Compact ESP8266 Gaming Console with Real-Time Firebase Score Tracking

Abstract

This project presents a compact and engaging gaming system built using the ESP8266 microcontroller, an LCD display, and a button-based user interface. The system features a single fast-paced game titled **Tunnel Escape**, where the player must **navigate through a scrolling tunnel** filled with obstacles. **Collision with any obstacle ends the game immediately**, emphasizing reflex and precision.

At the start, the user interacts with a **player selection menu** using **three buttons** — *Up*, *Down*, and *Select*. These buttons allow the player to scroll through available player names and confirm selection. Once selected, the game begins with the player navigating the tunnel using vertical movement controls.

At the end of each session, a **summary screen displays the player's name and score**, and the score is automatically **uploaded to Firebase**. Firebase maintains:

- The **individual high score** for each player
- A **leaderboard showing the highest scores among all players**

Players can return to the player selection menu via a button press, allowing continuous play with different players. The entire system operates over Wi-Fi (typically via a mobile hotspot), and all game logic, interface, and Firebase communication run natively on the ESP8266 without MQTT.

The LCD provides real-time game visuals and smooth transitions between menus. The design is modular, ensuring scalability and potential future enhancements.

This project effectively combines embedded system development, real-time graphics, and cloud-based data management to deliver a standalone tunnel-navigation game with persistent score tracking and competitive multiplayer features.

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