

Introduction

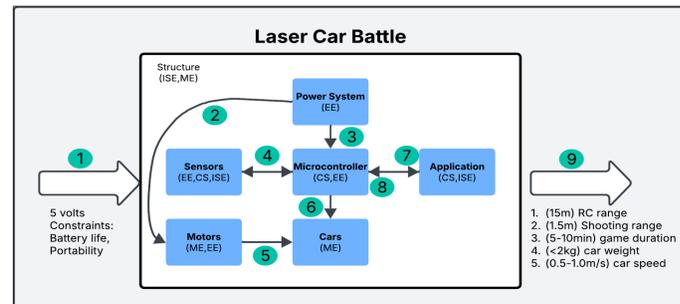
The Laser Car Battle is a real-world multiplayer game combining physical RC car combat with video game-like control and scoring. Players use mobile phones to control the cars and shoot IR lasers at each other, with hits detected by onboard sensors and scores tracked live. The game aims to be fun, safe, portable, and suitable for all ages.

Specifications

- Speed: 0.5 – 1.0 m/s
- Latency: Less than 60 ms (control), 120 ms (score sync)
- Battery Life: 1.5 – 2 hours
- Car Weight: Under 1.5 kg
- Shooting Accuracy: Around 90%
- Shooting Range: Up to 1.5 meters
- Game Duration: 5–10 minutes per match
- Car Size: 24 cm (L) × 18 cm (W) × 12.5 cm (H)
- Game Modes: Time-based and point-based
- App Size: Under 150 MB
- Score Sync: Real-time via Wi-Fi
- Safety: Enclosed body, no sharp edges

System Overview

The system is made up of three main components:
Mobile App: Controls the car's movement and laser firing.
RC Car: Equipped with motors, steering, sensors, and Bluetooth.
Scoring Mechanism: Uses Bluetooth messages and IR detection to track hits in real-time.



Team Roles Summary

Team Contributions

- Alsayab & Abdulrahim: App development, Bluetooth
- Almuslim & Alabad: Car design, motors, 3D printing
- Alqallaf: Circuit design, IR system
- Alkhumairi: Arena, system modeling

RC Car

- 3D-printed chassis (PLA)
- Brushless motor + ESC (36000 RPM)
- Servo-based front steering
- Laser emitter and IR receivers (BPY62)
- Arduino Nano + HC-05 Bluetooth
- Rechargeable 2-cell LiPo battery (2200 mAh)

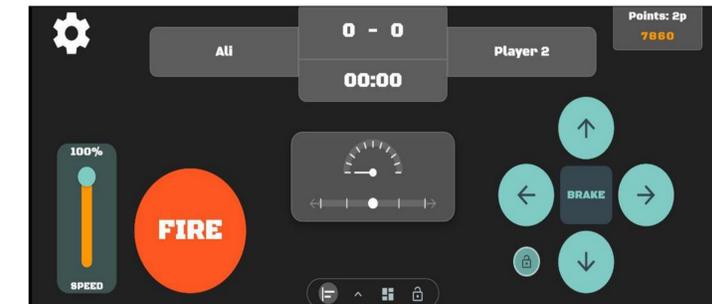


Testing & Results

- Our prototype was tested for responsiveness, accuracy, and gameplay.
- Battery lasted about a 1 hour
 - Speed met the 1 m/s target
 - Bluetooth latency was under 60 ms
 - Shooting accuracy was close to 90%, slightly below target
 - Arena size 2m² exactly

Mobile App

- Built using Flutter with MVVM architecture
- Joystick for movement, fire & brake buttons
- Game mode selection (time-based or point-based)
- Real-time score display and winner announcement



Impact & Conclusion

Encouraging active, social gameplay by combining physical interaction with screen-based control. It offers a fun alternative, screen-only entertainment. rechargeable batteries and 3D-printed parts, it also supports environmentally conscious design. Future improvements include better sensor accuracy, refined arena, and expanded game modes.