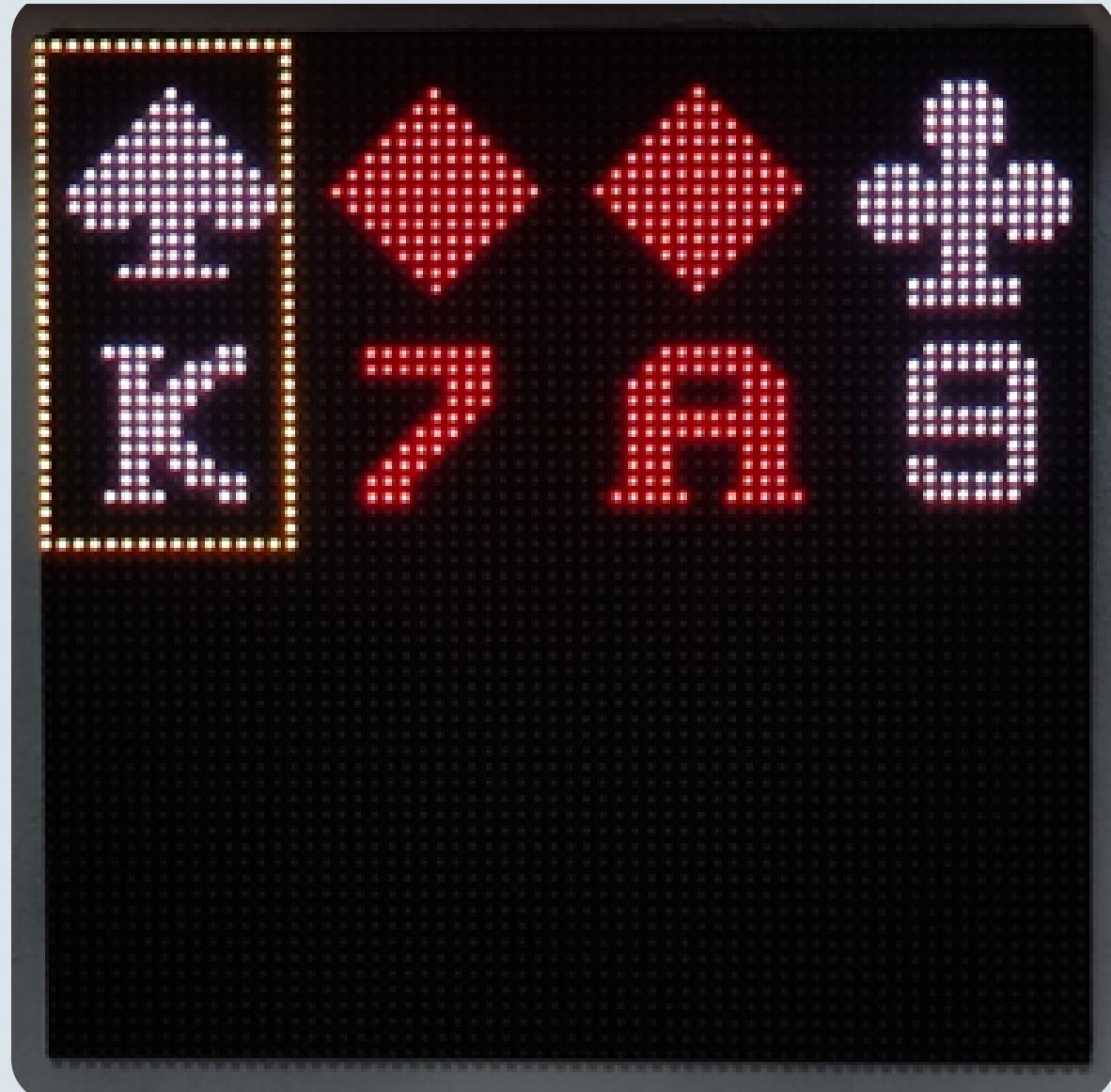
16*32 LED Slots

- Yellow background indicates the current selection card.

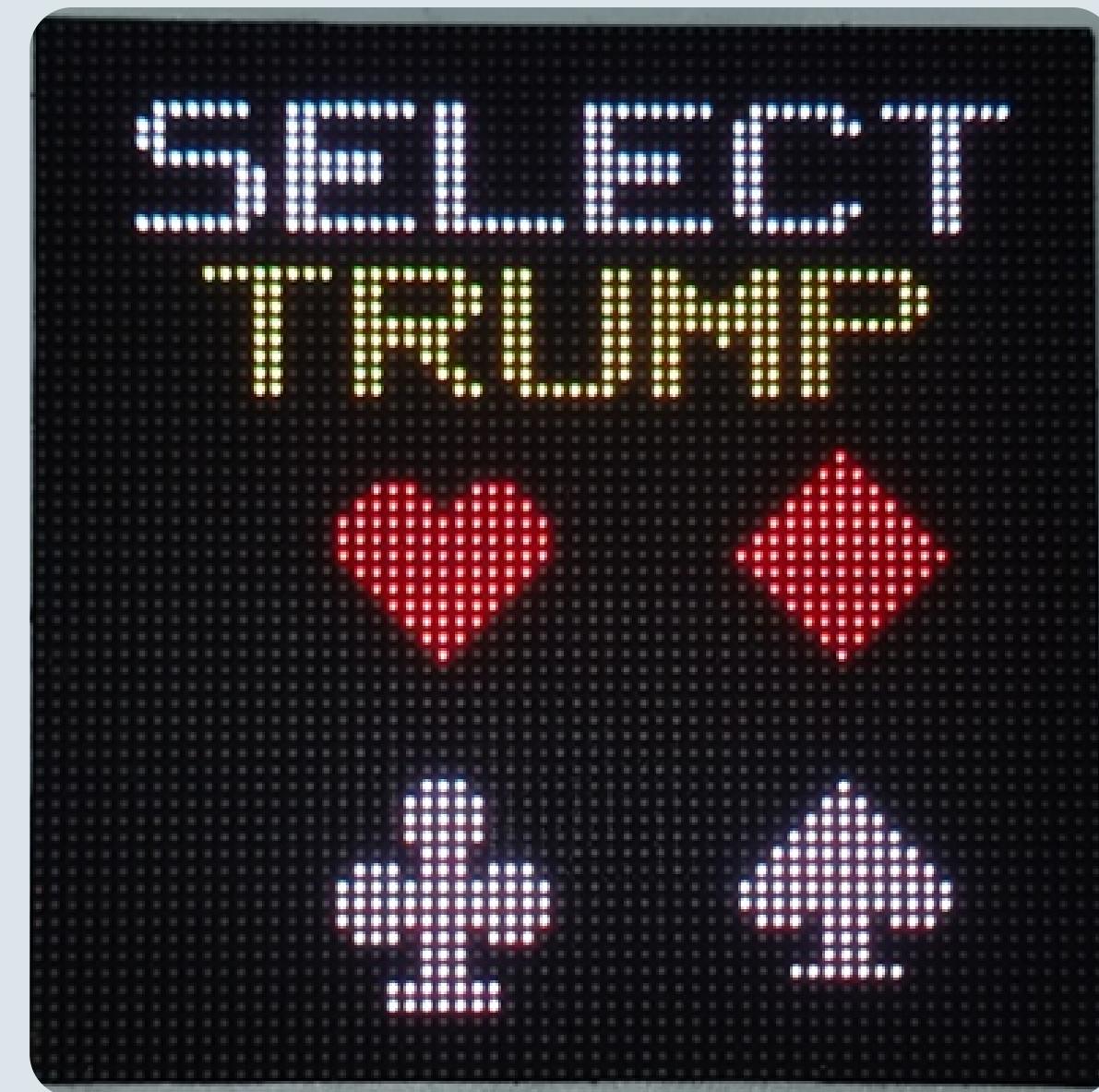




- Initially , Team B's Player 2 receives their first four cards . The other players cannot see their cards at this stage.

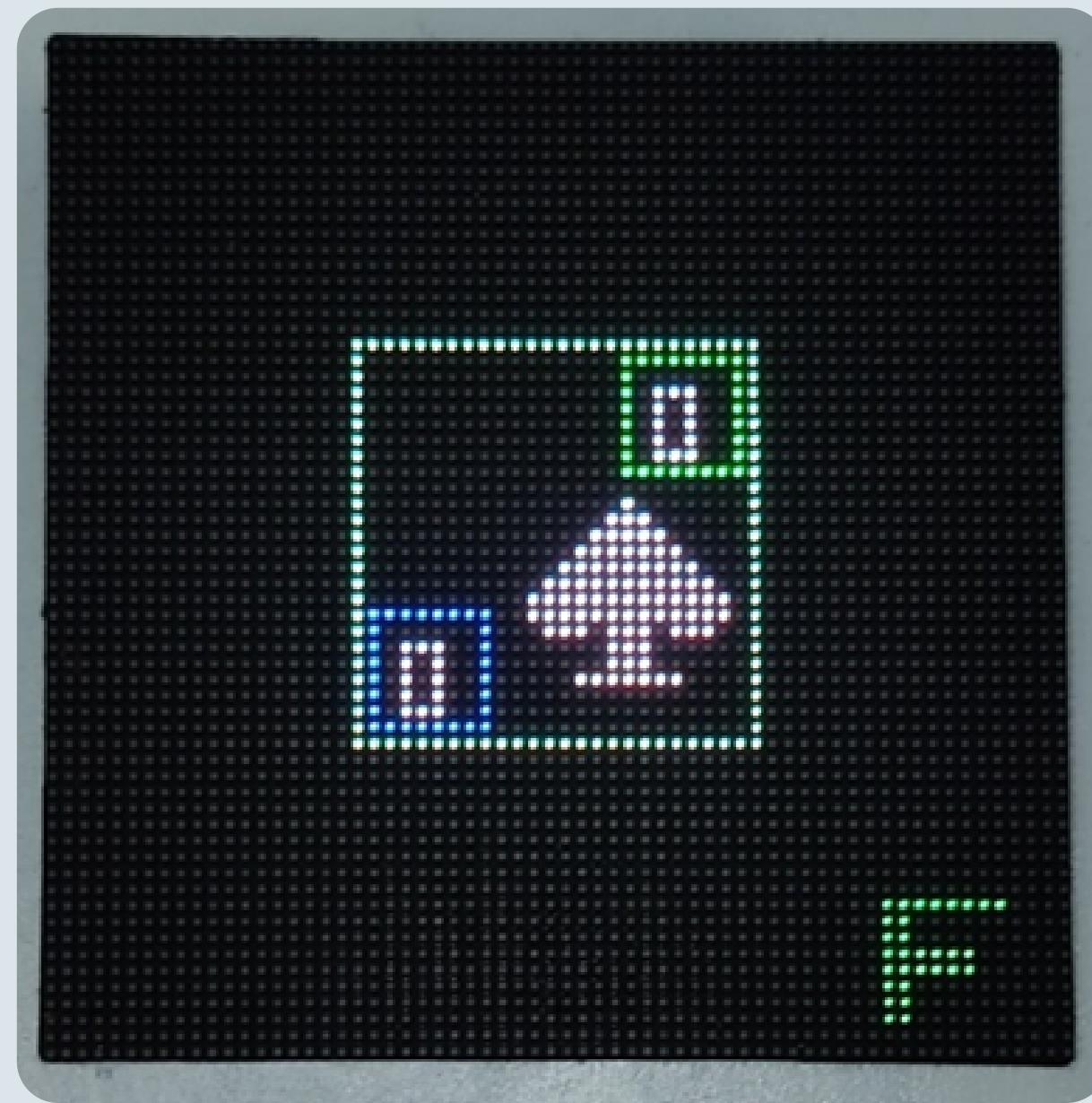
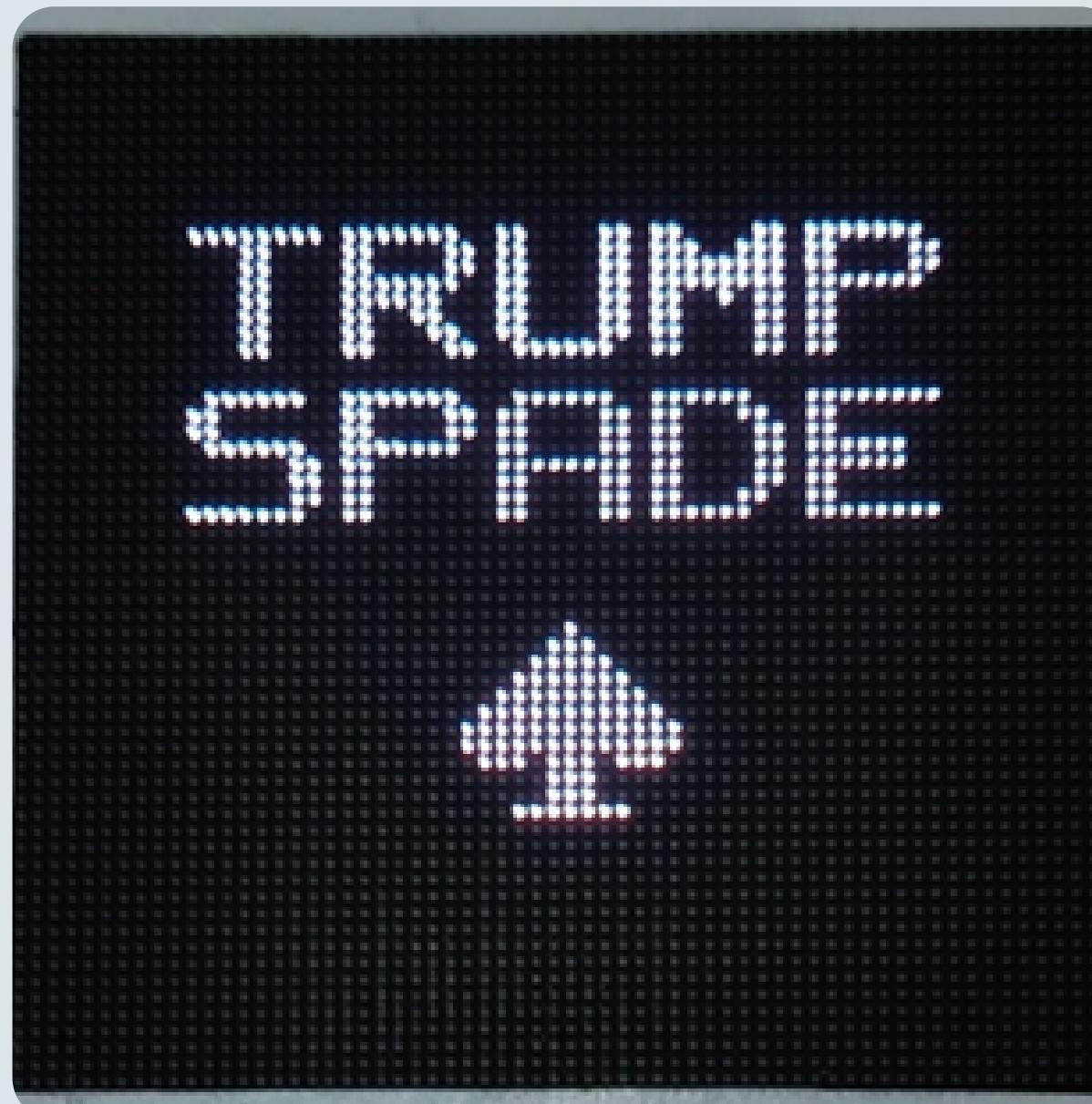


- During this time, the main display prompts playe to select their trump card.

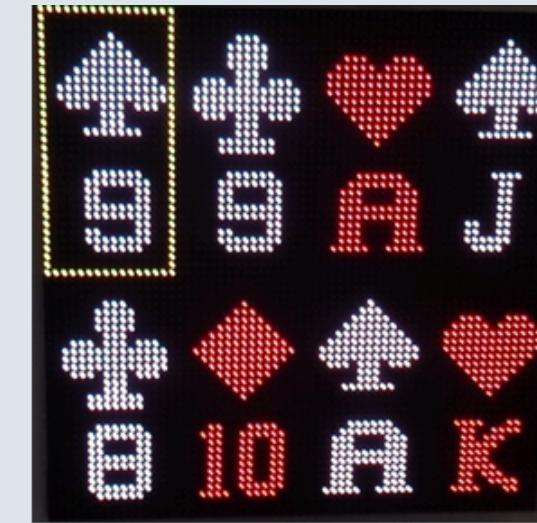




- When he choose the trump ,the main display shows it like this.
- After that, Trump stays in the middle and creates a marks panel around it.



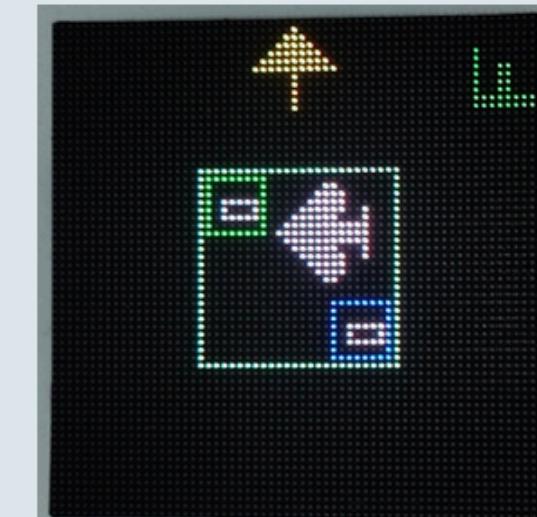
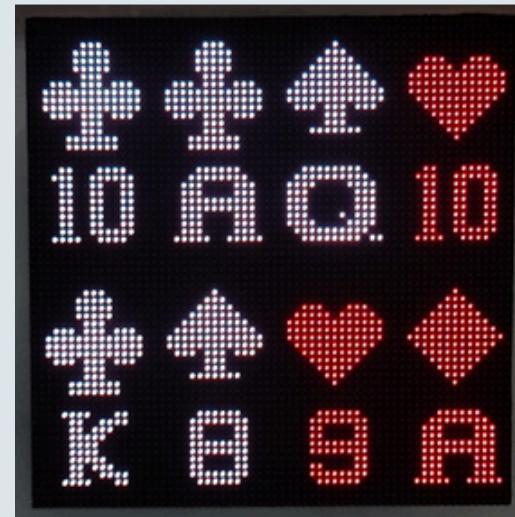
- Then , all users' cards are displayed on their respective screen.
- And they can navigate through their remotes to select a card.



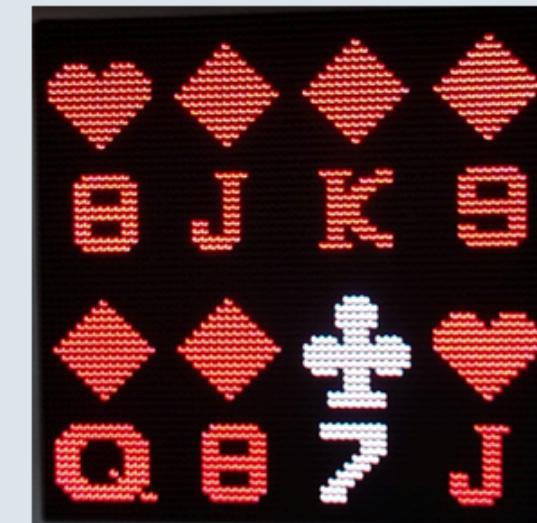
**Team B
Player 2**



**Team A
Player 3**



**Team A
Player 1**

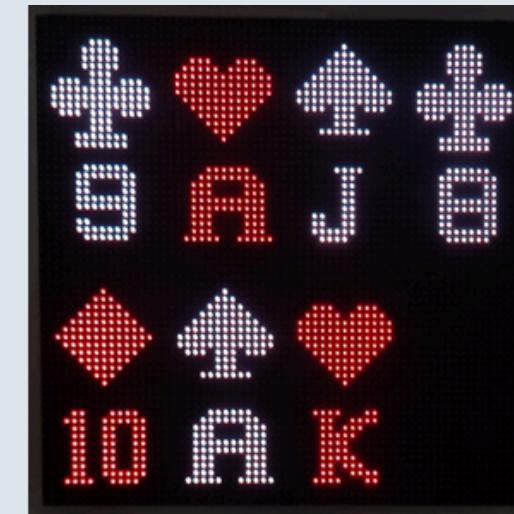


**Team B
Player 4**



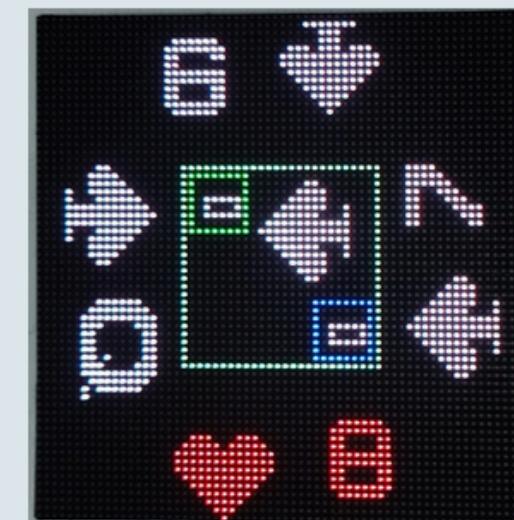
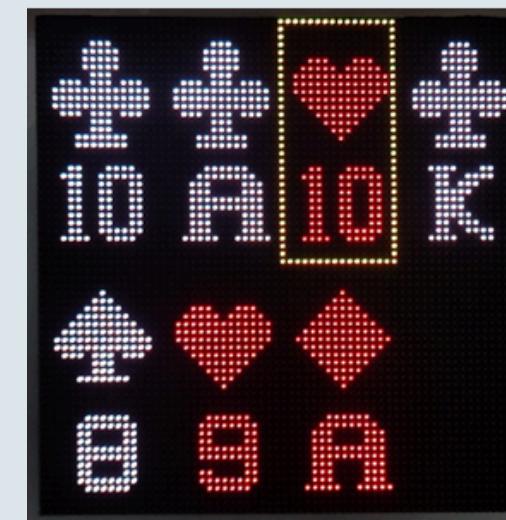


