

REFLEX RACER

RACE AGAINST TIME

ESD Project

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PROJECT OVERVIEW

Reflex Racer is an Arduino-based arcade game designed to test and improve users' reaction times. Inspired by the classic "whack-a-mole" game, Reflex Racer challenges players to respond quickly to visual stimuli. The game lights up LEDs at random intervals and locations, and players must press corresponding buttons as fast as possible. The primary objectives are to create an engaging and interactive experience while demonstrating the practical applications of Arduino in game development.

METHODOLOGY

The development of Reflex Racer involved several key methodologies:

- Planning and Design:** Initial stages focused on conceptualizing the game mechanics and designing the layout of LEDs and buttons.
- Hardware Integration:** Selection and integration of Arduino-compatible components such as LEDs, push buttons, resistors, and the Arduino board itself.
- Software Development:** Writing the Arduino sketch using C/C++ to control the game logic, random LED activation, and user input processing.
- Iterative Testing:** Continuous testing and refinement of both hardware and software to ensure seamless operation and user-friendly interaction.

SYSTEM ARCHITECTURE

The system architecture of Reflex Racer consists of the following components:

- **Arduino Board:** Acts as the central control unit.
- **LED Array:** An array of LEDs that light up in random sequences.
- **Push Buttons:** Corresponding to each LED, allowing user interaction.
- **Power Supply:** Provides necessary power to the Arduino and peripheral components.

IMPLEMENTATION

Key Features and Functionalities:

- **Random LED Activation:** Uses the `random()` function to select which LED to light up.
- **Timing and Scoring:** Measures the time taken for the user to press the correct button and updates the score accordingly.
- **Game States:** Manages different states of the game (ready, playing, game over) using a finite state machine.
- **Feedback Mechanism:** Provides auditory or visual feedback for correct and incorrect responses.

TESTING AND EVALUATION

Testing Procedures:

- Unit Testing:** Each component (LEDs, buttons) was tested individually to ensure proper functionality.
- Integration Testing:** Combined all components and tested the overall system to ensure cohesive operation.
- User Testing:** Conducted user trials to evaluate the game's responsiveness and accuracy.

FUTURE ENHACEMENTS

- Difficulty Levels:** Implement varying levels of difficulty by adjusting LED lighting speed and patterns.
- Mobile App Integration:** Develop a companion mobile app to track scores and provide additional game modes.
- Enhanced Feedback:** Add more sophisticated feedback mechanisms like sounds and vibrations for a more immersive experience.
- Wireless Connectivity:** Integrate Bluetooth or Wi-Fi to enable remote play and score sharing.