Card-size Reaction Test and LED Memory Test Device

Practicum Product Design Specification (PDS)

Team 10
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1 Executive Summary

The Portable Card-size Reaction Test and LED Memory Test Device is designed to implement two different interactive modes, namely reaction time measurement and memory retention testing. This handheld credit-card-sized device has been fitted with a joystick for mode selection, four buttons, LEDs, and an LCD screen to provide its users with an entertaining and diverse user experience.

In the Reaction Time Mode, the device can start a countdown while suddenly lighting up one of its LEDs. Immediately, the user should press the corresponding button as fast as possible and, on the screen, see the user's reaction speed. These could be done several times and then the device will calculate and display the average reaction speed. Those are some really valuable data, even for users in different groups such as athletes, e-sport players, drivers, and every other human who wants to test their reflexes.

In the Memory Test Mode, the device challenges the player to remember an increased sequence of the flashing LEDs. The game starts by one LED lighting on and the user pressing the corresponding button. As it advances through levels, several LEDs blink in a random order; the player has to memorize and replay the correct sequence. Any wrong button pressed restarts the game, hence fun and challenging for the users.

It is powered by the ESP32C3 microcontroller and housed in a custom 3D printed shell, making it portable and durable for convenience while carrying it anywhere at any time. Equipped with enhanced dual functionality, the Portable Card Reaction Tester and LED Memory Test Device come up with an effective and enjoyable device for testing both reaction times and memory, thus pleasing a wide range of user needs.

2 Market Analysis

2.1 Intended Users

- Athletes (for training)
- eSports players (to measure reflexes)
- F1-Drivers (to test reaction times for safety)
- General users (for personal interest and entertainment)

2.2 Competition

The current handheld reaction time devices are either larger in size or part of more expensive sport meters. Our device is uniquely portable, credit-card-sized, and cost-effective, hence fitting for the interests of both professional and casual users.

2.3 Price

The estimated price range is $30-$50, based on the cost of the components (microcontroller, sensors, LEDs, OLED display) and the 3D-printed casing. The main processor costs only $5, making the price competitive compared to larger and more complex reaction testing systems.

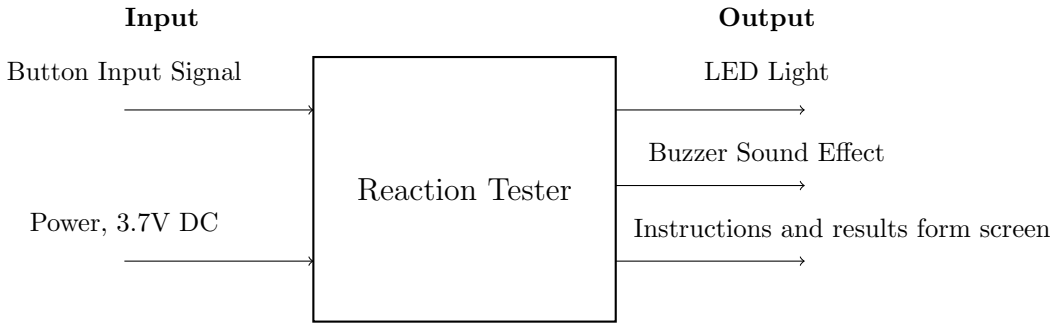
3 Requirements

1. Must be portable.
2. Must measure reaction times accurately.
3. Must have a screen to display the score.
4. Should be user-friendly.
5. Should initiate a countdown before testing.
6. Should have a switch to control power on/off.

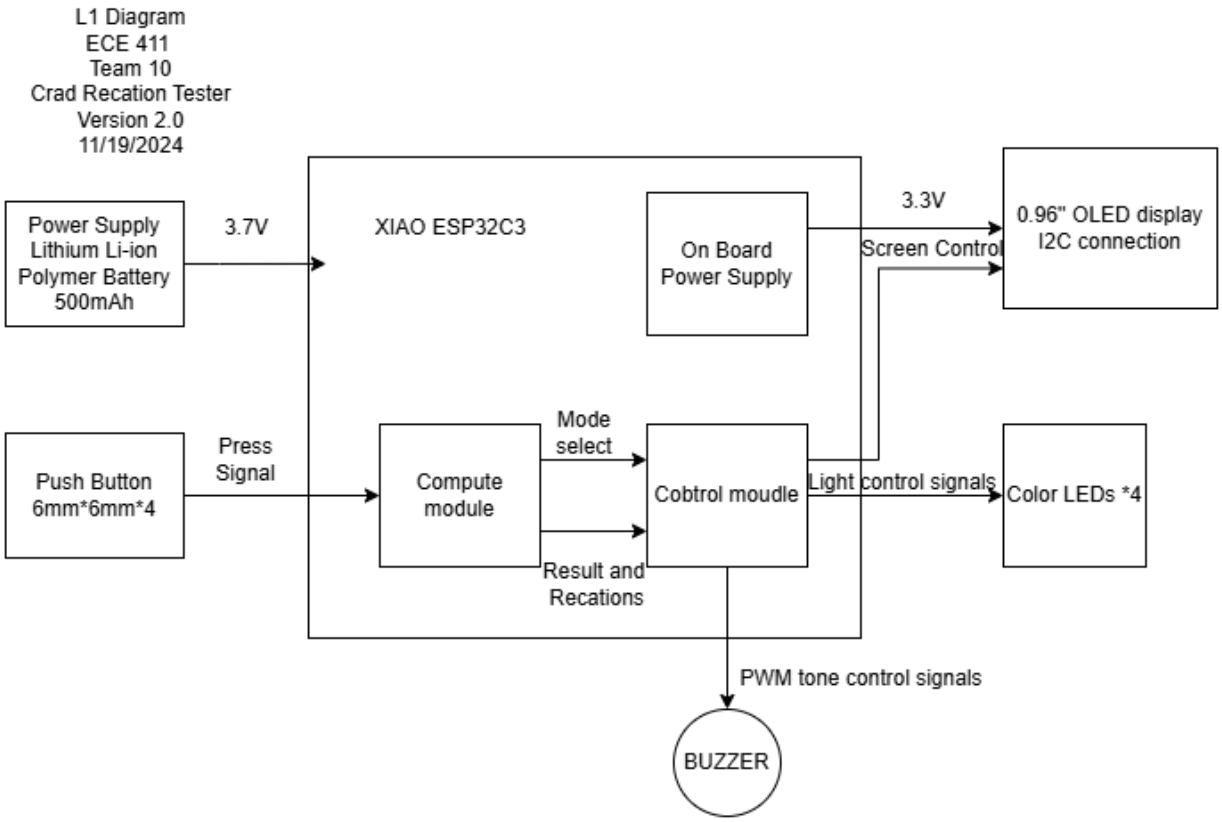
7. Should have another function.
8. May feature an aesthetically designed case.
9. May use low power.
10. May have a menu.

4 System Architecture

4.1 Level 0 Block Diagram



4.2 Level 1 Block Diagram



5 Design Specifications

- **Sensors:** Buttons
- **Processor:** ESP32C3
- **Display:** 0.96” OLED Screen
- **Sound:** Buzzer
- **Power:** Lithium Li-ion Polymer Battery
- **Development Environment:** Arduino, VS Code
- **Case:** 3D printed
- **Purpose:** Effective and compact design