- After selecting their cards, they will be displayed on the main screen one by one

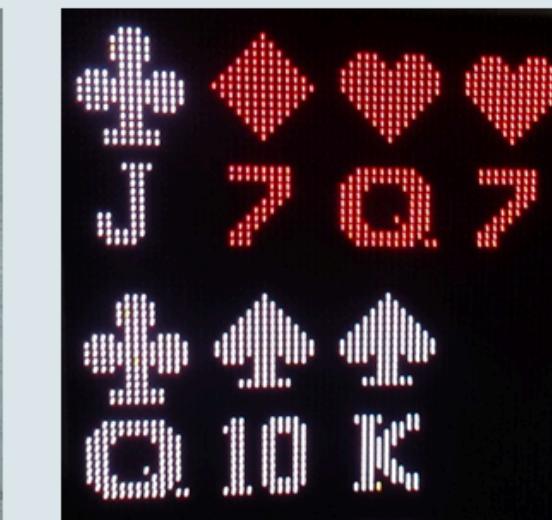


Team B
Player 2

Team A
Player 3



Team A
Player 1



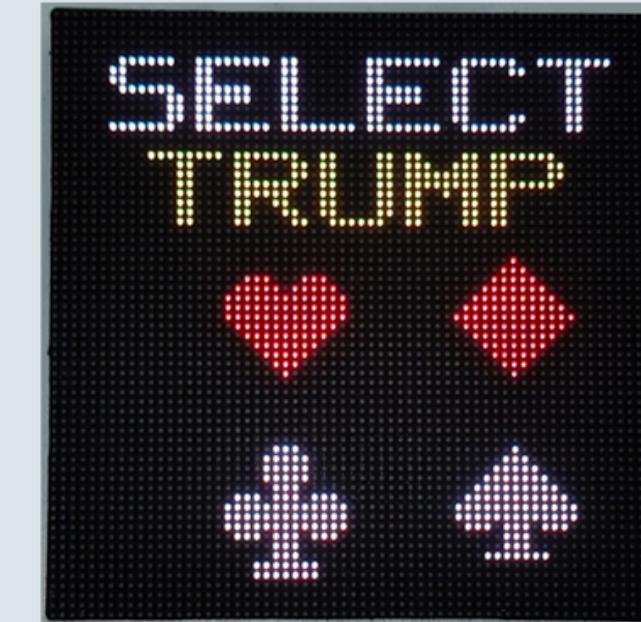
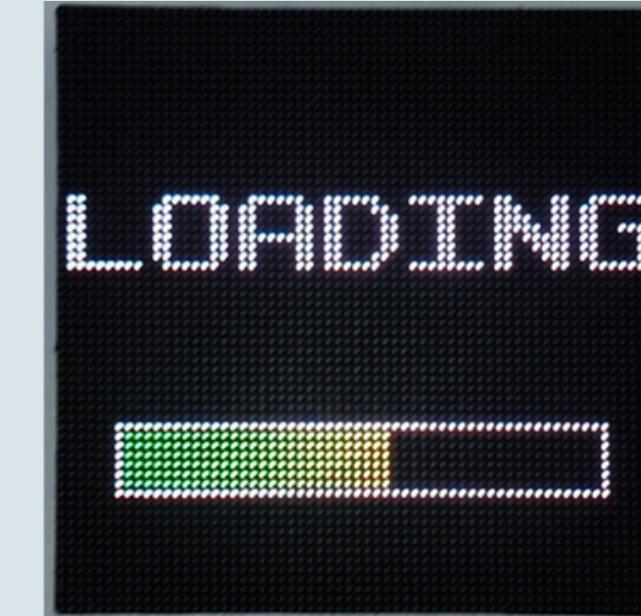
Team B
Player 4



Central Display

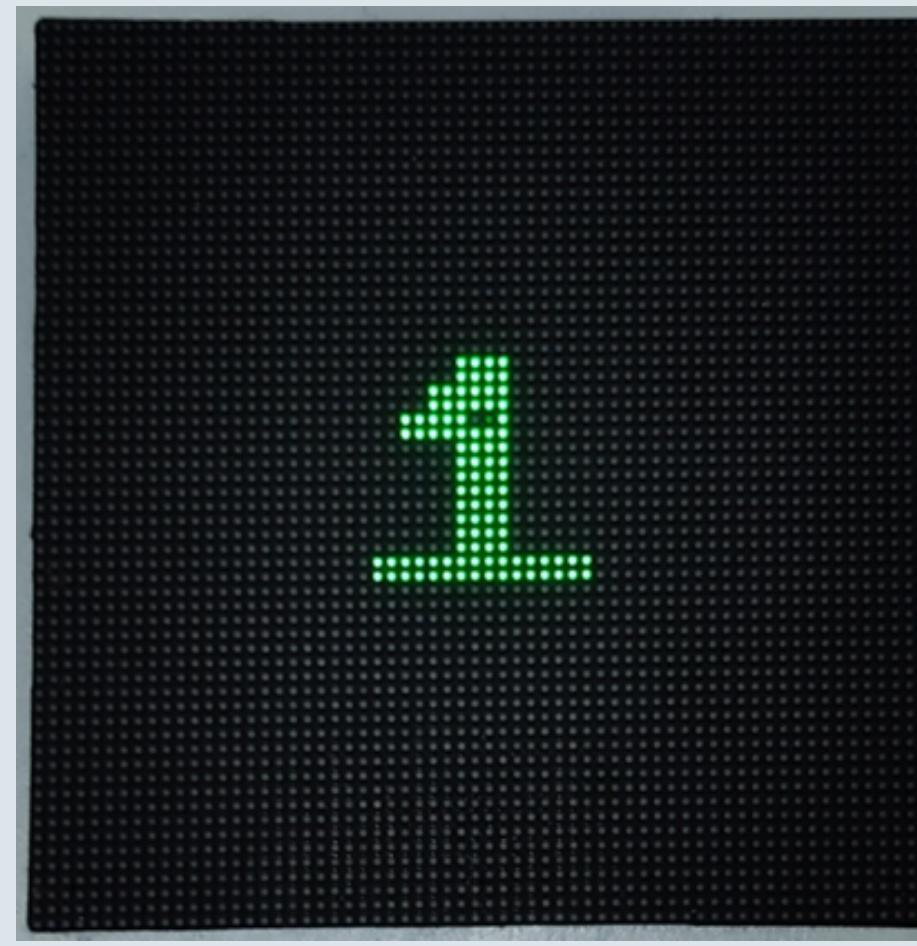


- When the game starts, the introduction and welcoming are shown on this display.





- After the trump is chosen by the player, all cards are given to the players and the game begins.



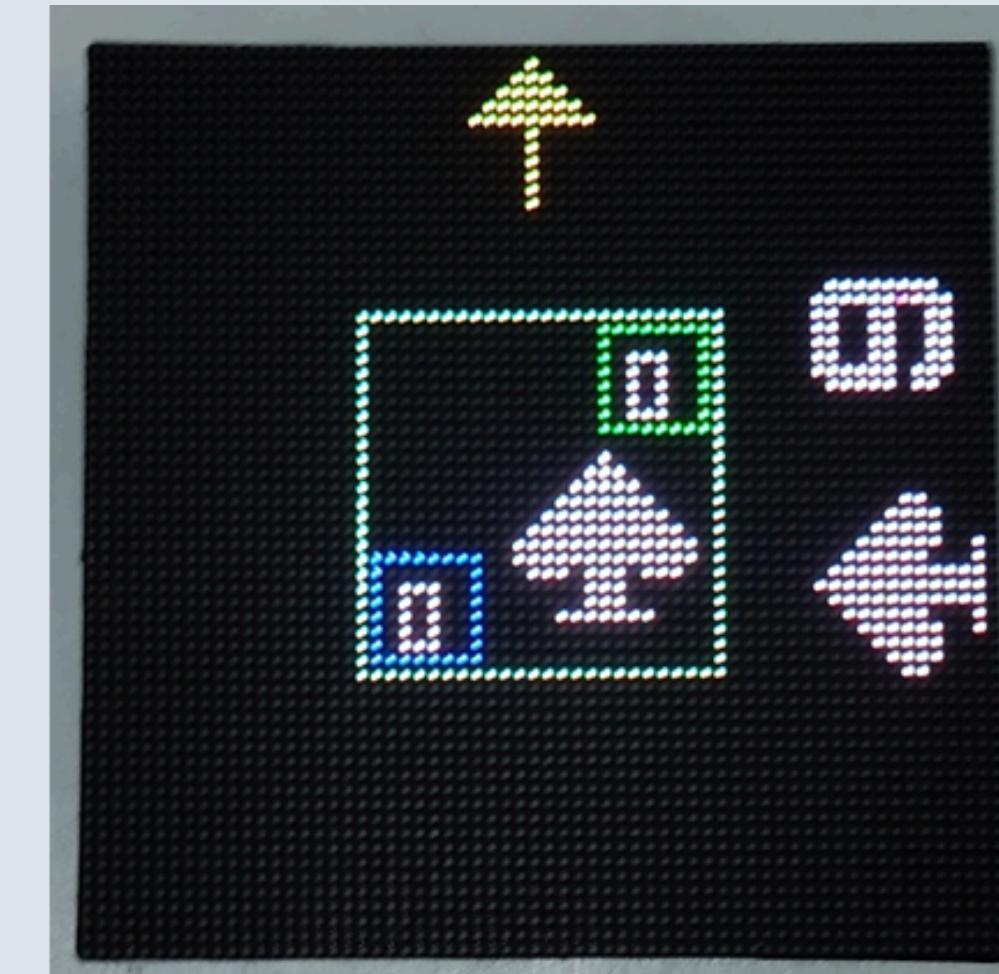
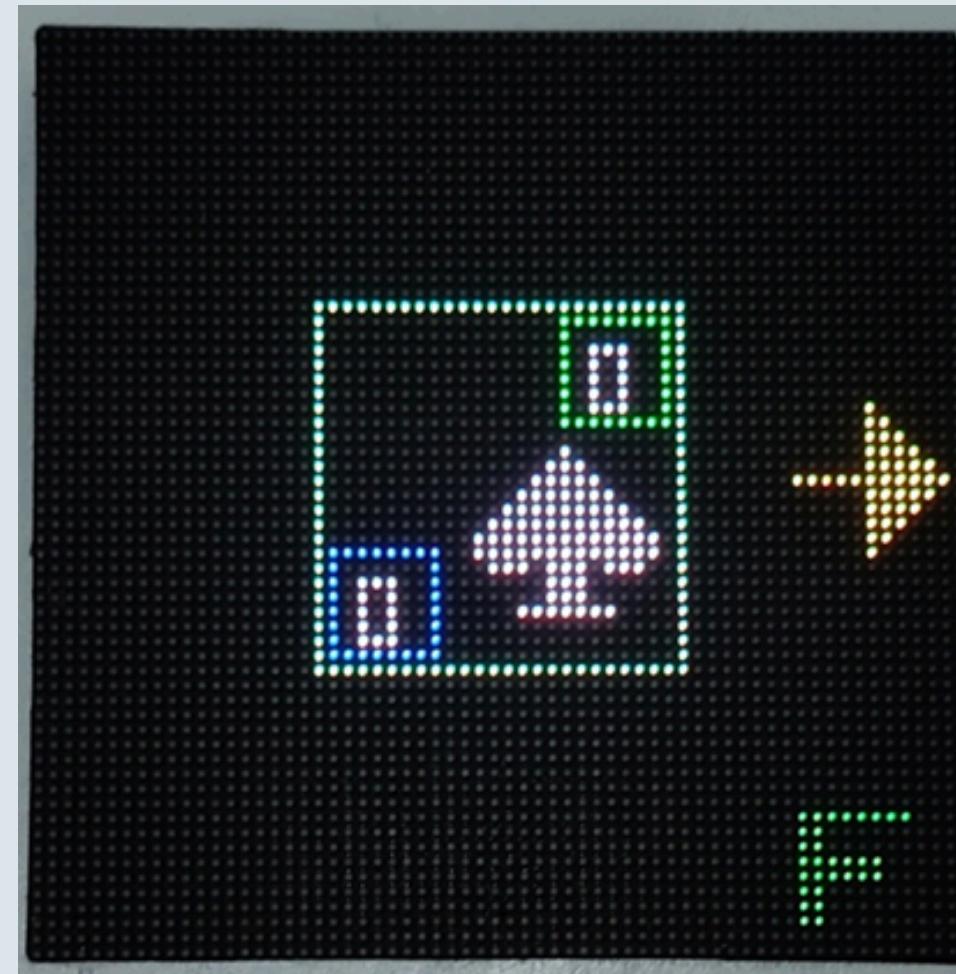
- While this happens, each player's cards are shown on their own display.
- And there's a countdown before the game begins.





After that, the main display looks as follows:

- The trump is in the middle, and each team's marks are shown around it.
- The green “F” symbol means players can play full court in this hand.
- The blinking yellow arrow indicates which player has to play.





- The following things are also shown on the central display.

When an invalid card is selected.



When a new round begins.





To see the previous hand, any player can navigate to the bottom card row on their display and press the down arrow button on their remote.

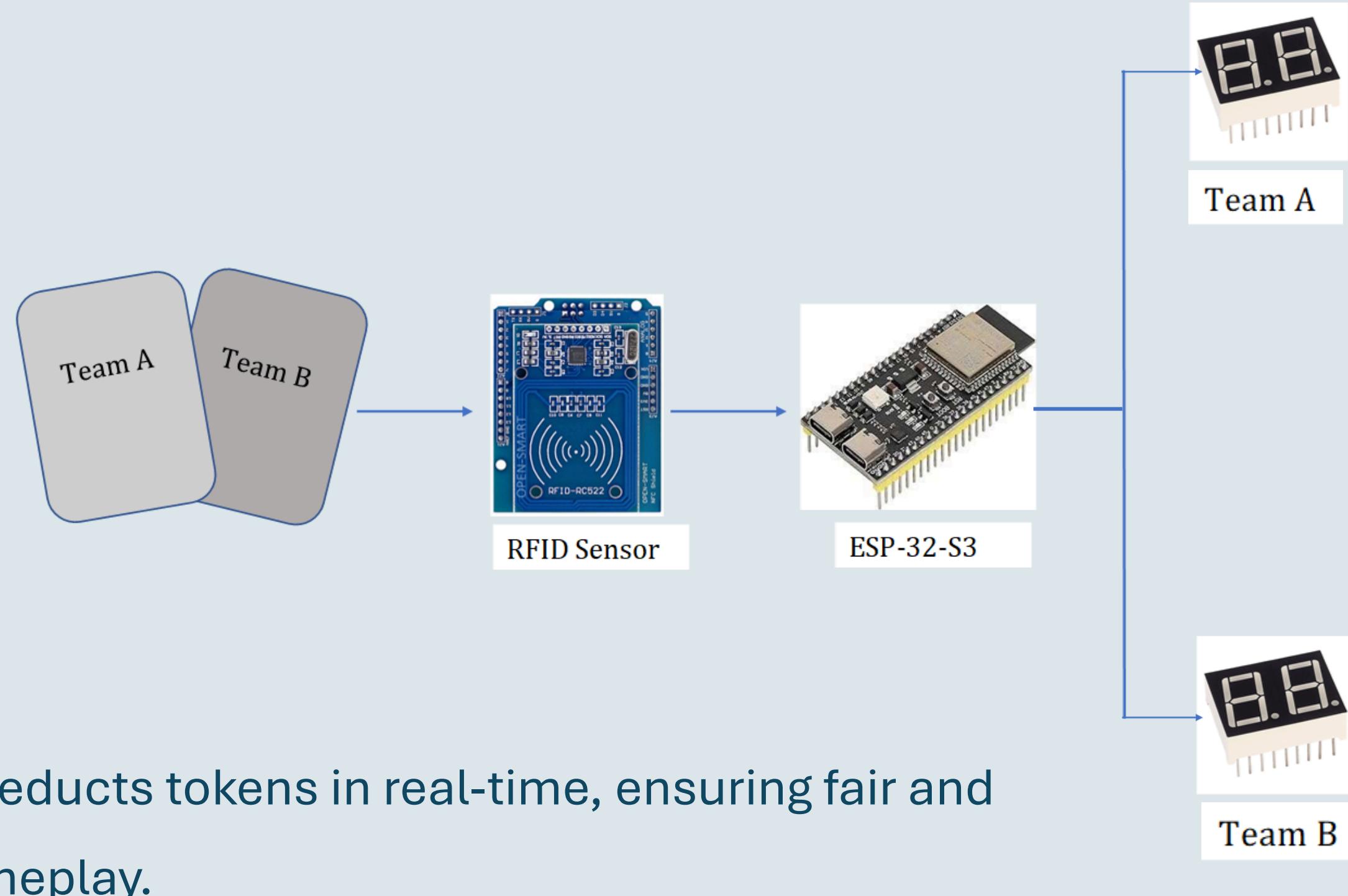
Wired Remotes



Players can easily navigate and select cards using handheld remotes.



RFID Token System

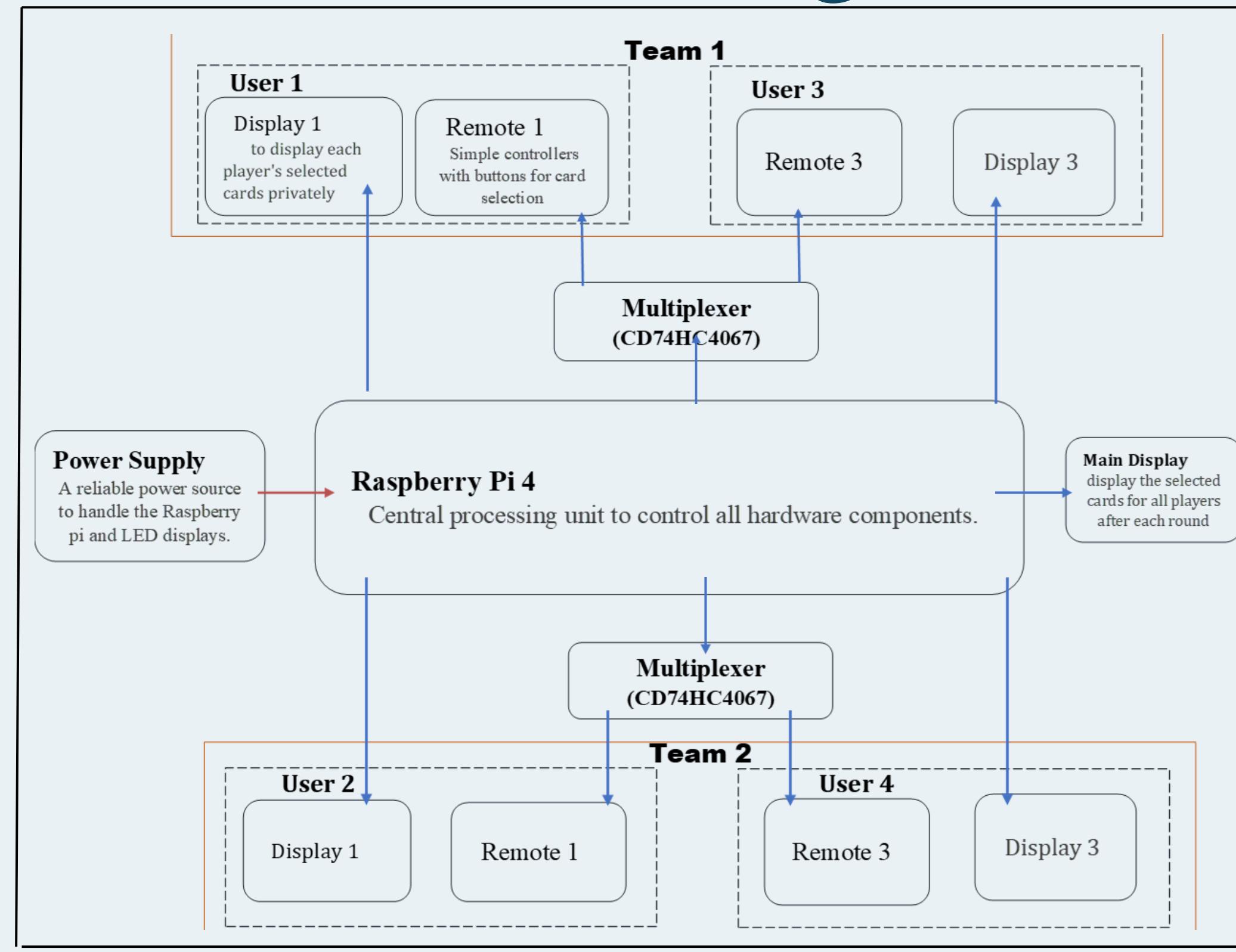


Components and Technologies

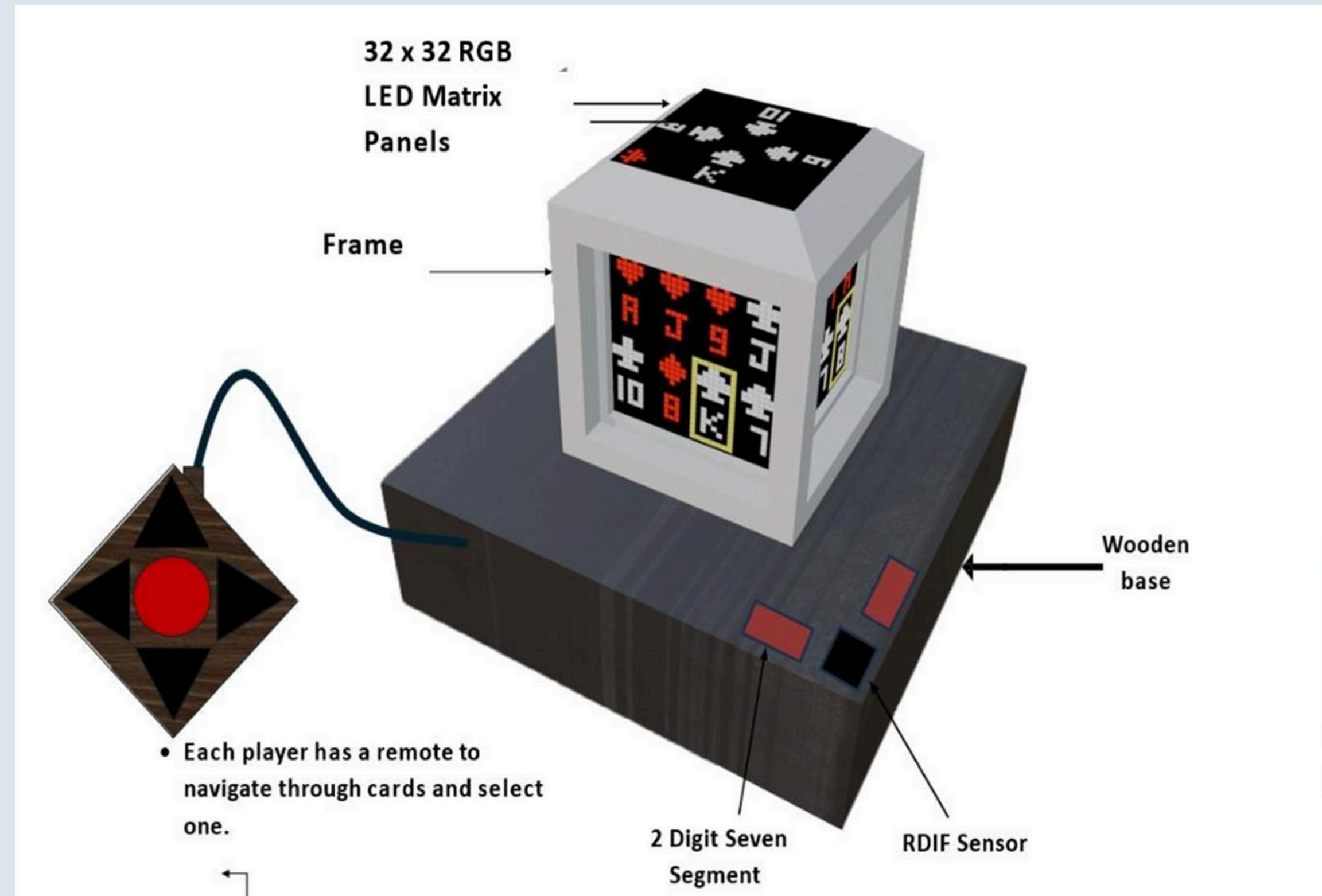


- Raspberry Pi 4 Model B
- 64 x 64 RGB LED Matrix Panel
- Power Supply
- ESP 32-S3
- RFID Sensor (RC522)
- 16-Channel Analog / Digital Multiplexer (CD74HC4067)
- 2 Digit seven segment (Common Cathode)

