DuelReality

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Advisor: Professor Jackson
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Team Members

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CSE

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Agenda

- Review of Project
- CDR Deliverables
- FDR Deliverables
- Demo
Our Card Game mechanism
Review of Project
System Requirement

1. Minimum of 20 cards needed for each player, RFID Tags attached to each card
2. Wristband device is light enough to wear and hold still
3. Support 2 Player Mode (need 2 wristband devices)
4. Casing Meet Safety Standards
5. 4+ hours battery life
6. Inexpensive
7. Bluetooth as midway communication
Block Diagram

- **ATMega 2560 PCB**
- **RFID Card Input**
- **TAG**
- **5 RFID Readers**
- **LCD Screen**
- **Buttons**
- **BLE Module**
- **Power Distribution Management**
- **Power Supply**
- **Server (Software)**
  - Game States
  - Leaderboard
  - SQL Card Database
  - Game Calculations
- **Server Data Signal**
- **Bluetooth 2.0 Bluetooth Connection Signal**
- **cellular network provided by user’s cellphone carrier**

Department of Electrical and Computer Engineering

Advisor: Prof. Jackson
CDR Individual Responsibilities

- **Jerry:**
  - Enable communication between wristband device and server, and players login to server through mobile app.

- **Hadi:**
  - Design online web server that handles game implementation, functionalities, and databases.

- **Xiaobin:**
  - Power distribution for the system and PCB microcontroller Design that integrates an ATMega2560 Processor.
Met CDR deliverables

- **Jerry:**
  - Mobile app registers players and enables communication between device and server.

- **Hadi:**
  - Designed online web server and full game implementation, functionalities, and databases.

- **Xiaobin:**
  - Power distribution for the system and PCB microcontroller Design that integrates an ATmega2560 Processor.
## Gantt Chart

### ACTIVITY

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>MDR</th>
<th>CDR</th>
<th>FDR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hadi: Finish App To Server Implementation</td>
<td>Dec.4</td>
<td>Jan.22</td>
<td></td>
</tr>
<tr>
<td>Hadi: Implement/Register Card Database</td>
<td>Dec.11</td>
<td>Jan.29</td>
<td></td>
</tr>
<tr>
<td>Hadi: Implement Card Game Mechanism On The Server</td>
<td>Dec.18</td>
<td>Feb.5</td>
<td>FEB.26</td>
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<tr>
<td>Jerry: Enable Bluetooth App To Login Players To Server</td>
<td>Winter break</td>
<td>Feb.12</td>
<td>Mar.5</td>
</tr>
<tr>
<td>Jerry: Test Communication Between BLE and Server For a Full Game</td>
<td>Jan.22</td>
<td>Feb.19</td>
<td>Apr.2</td>
</tr>
<tr>
<td>Xiaobin: Research PCB Microcontroller Design</td>
<td>Jan.29</td>
<td>Feb.5</td>
<td>Apr.9</td>
</tr>
<tr>
<td>Xiaobin: Design PCB Integrating ATmega2560 Microprocessor</td>
<td>Feb.12</td>
<td>Mar.19</td>
<td>Apr.16</td>
</tr>
<tr>
<td>Xiaobin: Order Parts and Print PCB</td>
<td>Feb.19</td>
<td>Mar.26</td>
<td></td>
</tr>
<tr>
<td>Whole Team: Prepare and Present CDR</td>
<td>Feb.26</td>
<td>Mar.5</td>
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<td>Whole Team: move the code from andrino to PCB and testing</td>
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<tr>
<td>Whole Team: Prepare and present CDR</td>
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<tr>
<td>Whole Team: Complete additional features implementation</td>
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<tr>
<td>Whole Team: Prepare and present FDR</td>
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</table>
Jerry: Smartphone Application

- Connects wristband device to phone through Bluetooth
- Enables user to connect to the server
- Allows wristband device to send messages to server (card IDs, Login messages)
- Allows server to send messages to device

HC-06 Bluetooth module
Jerry: Mobile application diagram

Player move

Game update

Player move

Game update
Hadi: Reader-Game Communication

- **Hardware:**
  - Arduino Mega2560
  - MFRC522 RFID Reader
  - LCD Display

- **Software:**
  - Arduino IDE - C

- **Process:**
  - RFID Readers detect new card ID
  - RFID reports ID details to Microcontroller
  - Microcontroller prints contents to LCD Display
  - Pushes ID through Bluetooth to Server
Client-Server Implementation

- **Eclipse IDE:**
  - Main Classes: Client.java, Server.java, Spectator.java

- **Client Class:**
  - Make connection with Temp Local Server (localhost)
  - Send and receive messages to/from server for testing

- **Server Class:**
  - Listen and accept new connections
  - Send and receive messages to/from client(s) for testing

- **Spectator Class:**
  - Connect viewers to current games
  - Allow for real time game viewing
Server Hosting

- **Google Cloud Platform:**
  - Establishes an online client-connectable server running `Server.java`
  - Bulk of the game states, calculations, databases, and leaderboards.

- **Security:**
  - Uses RSA algorithm for Public-Key Encryption
  - Uses MD5 hashing for additional security
Xiaobin: Power distribution

- BLE Module @ 5V
  - Standby Mode: <25 mW
  - Transmission Mode: 200 mW
- LCD 16x2 @ 5V
  - No Backlight: < 5mW
  - Backlight Enabled: 600~800 mW
- (RFID Reader @ 3.3V) x 5
  - Standby Mode: 170~210 mW
  - Peak: <480 mW
- PCB @ 5V
  - <100mW
PCB Design Requirement

- Lower component count and smaller board size
- Pin layout matches Arduino Mega pinout
- Bypass capacitors from Vcc to ground
- LED indicators for power and transmission
- Pull-up resistor between RESET and Vcc/AVcc
Programming PCB

- Use an CP2102 USB to UART TTL Module or equivalent Module to upload sketch onto the ATmega2560 chip
FPR Deliverables

- Build 2 fully functional wristband devices with an integrated PCB Design.
- Allow users to start, play, and end a fully functioning game from their DuelReality systems without the use of a computer.
- Project game actions into a user’s Field-Of-View through a connected projector.
Demo
Thank You!

Questions?