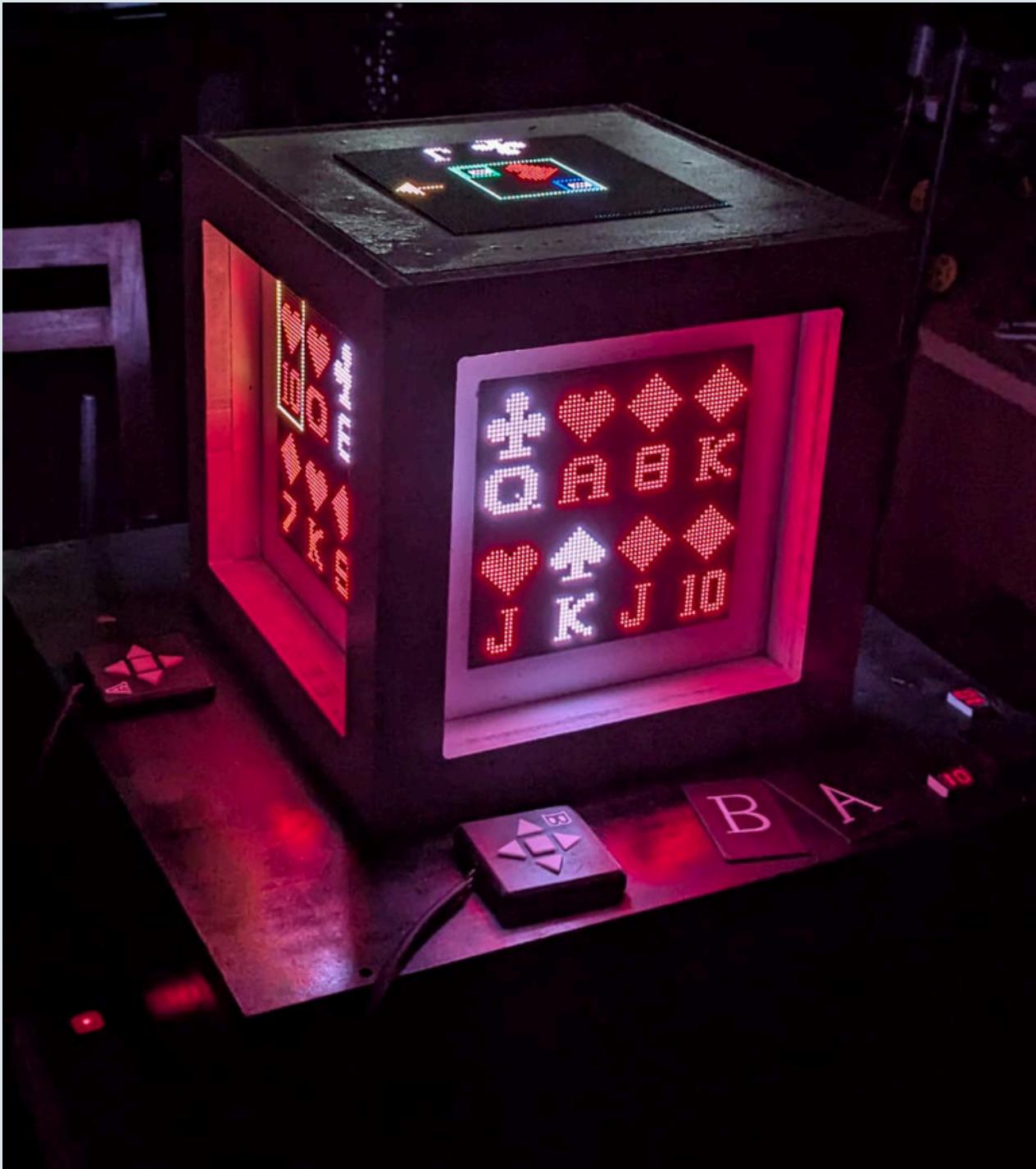
Overview Diagram



End Product



End Product



Total Cost



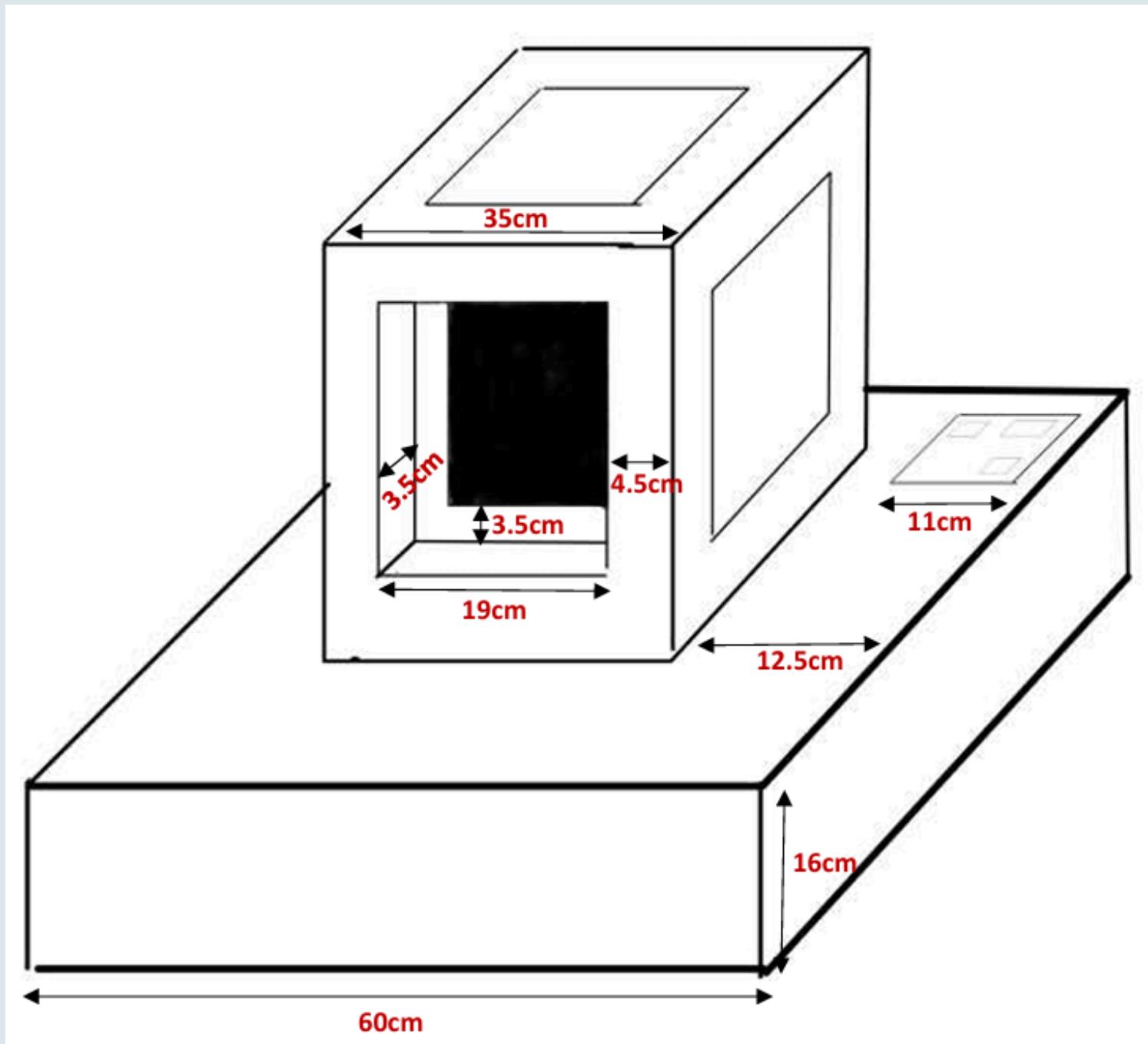
	Quantity	Price
Raspberry Pi 4 Model B	1	15900.00
64 x 64 RGB LED Matrix Panel	5	22500.00
ESP 32 S3	1	1200.00
Accessories For Wired Remotes	4	6000.00
2 Digit seven segment	2	70.00
Multiplexer (CD74HC4067)	2	400.00
5V 40A SMPS Power Supply	1	2850.00
RFID Sensor	1	450.00
PCB Design		10500.00
3D Wooden Frame	1	8000.00
Total		67870.00



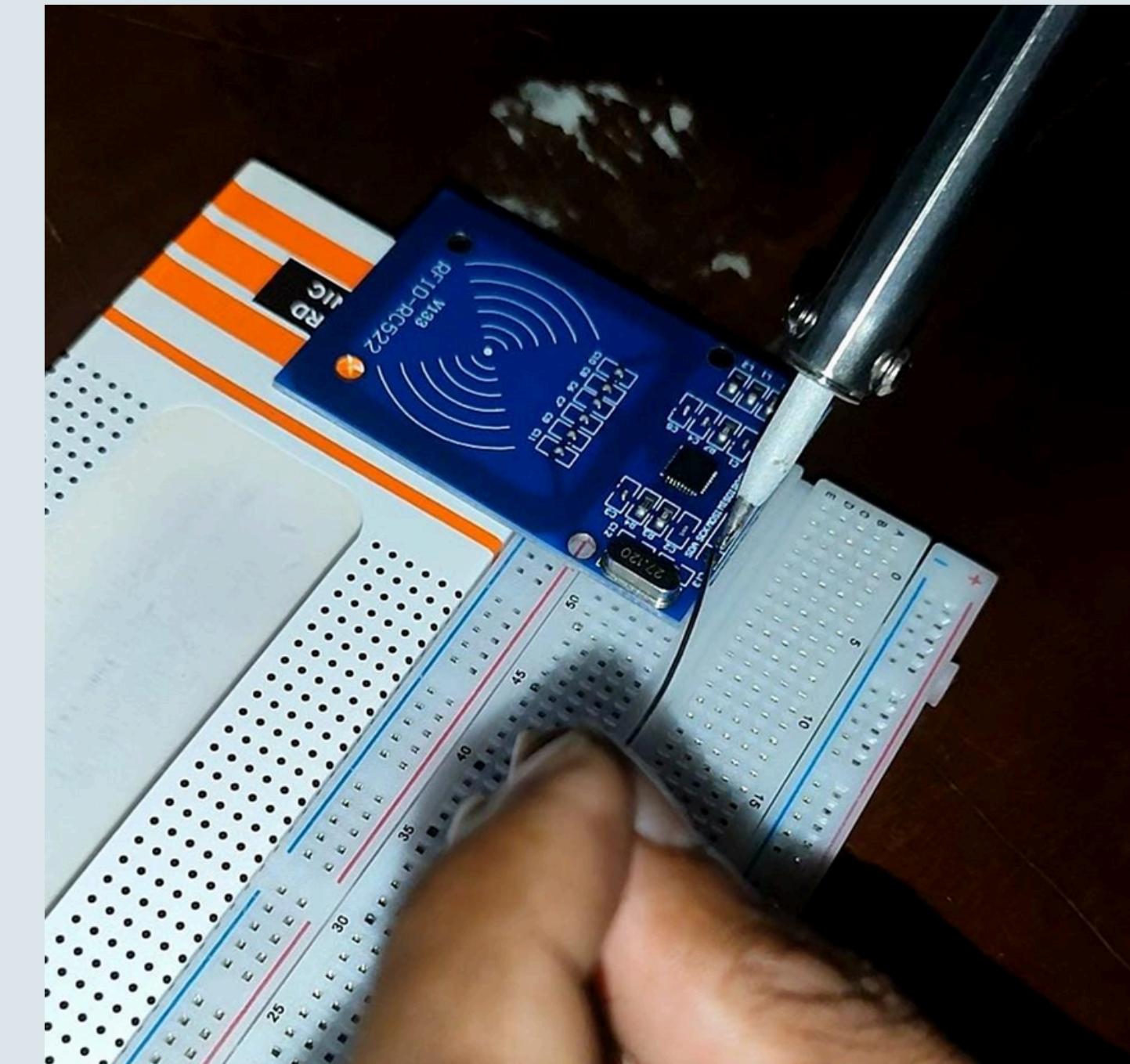


Testing and Implementation



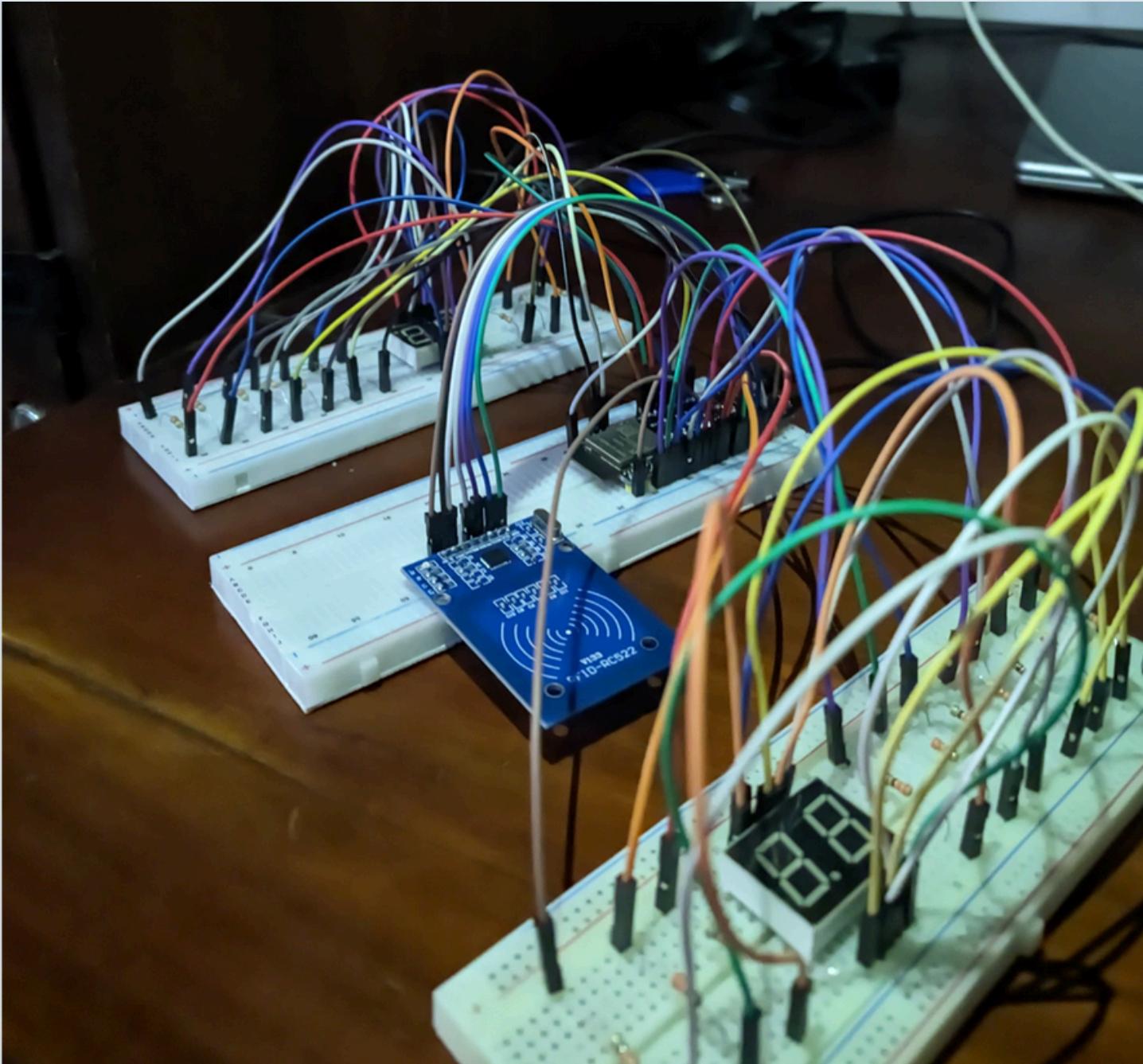


- Drawing the sketch for the model.



- Soldering the RFID sensor pins.



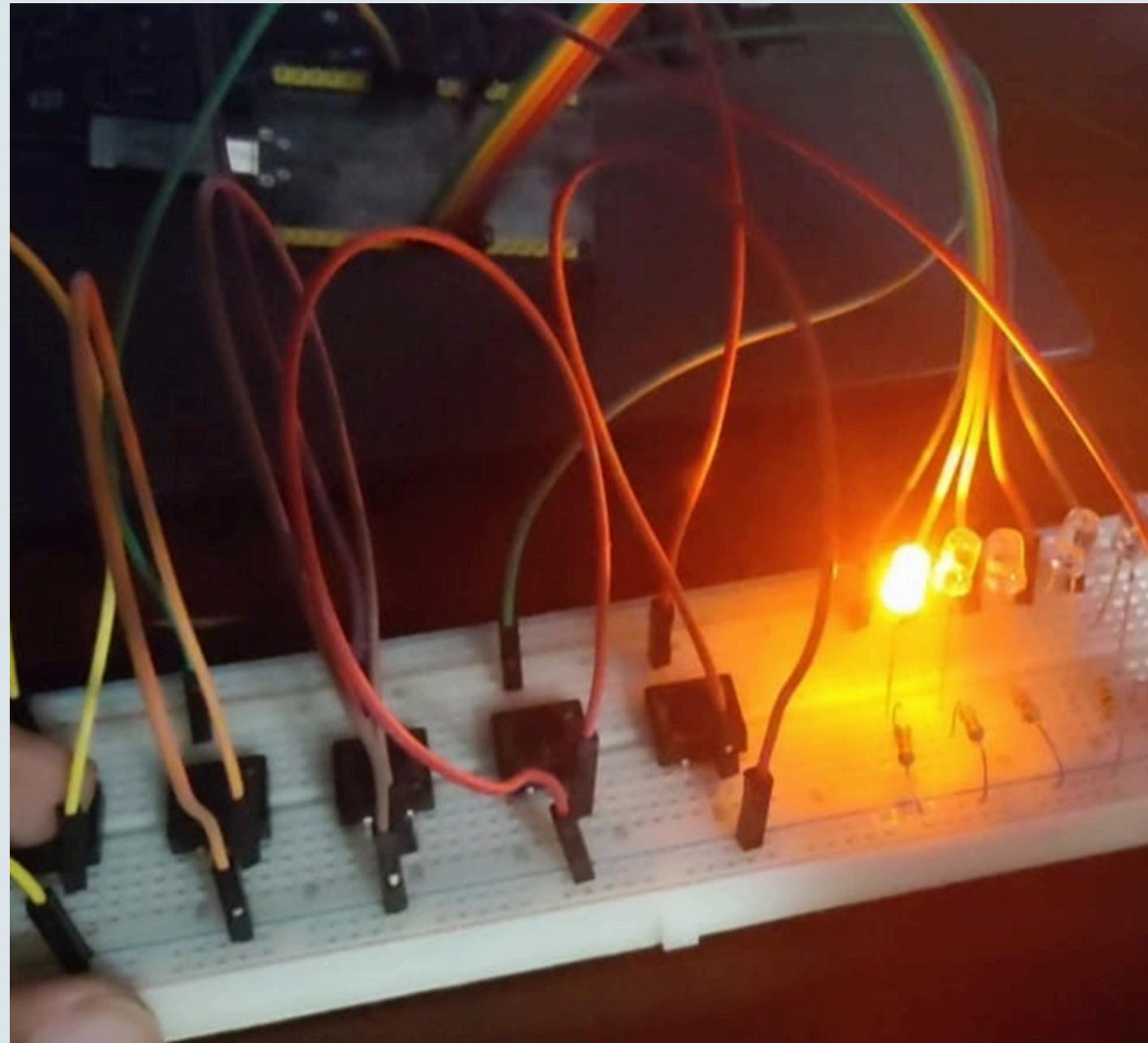


- Complete the token function.



- Installing the OS.



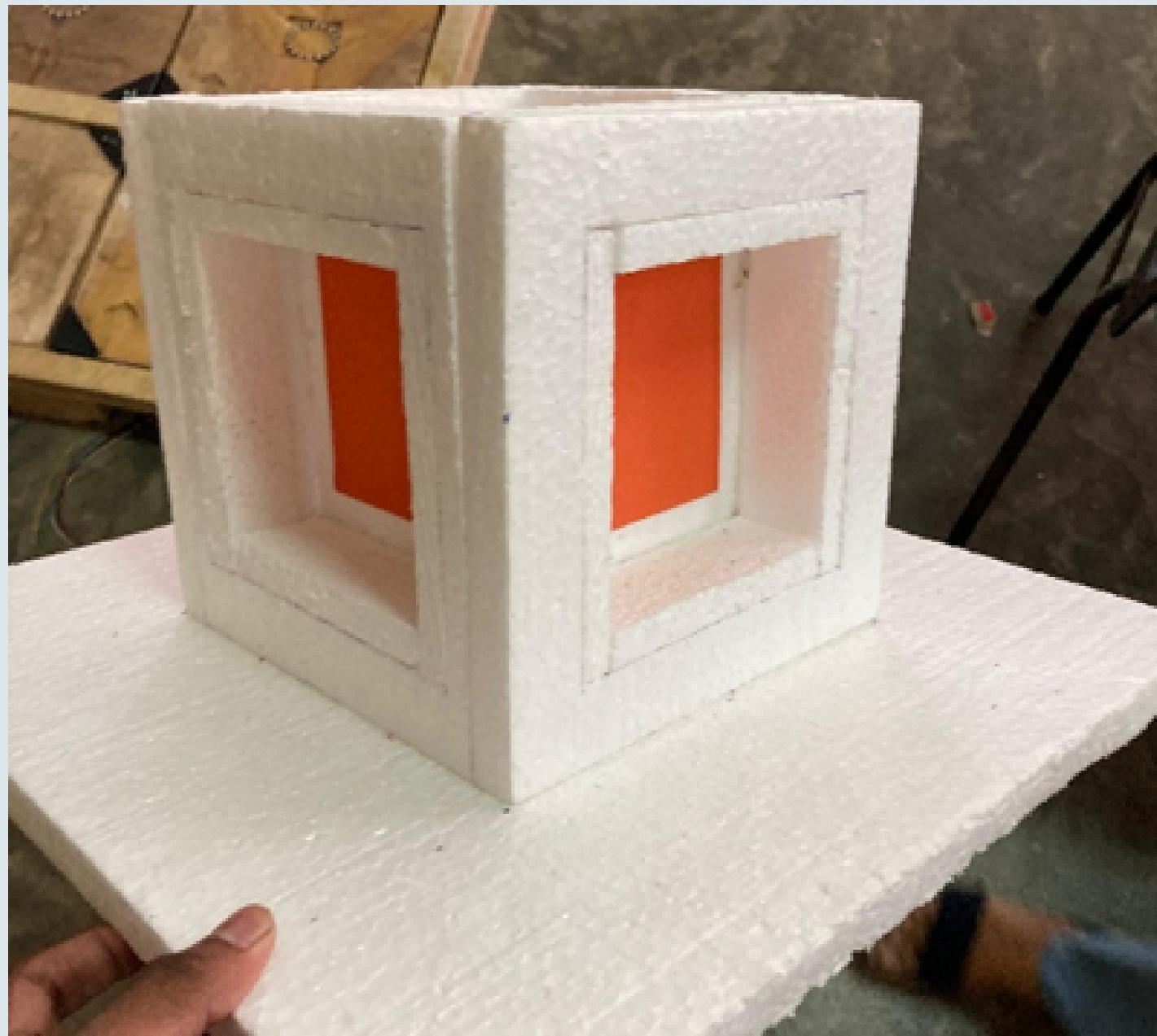


- Testing remote buttons by lighting some LEDs.



- Displaying the cards through LED panels.



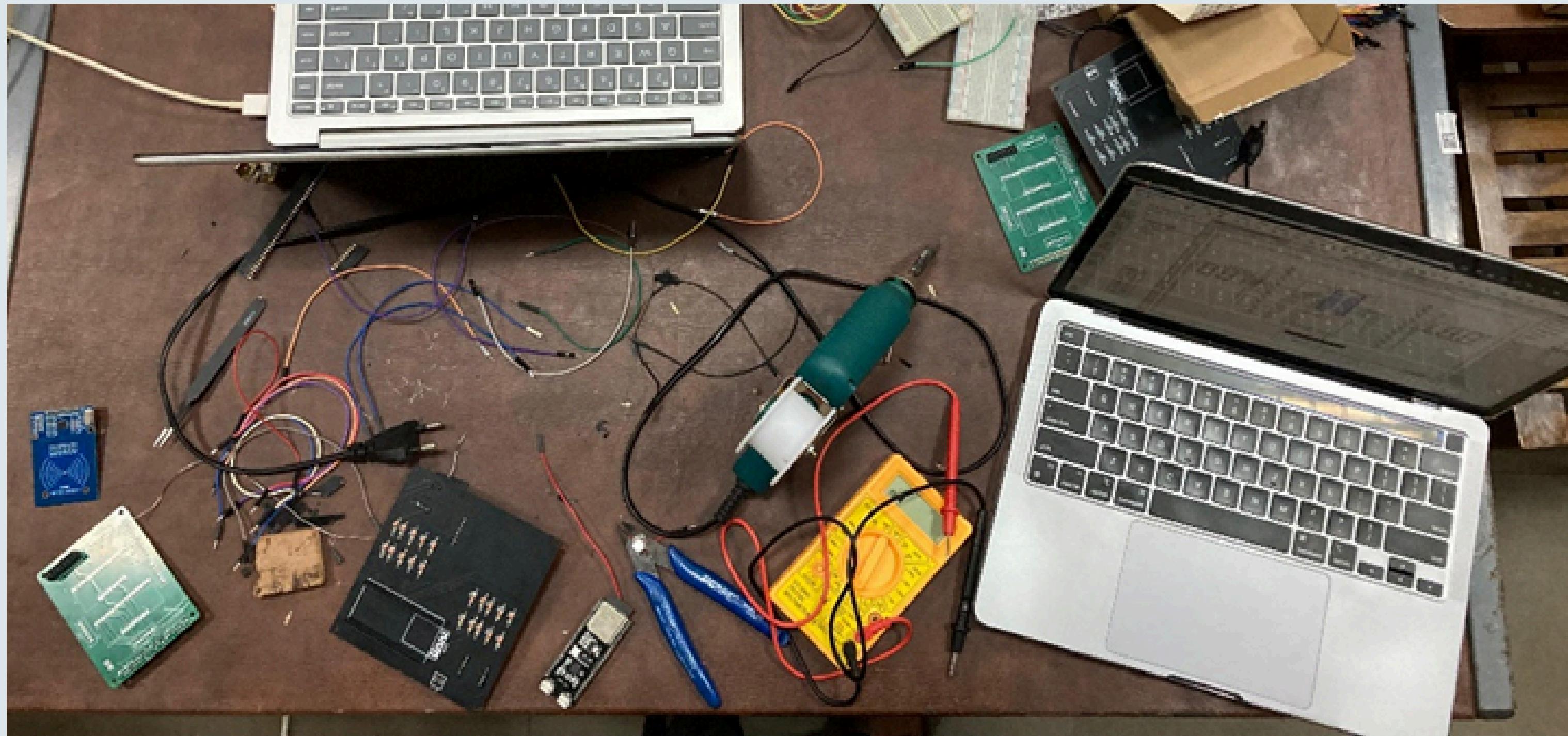


- Building a Prototype the Model



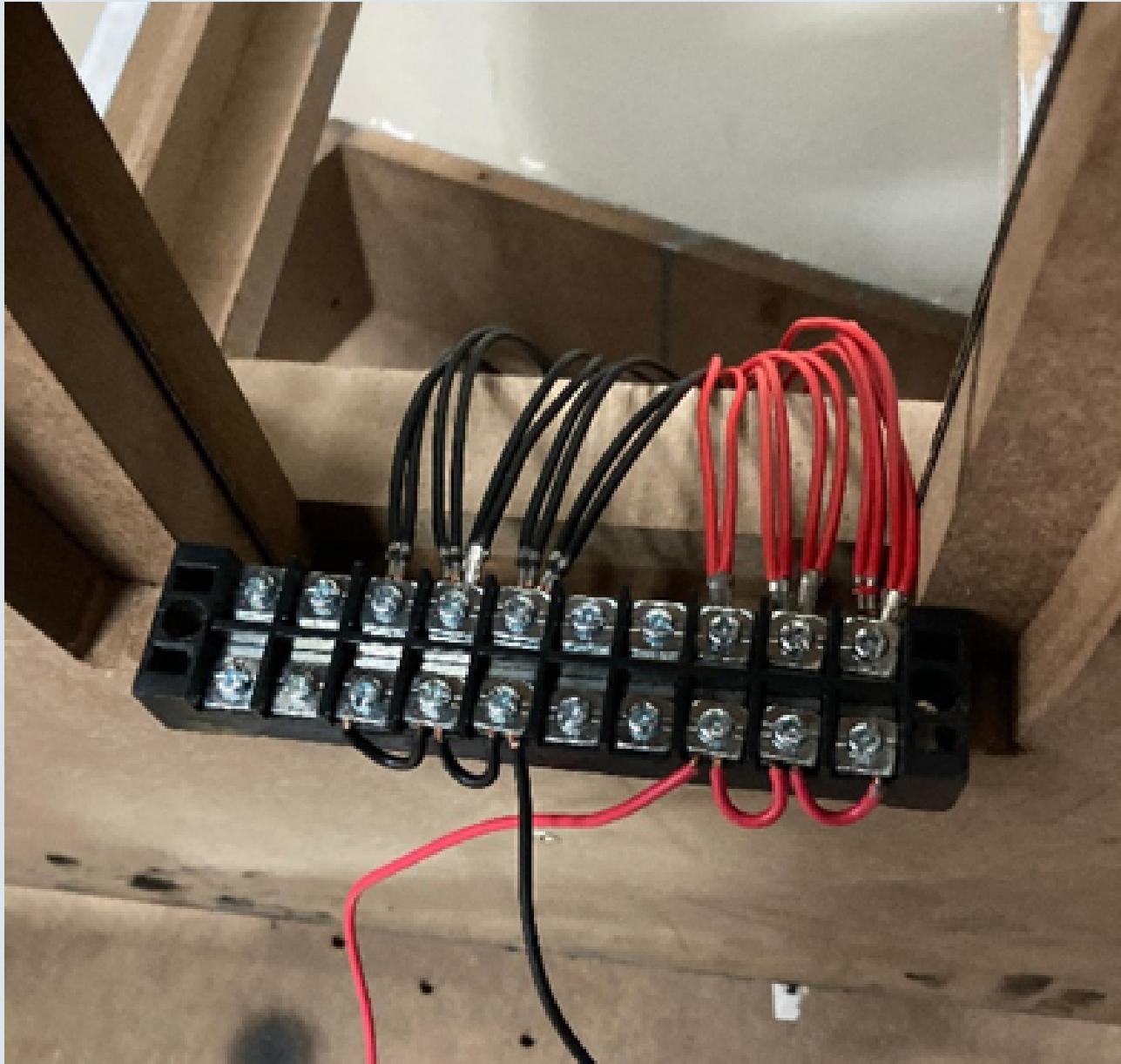
- Building the Model



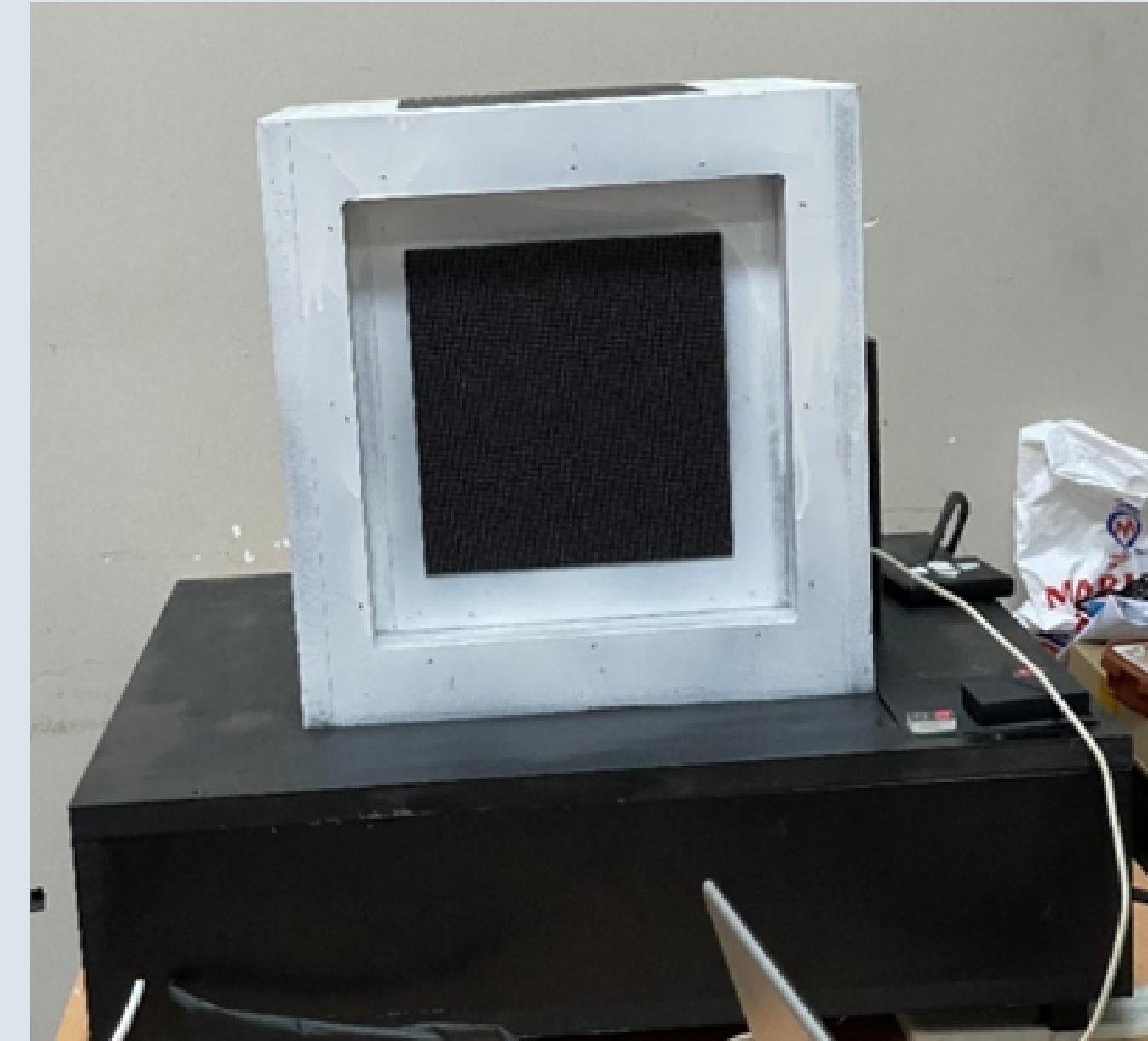


- Testing and Soldering PCBs





- Wiring the LED panell



- Assembling and Testing





Individual Contribution



Responsibilities

- Setup the raspberry pi 4 board
- Integrated led matrix panels serially via hub 75 with raspberry pi to implement an interface for game
- Wrote the basic game code to display game on led matrix panels.
- Use the suitable power supply to power the led matrix panels and token function
- Create 3d designs and structure design

Components

- Raspberry Pi 4 Model B
- 64x64 RGB LED Matrix Panel (3mm pitch)
- 5V 40A Power Supply

Raspberry Pi 4 Model B



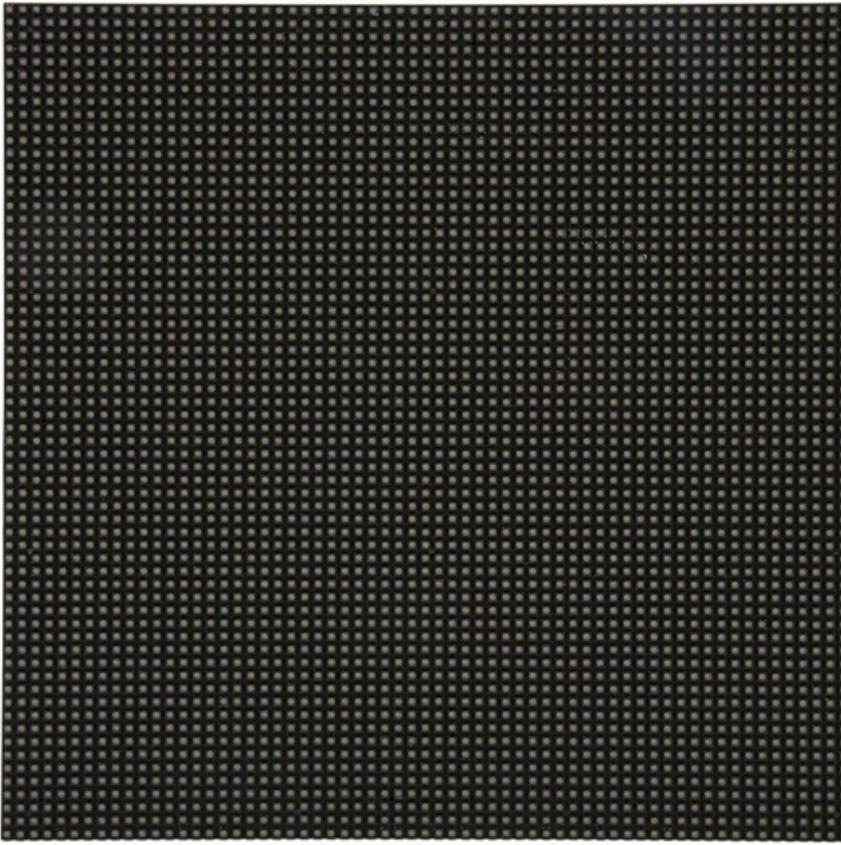
- Raspberry Pi 4 B controls game logic, display, player input, and peripherals, making it the core of the Omi the Trumps system.

- Processor: Broadcom BCM2711,
- CPU: ·Quad core Cortex-A72 (ARM v8) 64-bit SoC
- RAM : 4GB LPDDR4-3200 SDRAM



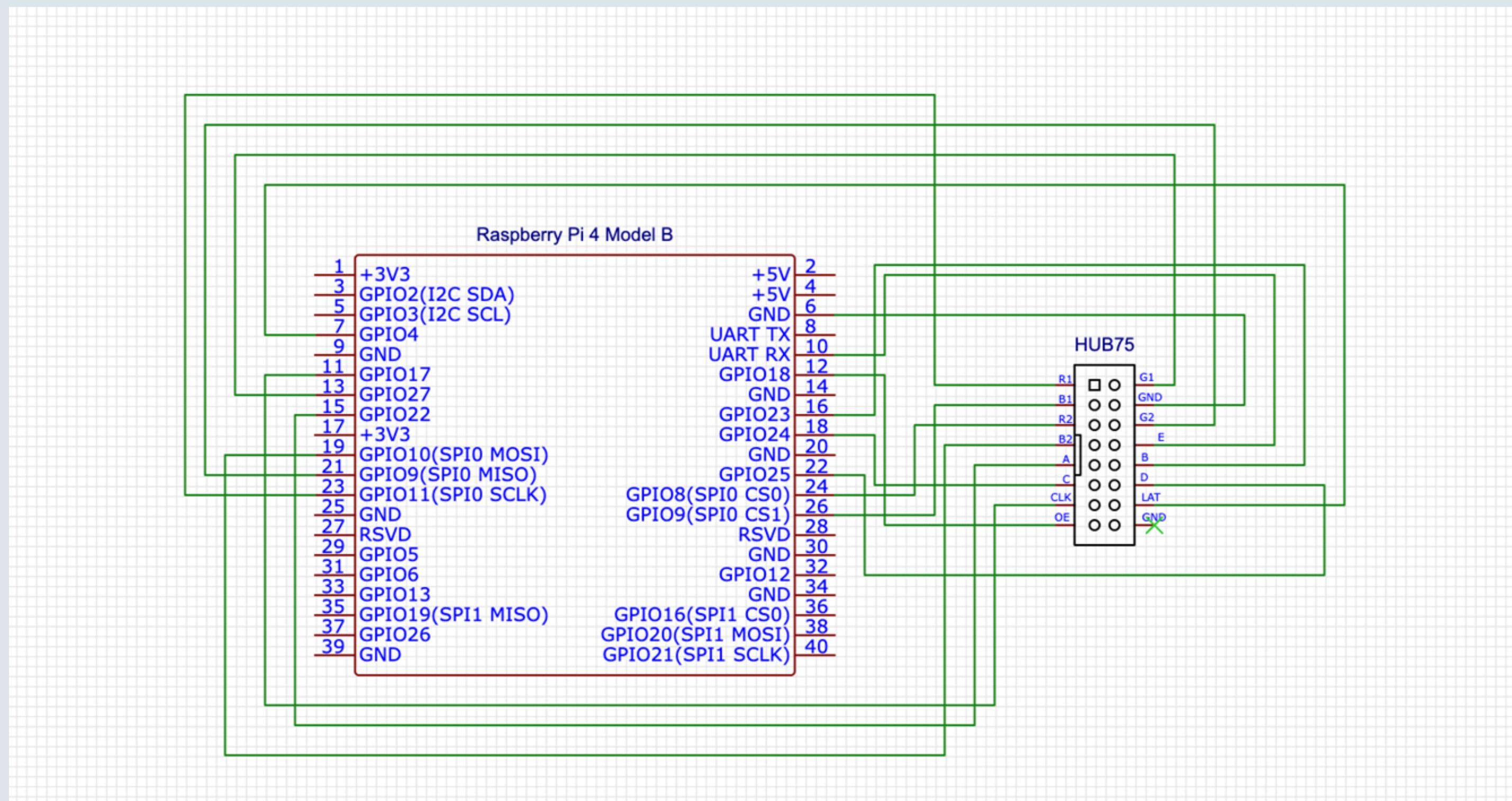
64 x 64 RGB LED Matrix Panel(3mm pitch) ♣♥♠♦

- The 64×64 RGB LED panel privately displays each player's cards with clear and colorful visuals.

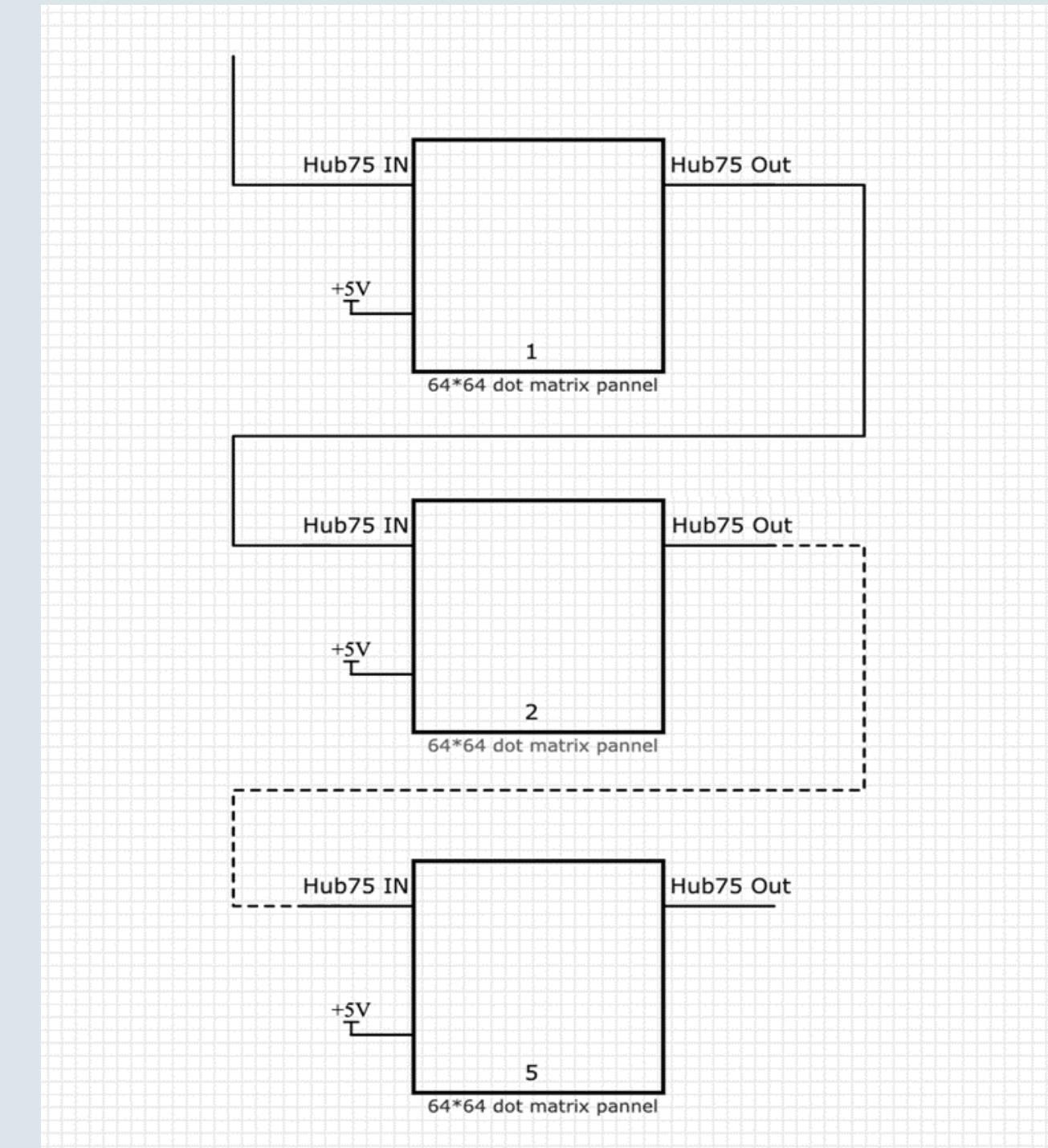
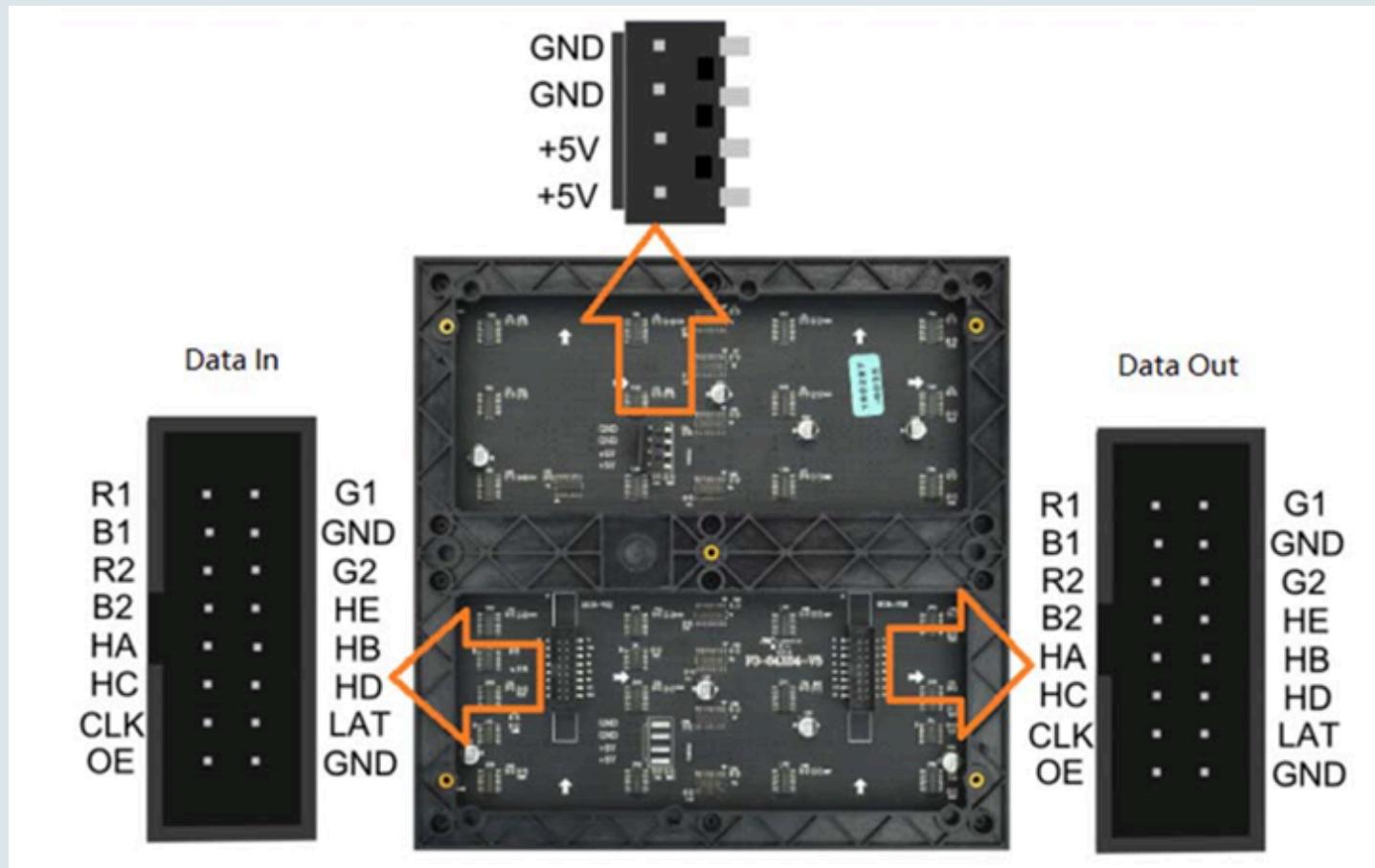


- LED Type : SMD2121
- Resolution : 64×64 (4096 LEDs)
- Pins: Power, HUB75 input, HUB75 output

Panel Configuration Schematic



Panel Configuration





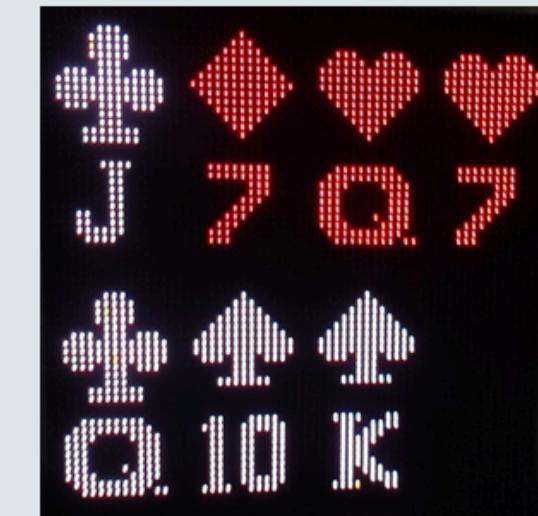
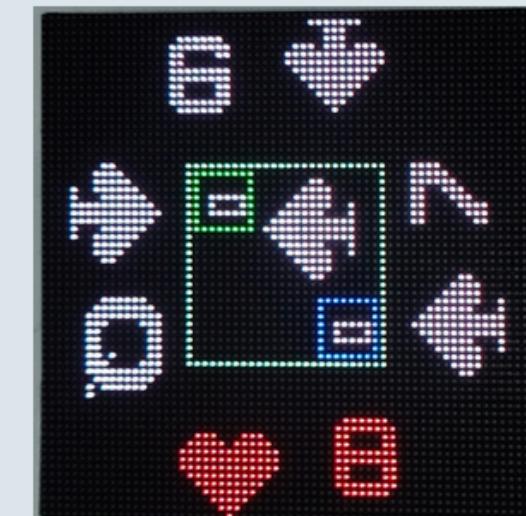
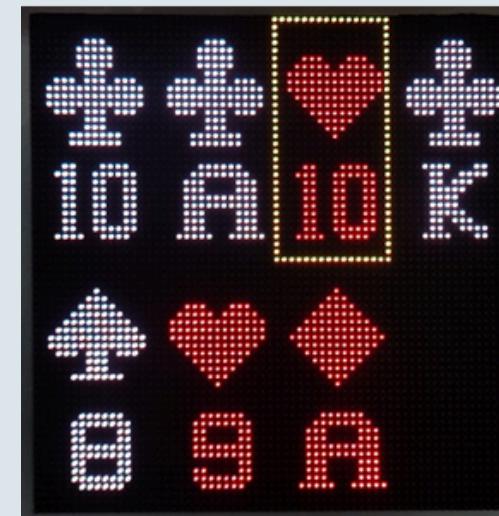
Team B

Player 2



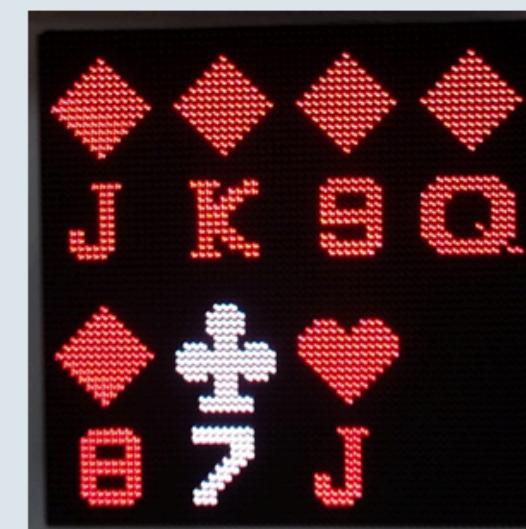
Team A

Player 3



Team A

Player 1



Team B

Player 4



Basic Game Logic



- Normal Game (8 tricks)
- Trump team wins 5+ tricks: Trump team gets 1 token
- Non-trump team wins 5+ tricks: Non-trump team gets 2 tokens
- All 8 tricks (Kapothi): Winner gets 3 tokens
- 4-4 tie: No tokens awarded



Power supply



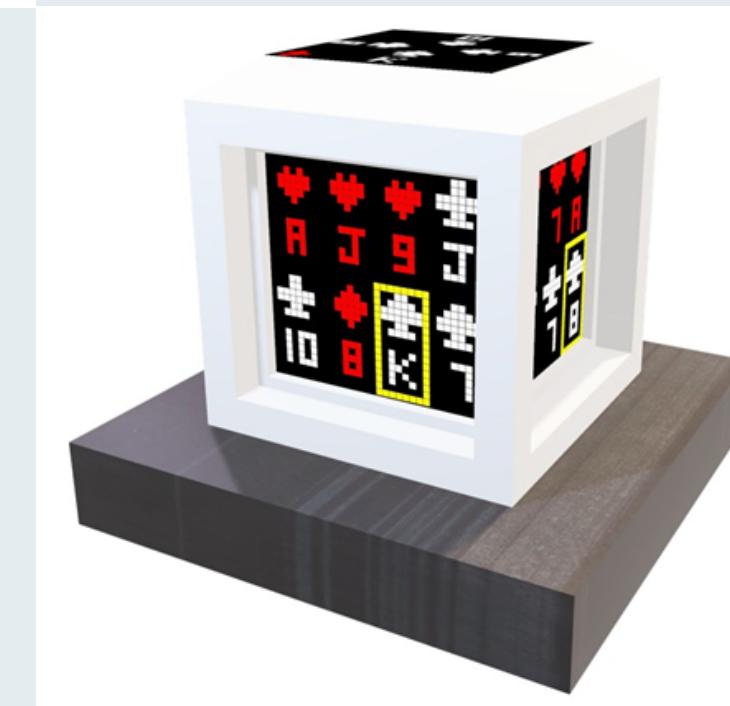
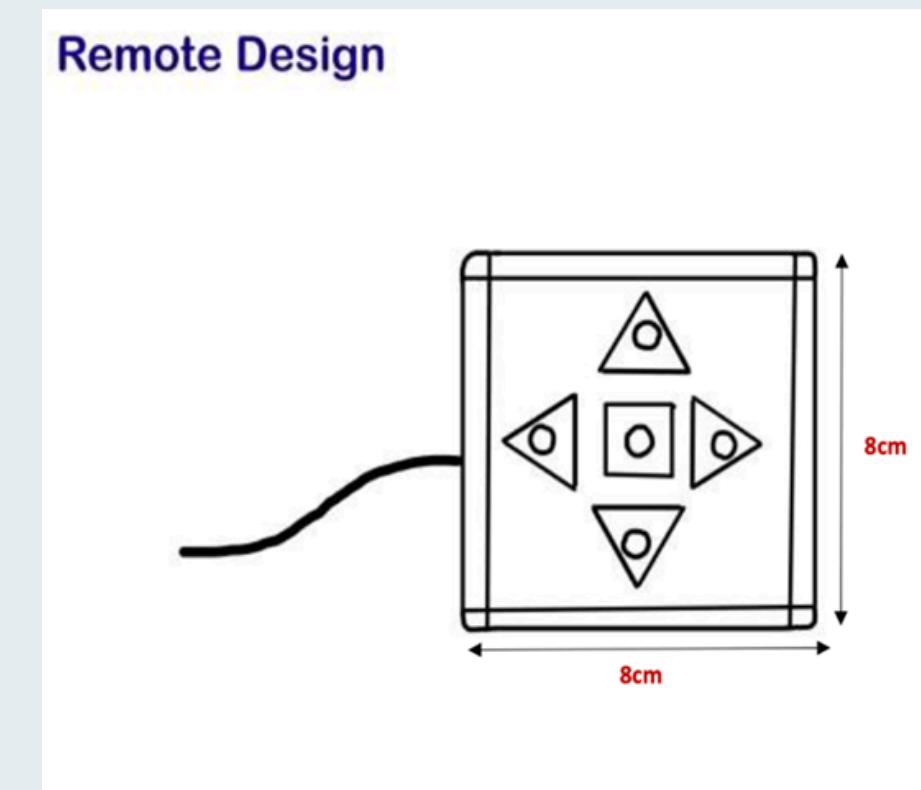
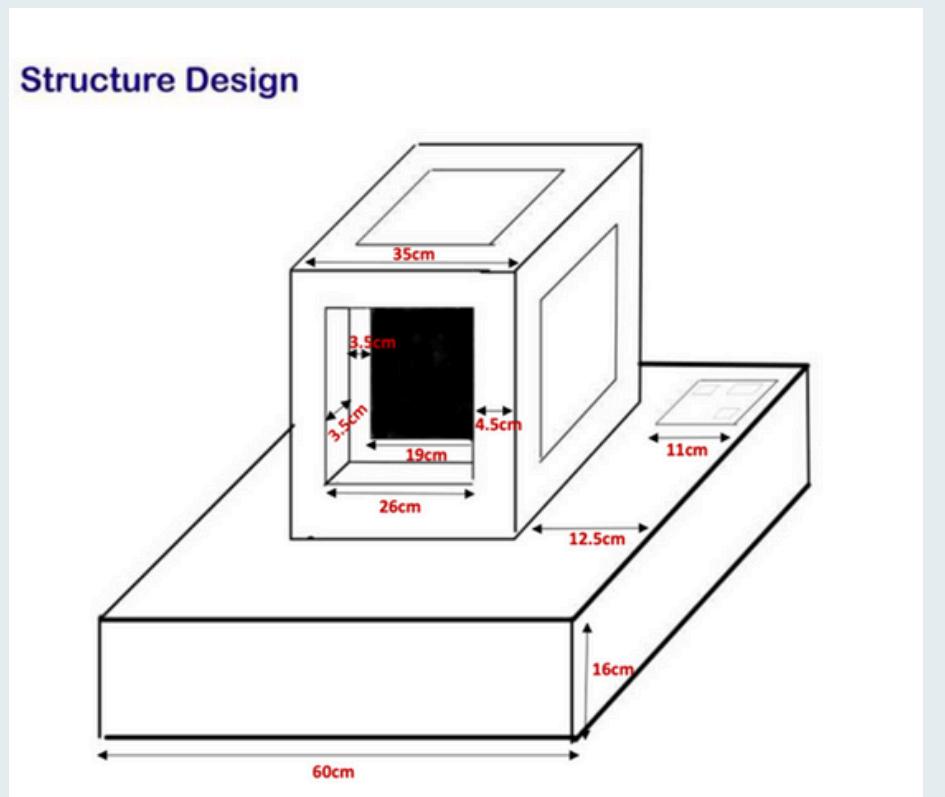
- The 5V 40A SMPS powers all system components, offering stable, efficient, and safe performance, ideal for continuous use in a hardware-intensive multiplayer setup.



- 5V 40A SMPS Power Supply



3D Designs and structure design



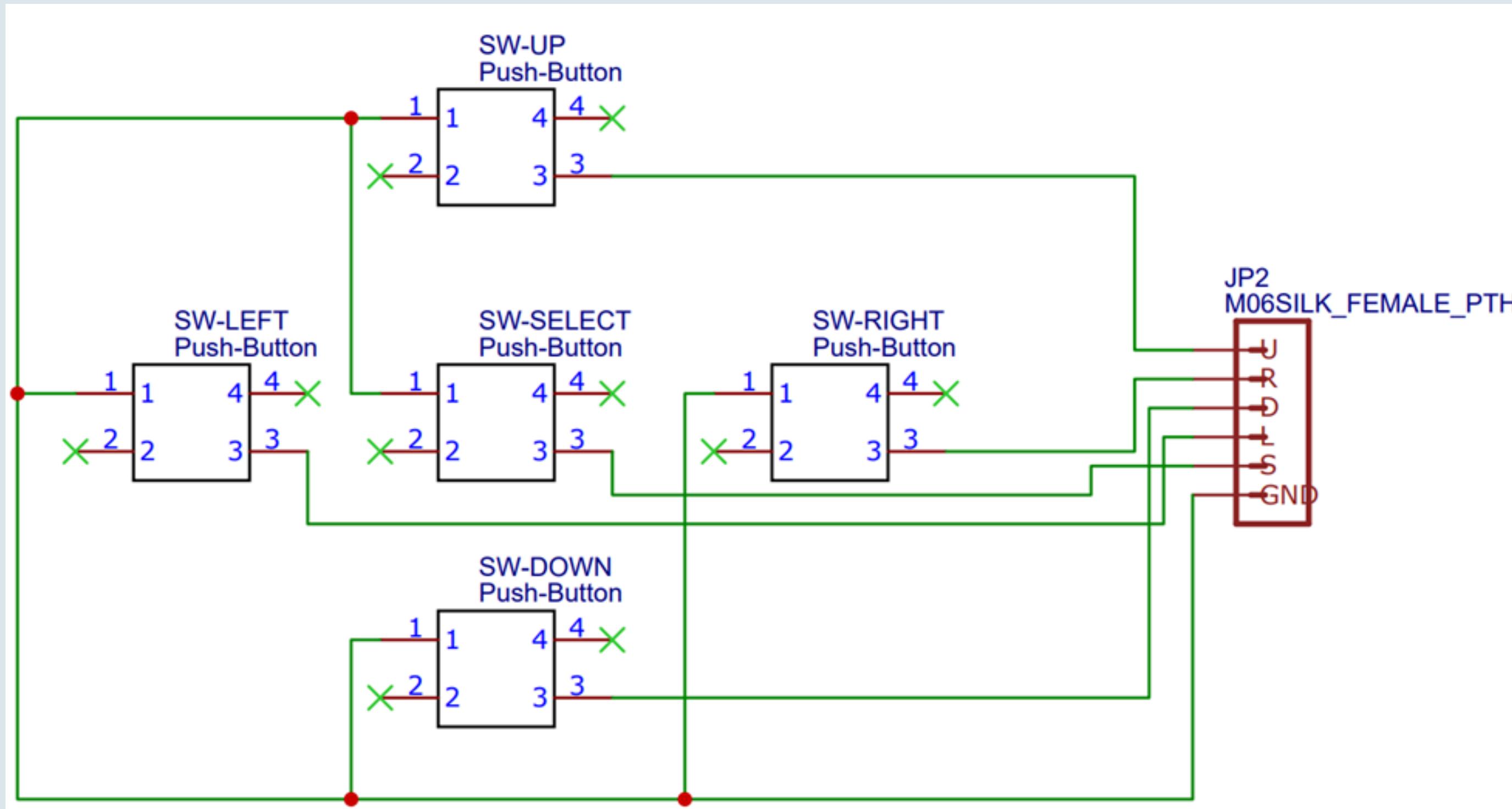
Responsibilities

- Designed & implemented remote control circuit and PCB in EasyEDA.
- Used Raspberry Pi internal pull-up logic for noise-free input.
- Added software debounce for accurate, low-latency button reading.

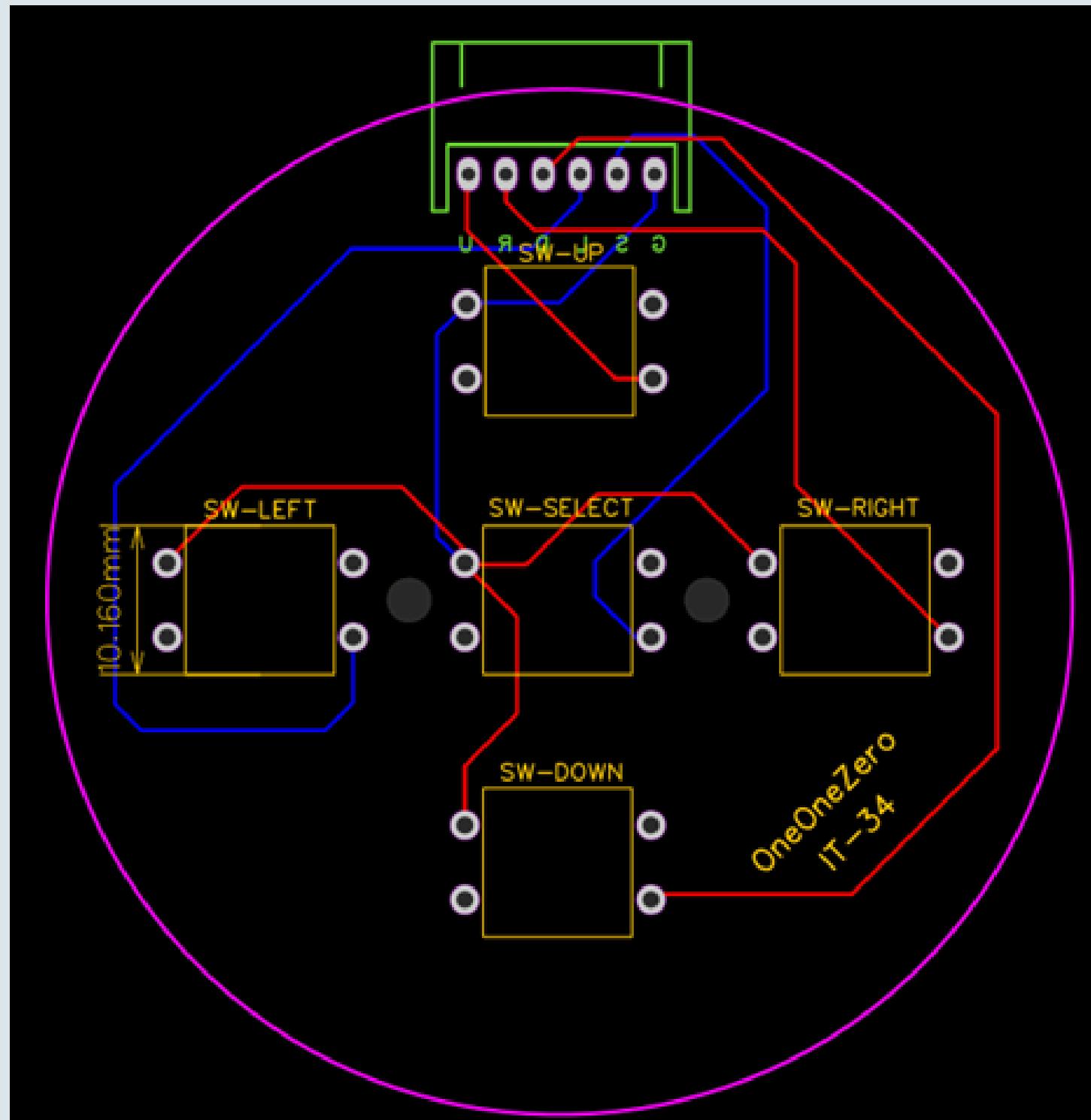
Designed & implemented circuit and PCB ♣♥♠♦

- 4 remotes × 5 push buttons = 20 inputs.
- Integrated 2 × CD74HC4067 multiplexers to reduce GPIO usage.
- Enable pins grounded for continuous readout.
- PCB designed in EasyEDA with:
 - Short, EMI-minimized signal traces.
 - Edge headers for organized wiring.
- Mounted push buttons, IC sockets, and connectors.

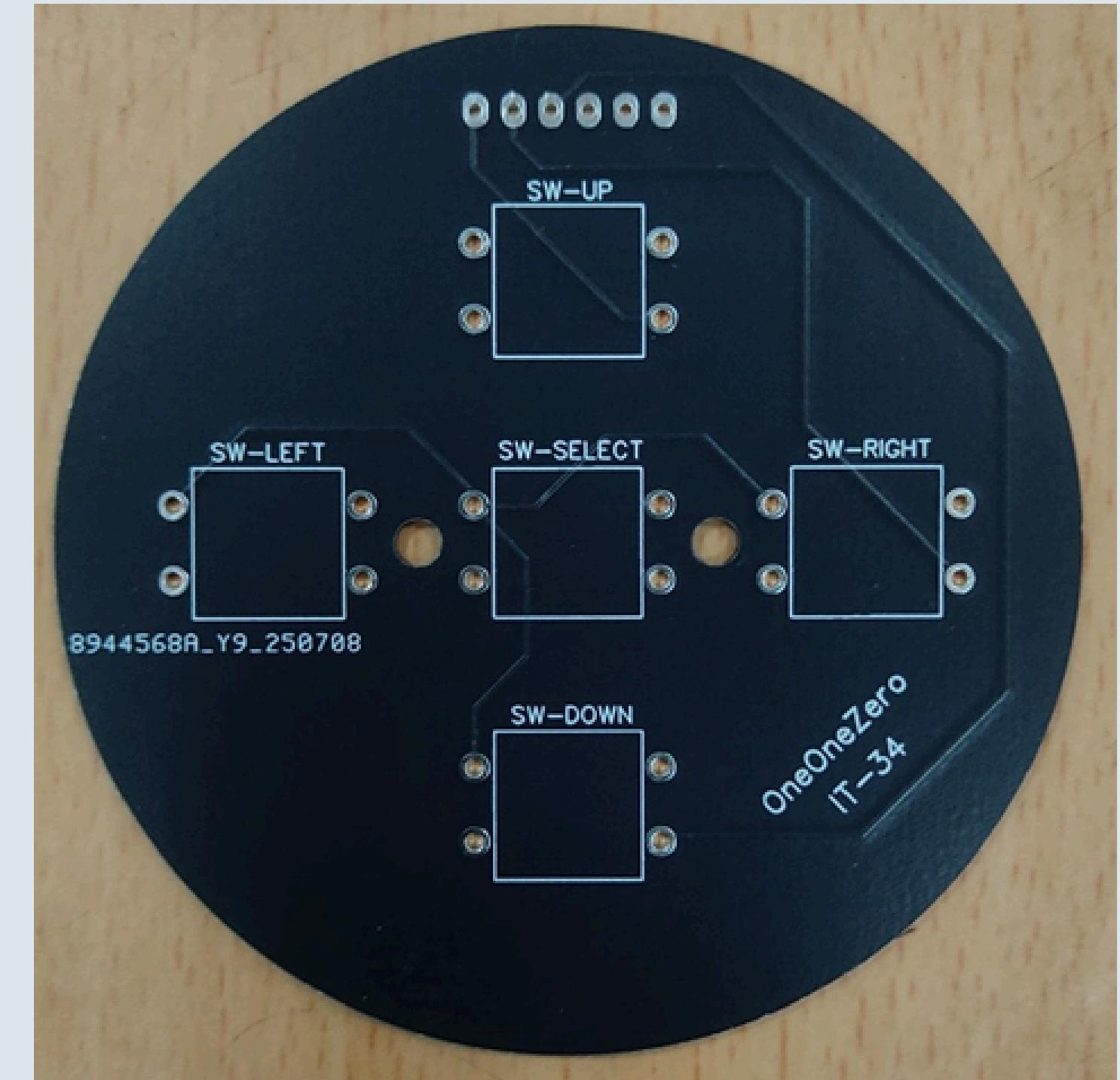
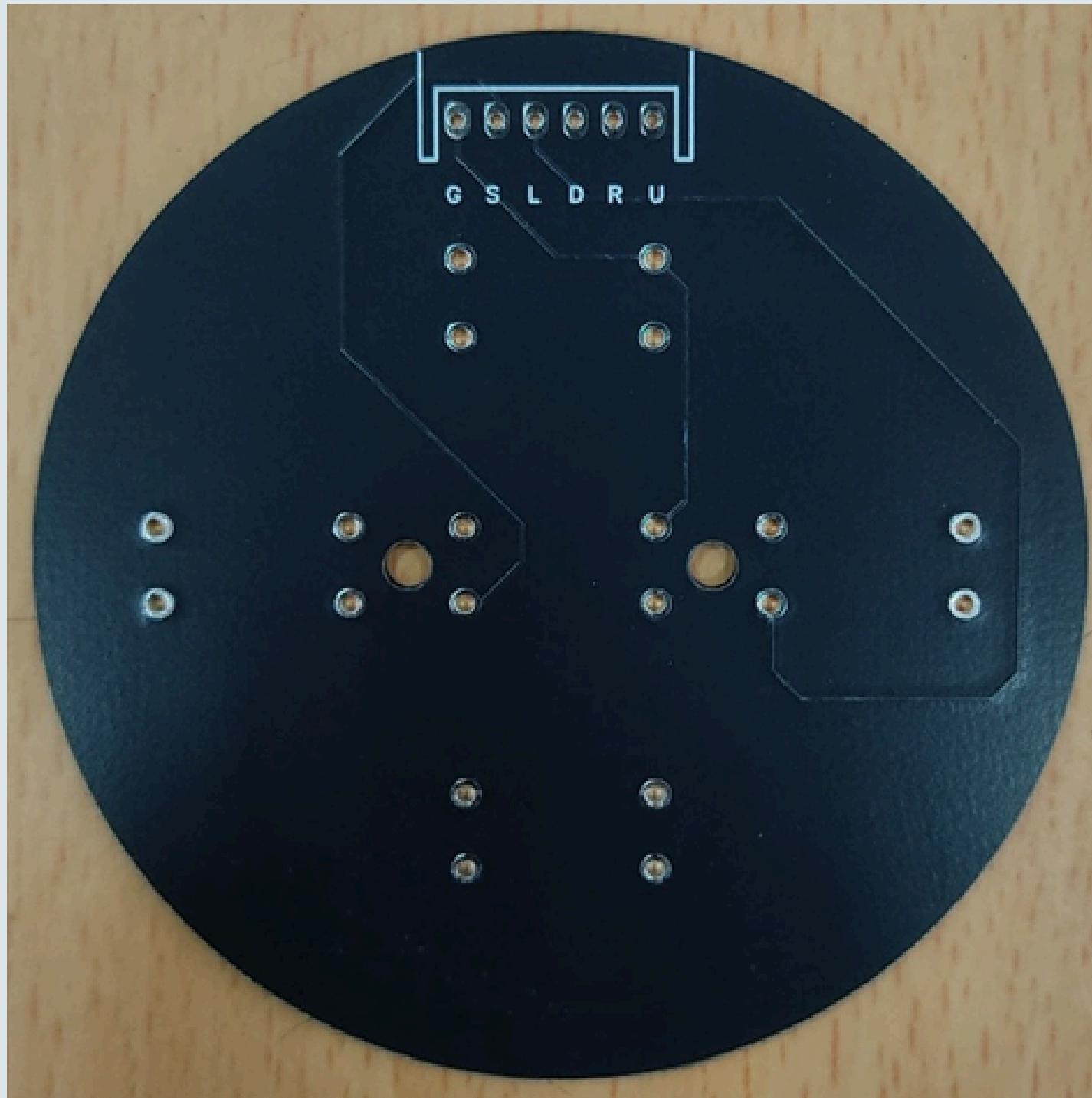
Remote Configuration Circuit Diagram ♣♥♠♦



Remote Configuration PCB Design



Remote Configuration PCB Design



Internal Pull-Up Logic



- Raspberry Pi internal pull-up resistors used for all button inputs.
- Logic state:
 - Released button → HIGH.
 - Pressed button → LOW.
- Advantages:
 - No extra resistors on PCB → simpler circuit.
 - Improved noise immunity.
 - Reduced wiring complexity.
 - Works seamlessly with multiplexer channel scanning.



Debounce Implementation



- **Problem:**
 - Mechanical buttons can cause multiple false signals per press.
- **Solution: Software debounce in Python:**
 - 200 ms delay between valid presses.
 - Tracks button state changes (`self.button_states`) & last press time.
- **Benefits:**
 - No unintended inputs.
 - Smooth, responsive control during gameplay.



Testing & Results



- **Testing steps:**

- Continuity checks after soldering.
- GPIO monitoring to verify each button press.
- Channel remapping where necessary.
- Trace routing adjustments for optimal performance.

- **Results:**

- Reliable, low-latency input detection.
- Only 10 GPIO pins used for 20 signals.
- Durable PCB design suitable for long-term use.
- Fully integrated with game logic for Omi the Trumps



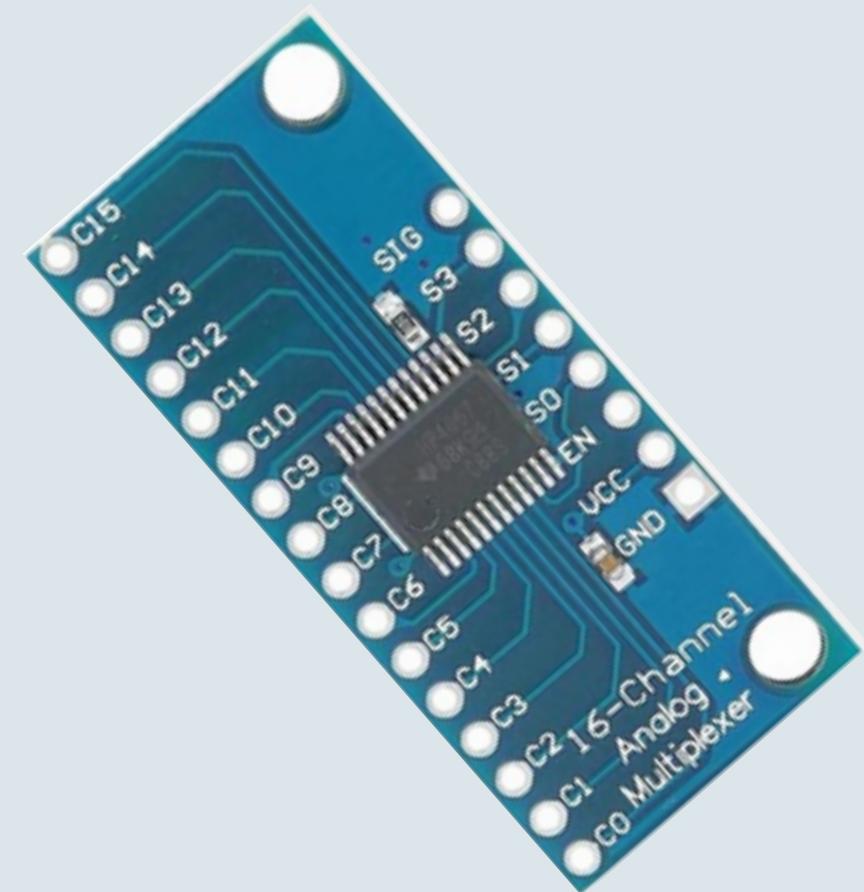
Responsibilities

- Designing and implementing the remote control input system using multiplexers (CD74HC4067) and Raspberry Pi GPIO pins.
- Designed a four-layer PCB to efficiently connect the Raspberry Pi, multiplexers, and four player remotes.
- Implemented key software features

16-Channel Analog/Digital Multiplexer (CD74HC4067)



- Two CD74HC4067 multiplexers connect 4 remotes, allowing multiple inputs to be read efficiently with minimal GPIO usage (5 pins per mux) on the Raspberry Pi.



How It Works



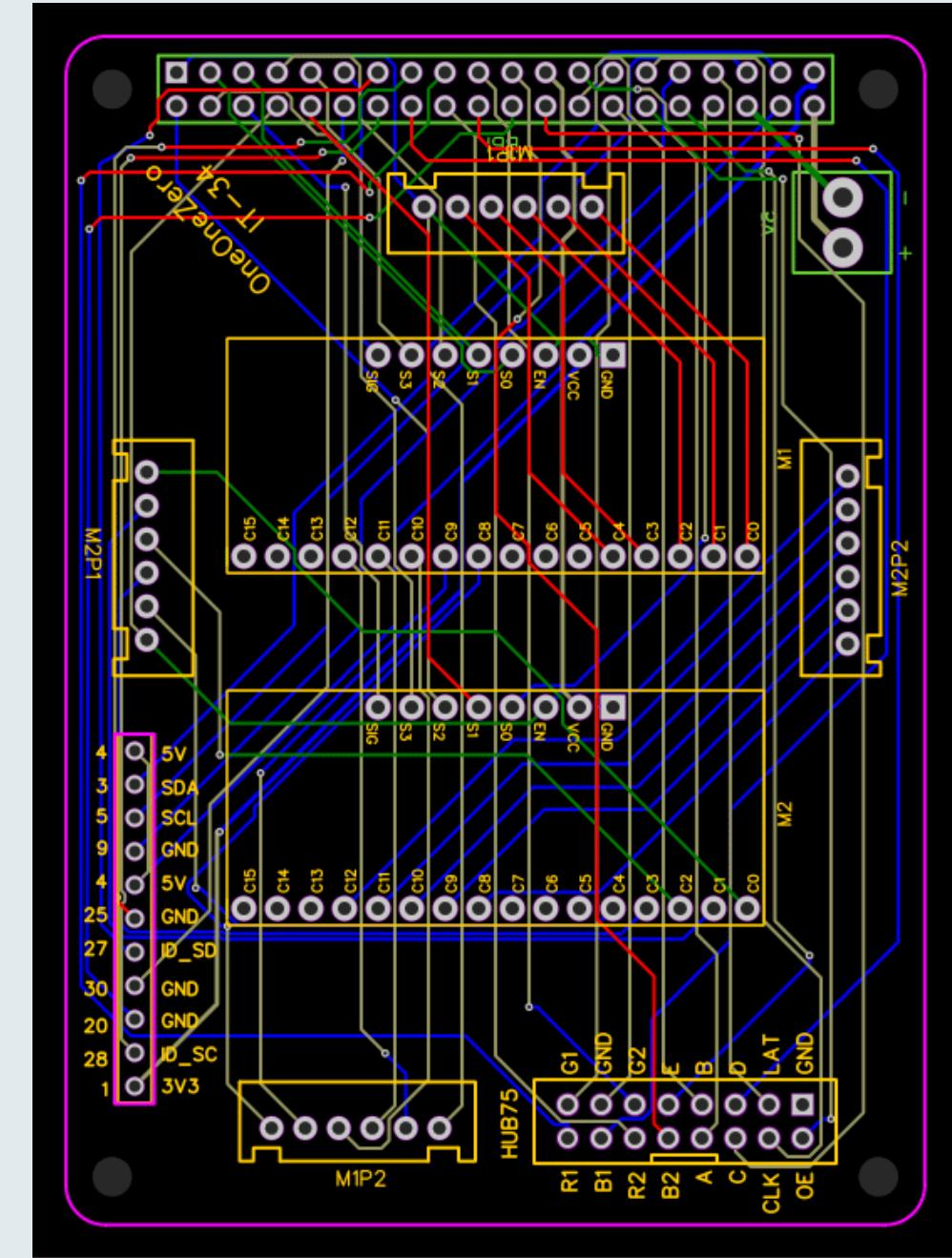
- Multiplexer selects 1 of 16 inputs via binary control (S0–S3)
- Selected button state sent to Raspberry Pi SIG pin
- Pull-up resistors: LOW = pressed, HIGH = not pressed
- Raspberry Pi cycles through channels to read all buttons quickly

PCB Design

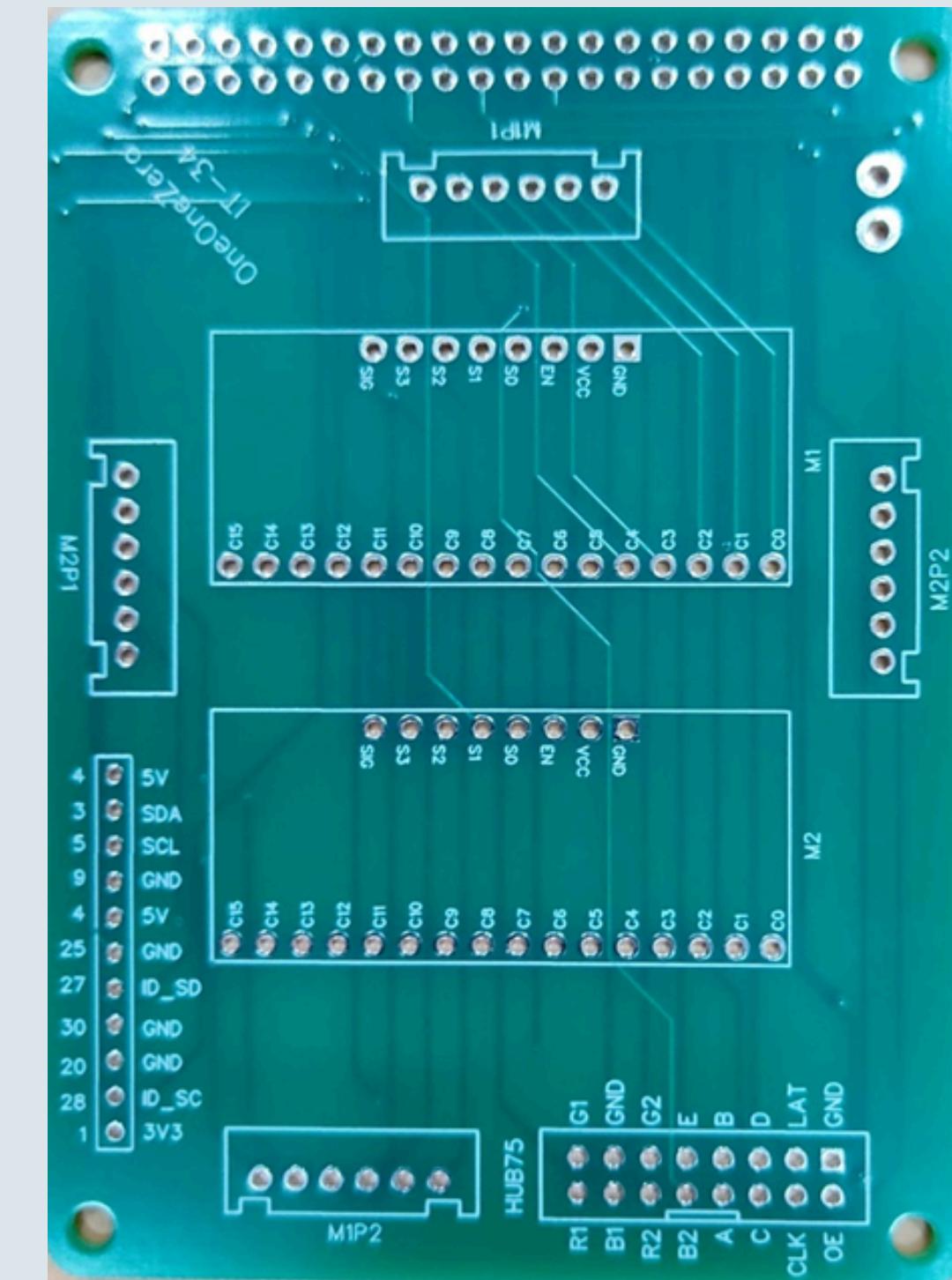
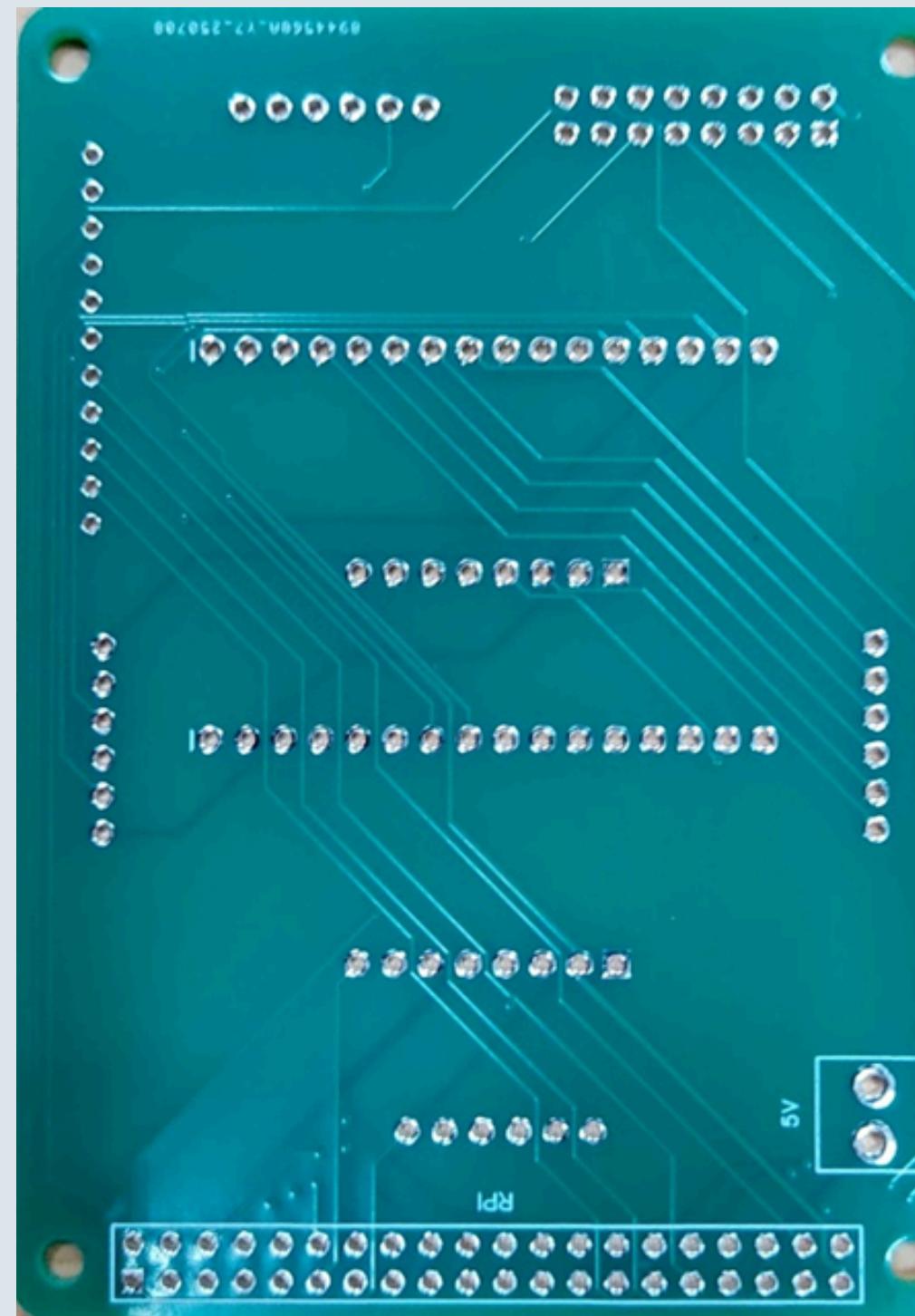


For RGB matrix panels and 4 remote configurations.

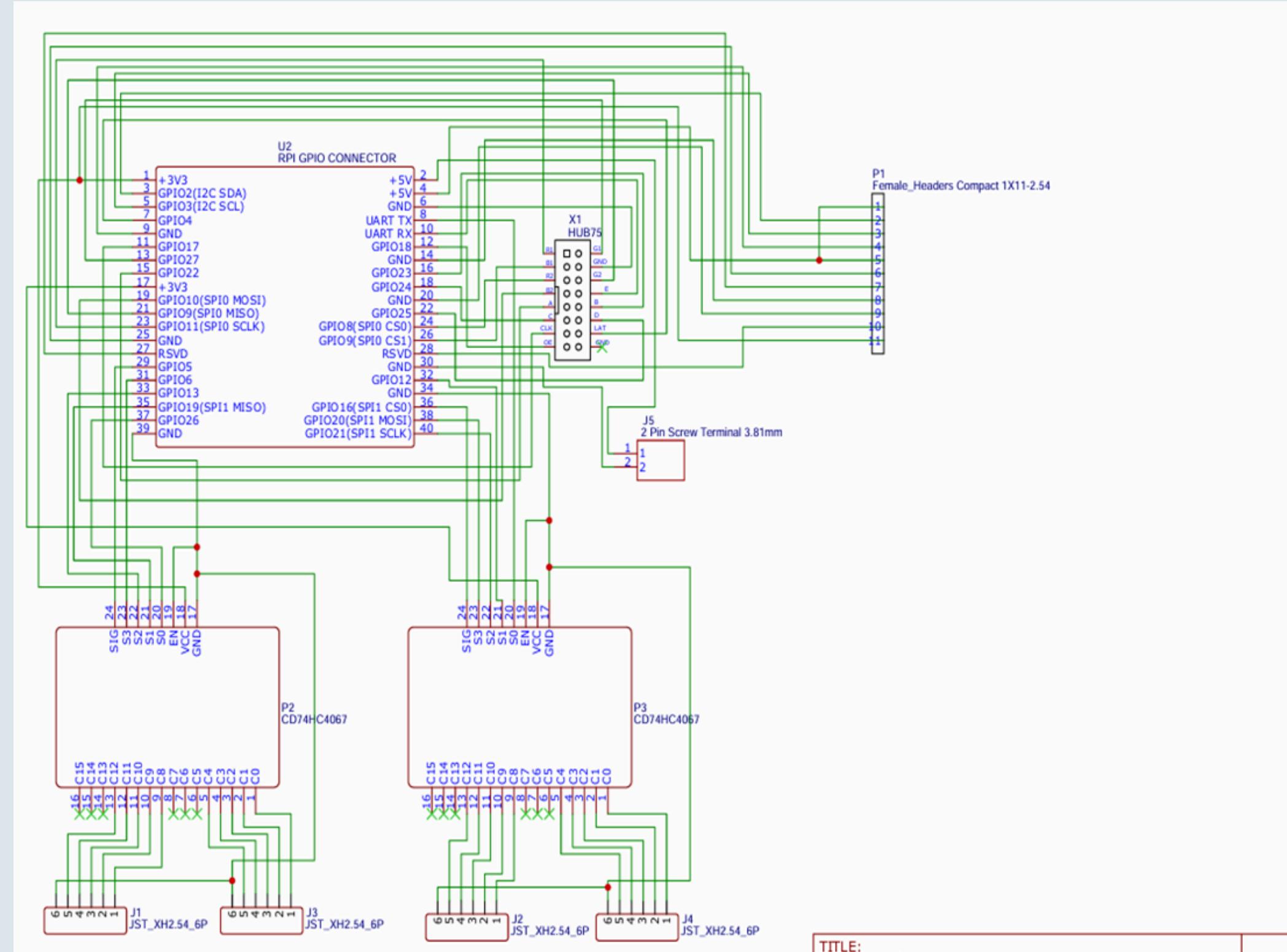
- Four-layer PCB for compact enclosure
 - Cleaner & shorter signal routing
 - Better signal integrity vs two-layer board
 - Easier assembly & maintenance



PCB Design



Schematic Diagram



Gameplay Enhancements



Previous Hand Display:

- Shows last trick cards for all players



Game Animations



- Trick/Round winner celebration
- New round transition
- Spectacular game over sequence
- Integrated with game loop for smooth flow



Responsibilities

- Designed and implemented two-digit common-cathode seven-segment display system for token counts.
- Mapped ESP32-S3 GPIO pins and selected suitable current-limiting resistors.
- Assembled hardware on PCB and ensured stable 5V power supply.

Designed & Implemented Display System ♣♥♠♦

- Created a two-digit common-cathode seven-segment display system to show token counts for Team A & Team B.
- Designed the display circuit to work with the ESP32-S3 microcontroller.
- Provided real-time token count updates, improving match transparency and professionalism.



2 Digit seven segment (Common Cathode)



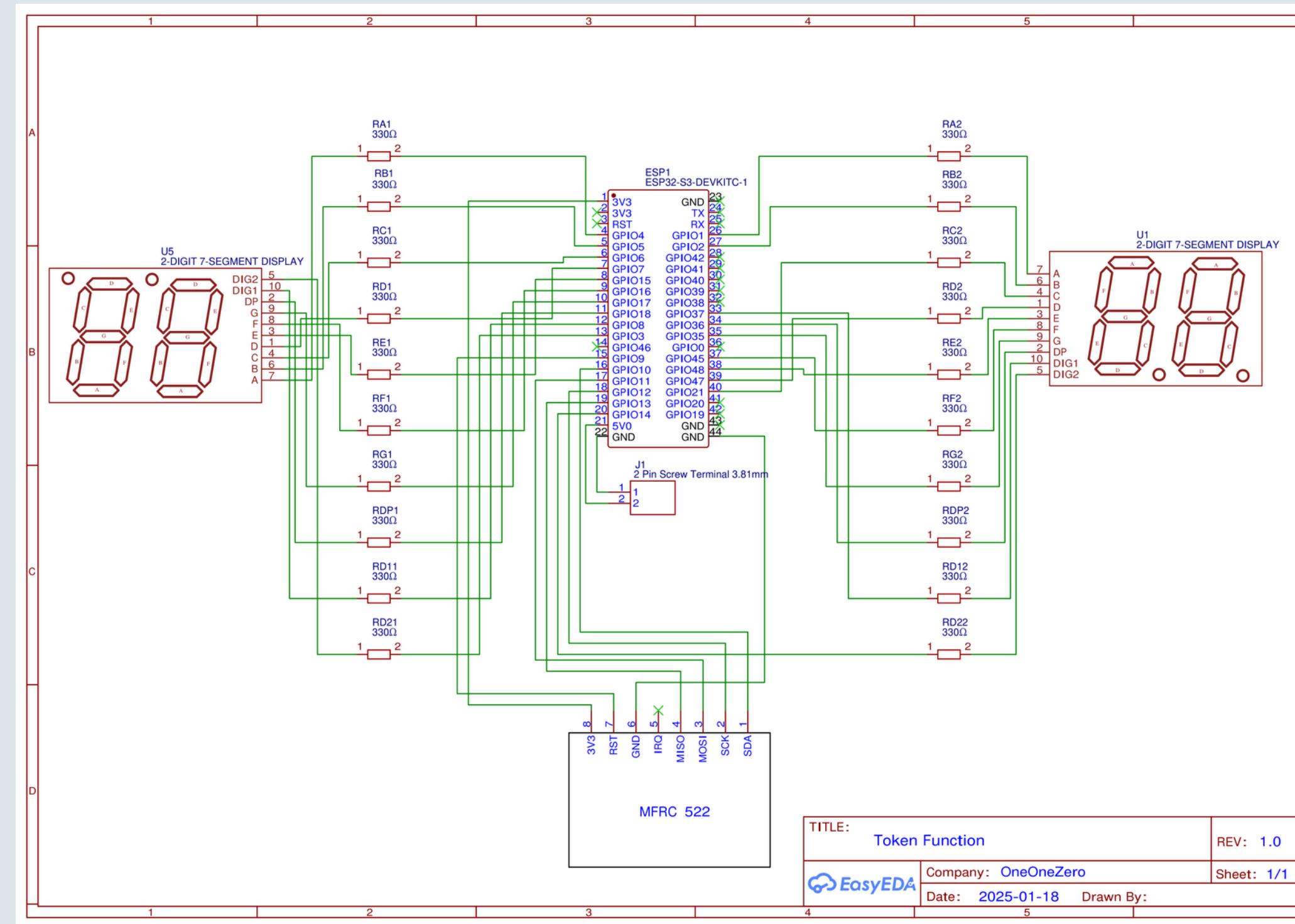
- Display the token count of Team A and Team B in real-time.

Mapped GPIO & Selected Resistors



- Assigned correct ESP32-S3 GPIO pins for each segment and digit control line.
- Chose current-limiting resistors to protect LED segments from excessive current.

RFID Token System Schematic Diagram



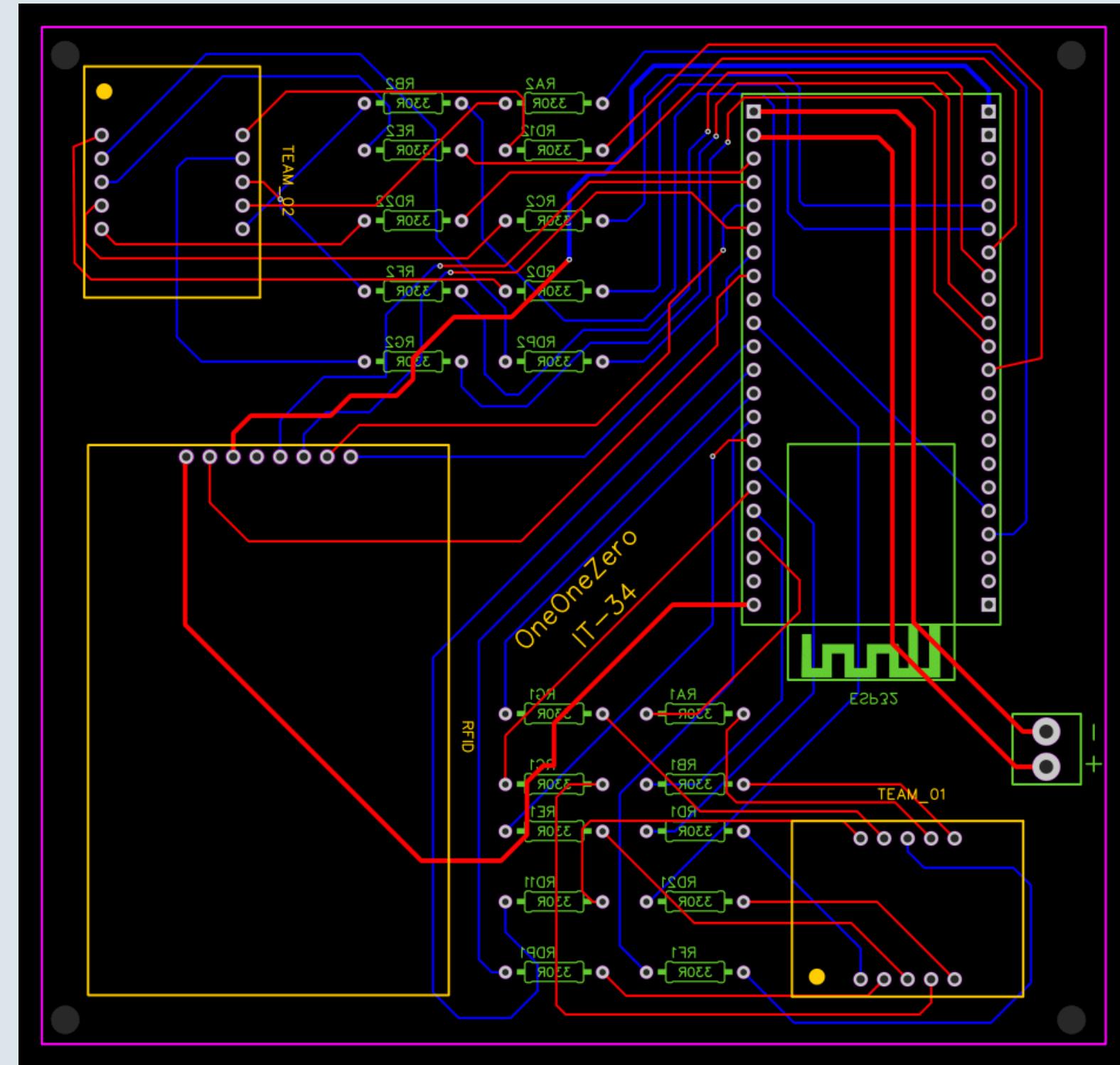
PCB Design & Hardware Integration



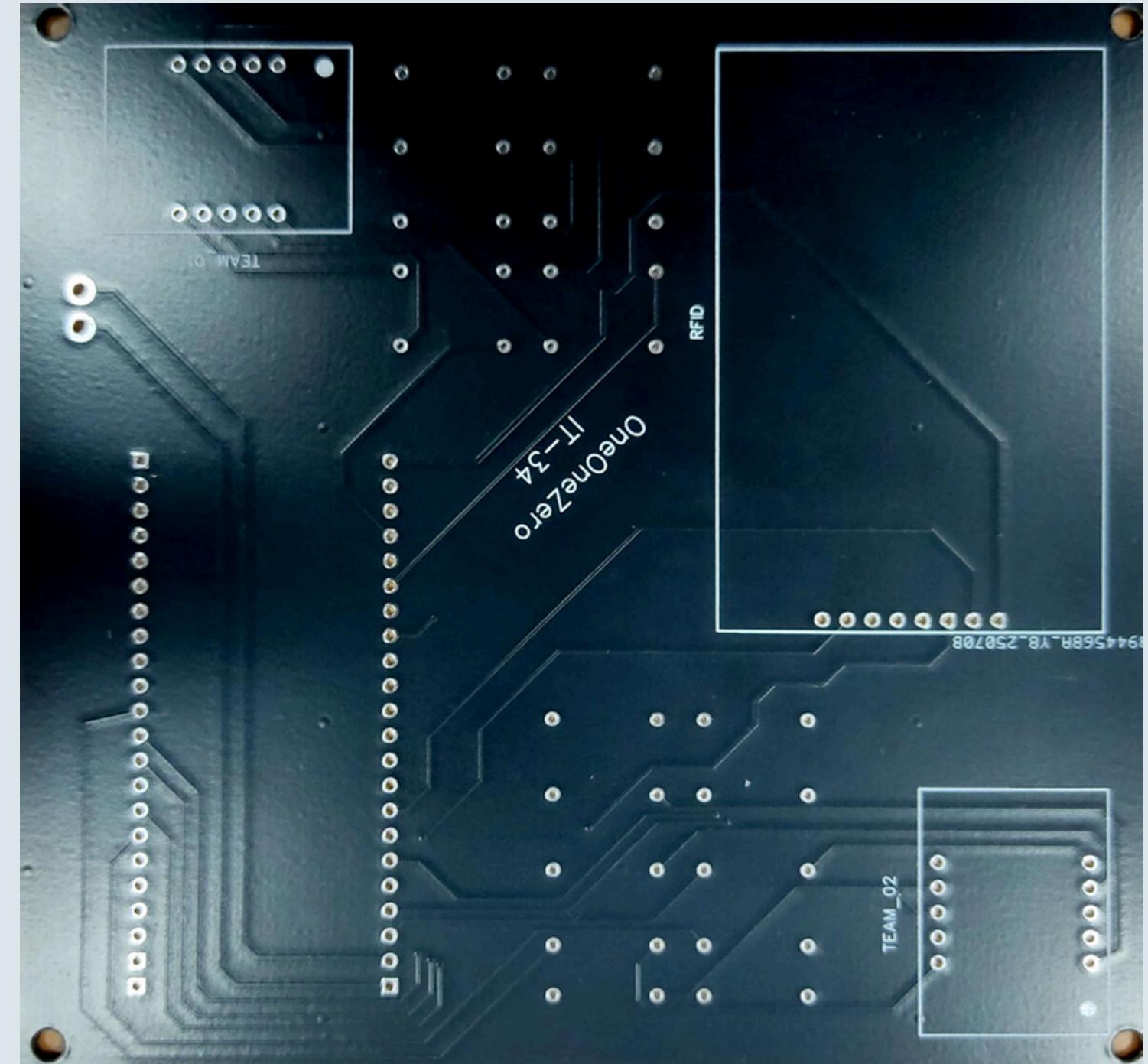
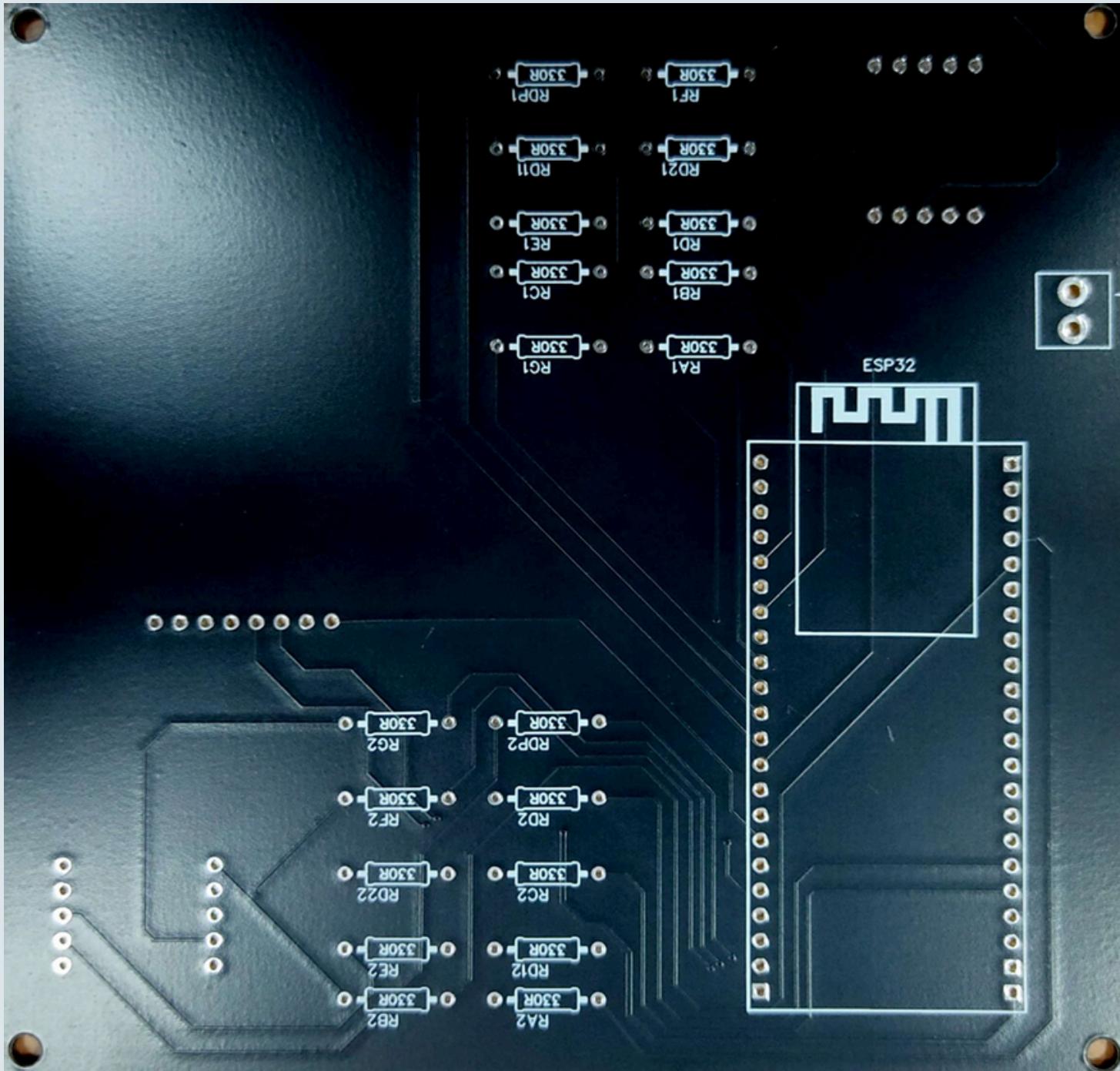
- Designed custom PCB for ESP32, RFID module, seven-segment displays, and circuitry.
- Applied 0.5 mm traces for power, 0.25 mm for data to reduce voltage drop.



RFID Token System PCB Design



RFID Token System PCB Design



Hardware-Software Integration

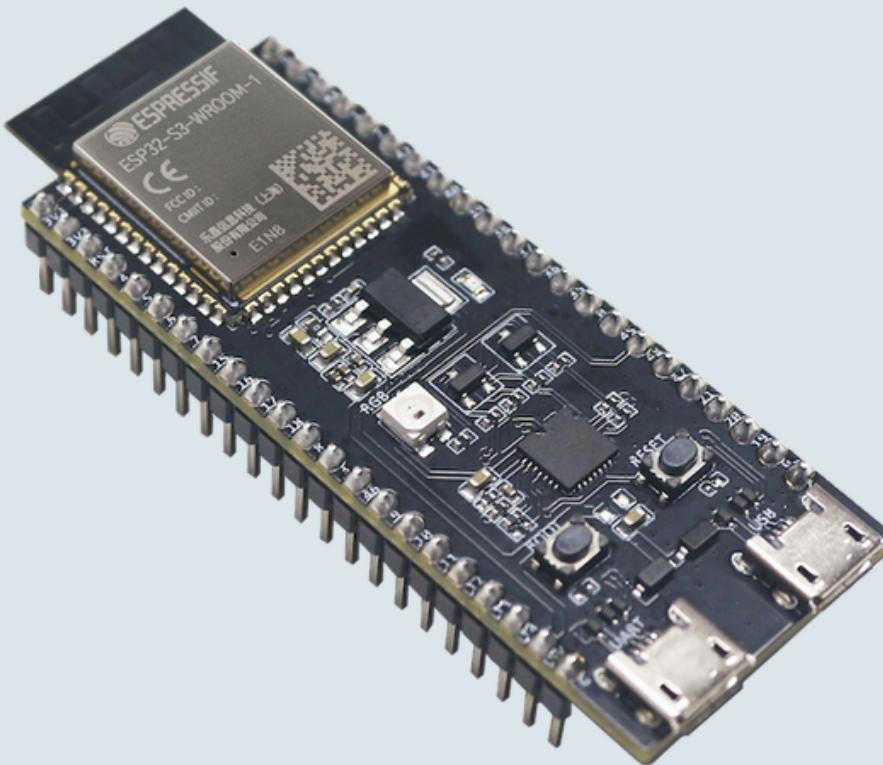
Responsibilities:

- Complete RFID token scanning system design
- TCP WiFi communication bridge (ESP32 ↔ Raspberry Pi)
- Real-time token deduction & display system
- Game logic integration (half/full court, trump cancel)
- Technologies: ESP32, MFRC522 RFID, SPI Protocol, TCP/IP

ESP32-S3



- ESP32-S3 processes RFID inputs and controls the 7-segment displays in real time.



- Processor: Dual-core 32-bit LX7 processor up to 240 MHz
- Connectivity: Wi-Fi 802.11 b/g/n up to 150 Mbps, Bluetooth 5.0 LE with mesh support

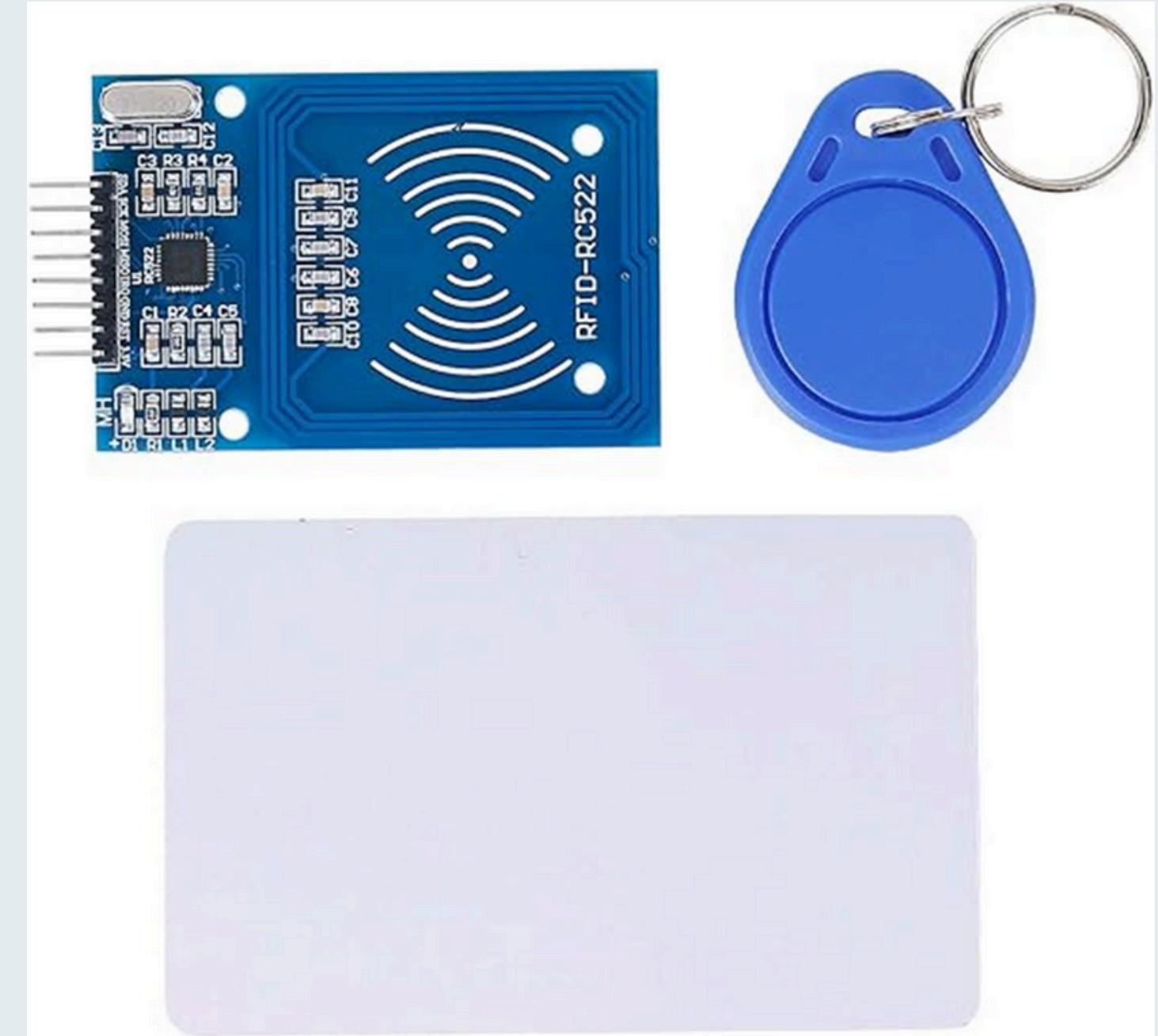


Hardware Design & Components



RFID Scanner Integration

- MFRC522 module configured via SPI communication
- 2-second scan delay to prevent accidental double deductions
- Team A/B card recognition via hardcoded UIDs



Communication System & Protocols



WiFi Bridge Architecture

- ESP32 as TCP server (port 8080)
- Raspberry Pi as client using custom ESP32WiFiManager
- Automatic network discovery with static IP fallback
- Heartbeat monitoring for connection stability

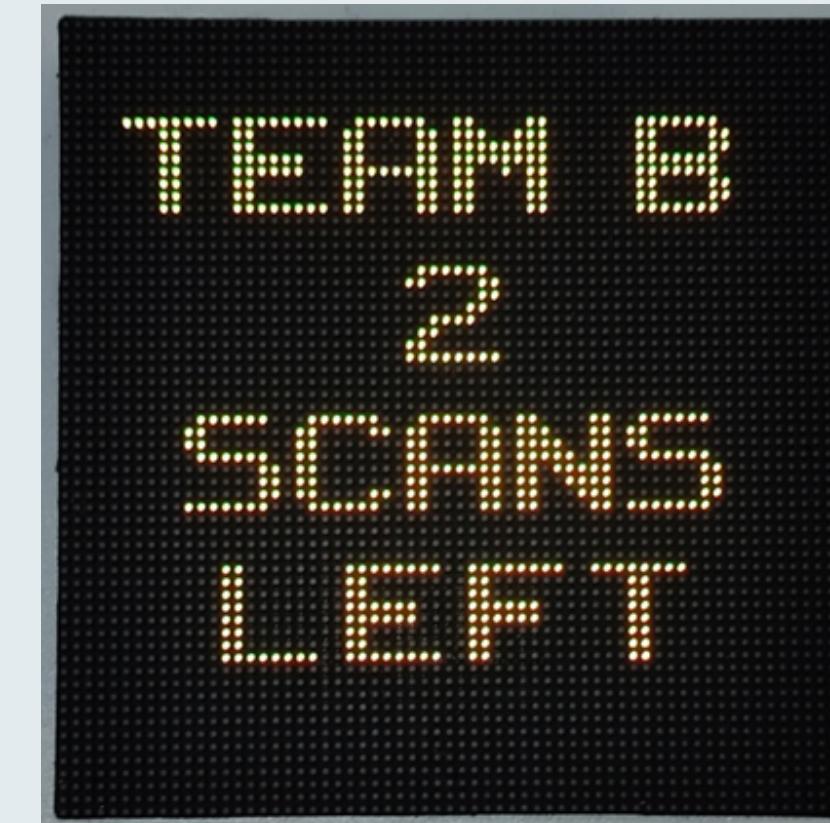
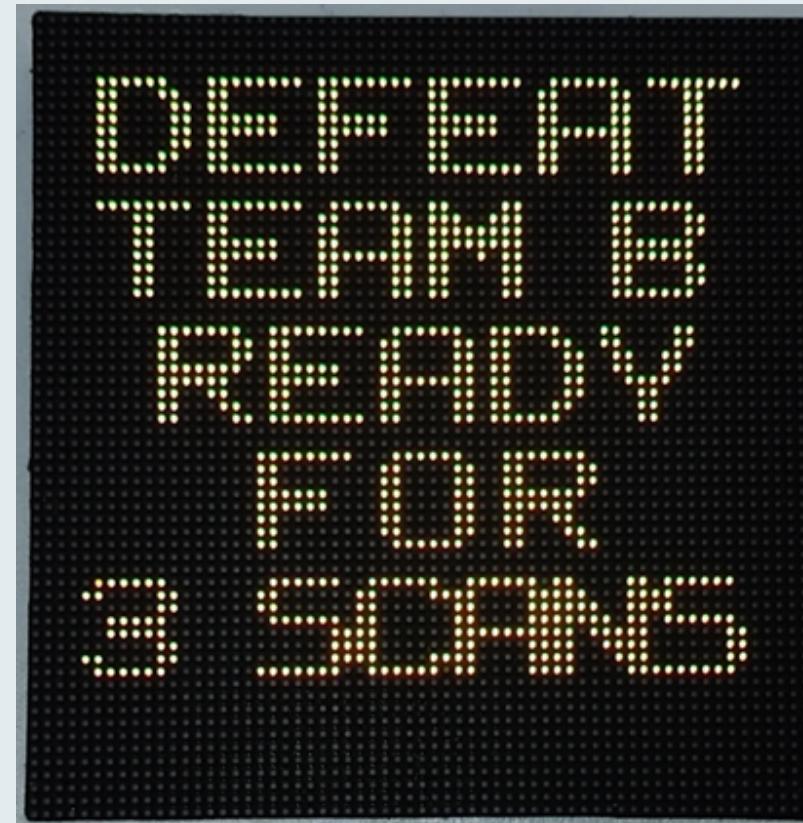


Communication System & Protocols



Communication Protocol

- START_SCAN: Initiates token scanning sequence
- SCAN_PROGRESS: Real-time scanning updates
- SCAN_COMPLETE: Session completion notification
- Token count synchronization between systems



Communication System & Protocols



Network Reliability Features

- Automatic reconnection after network interruptions
- Connection state monitoring and error recovery
- Message queuing with acknowledgment protocols

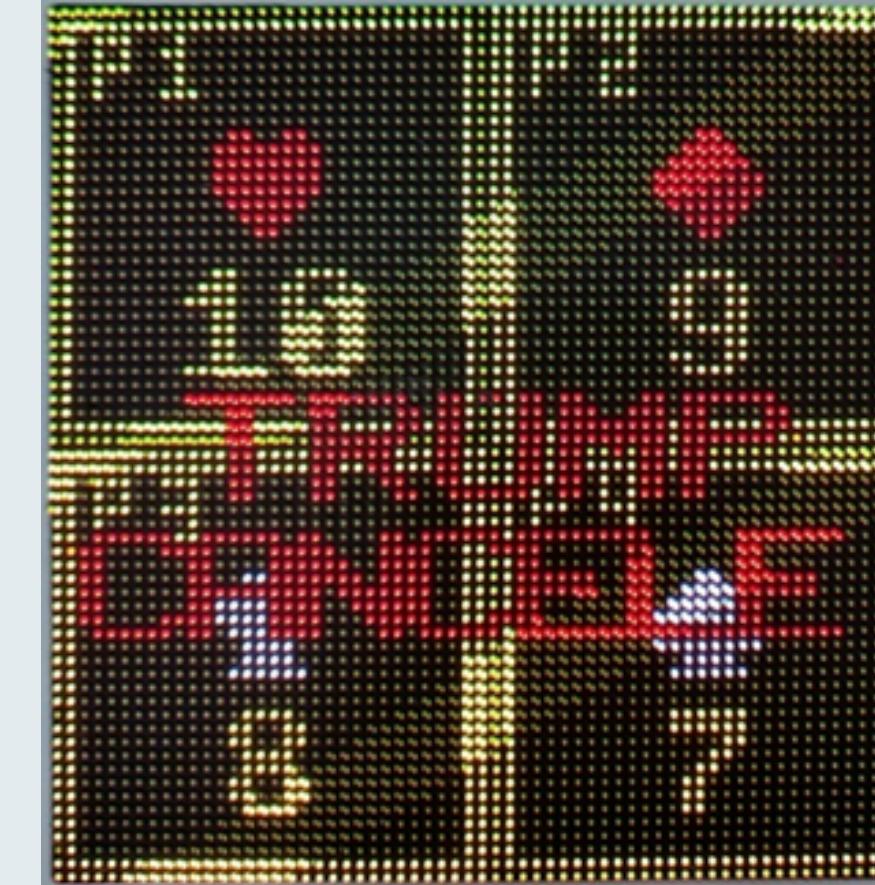


Game Logic Integration



Advanced Game Modes

- Half Court Mode: Detects single player press, triggers 2-card scan
- Full Court Mode: Tracks 8 tricks, identifies winner, requires 3-card scan
- Cancel Trump: Validates cards ≤10 rank, enables trump cancellation





Game Logic Integration

Token Management Logic

- Real-time token deduction upon valid card scan
- Team-specific card recognition and validation
- Automatic display updates reflecting current game state
- Error handling for insufficient tokens and wrong cards



Further Implementation



- AI Player Support:
 - Integrate artificial intelligence agents to fill empty slots, allowing solo or mixed human–AI gameplay if some players are absent.
- Single-Player & Team Modes:
 - Enable one-player mode, cooperative teams vs. AI, or all-AI teams to expand play options.
- Intelligent Move Suggestions:
 - Provide real-time hints, explanations, and strategic advice to help beginners learn the game.



Conclusion



Our project has modernized Omi the Trumps by creating a simple, user-friendly digital platform that preserves its tactical gameplay while effectively solving issues of inefficiency, privacy, and cheating, ensuring players enjoy a fair and engaging experience.



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Thank you

