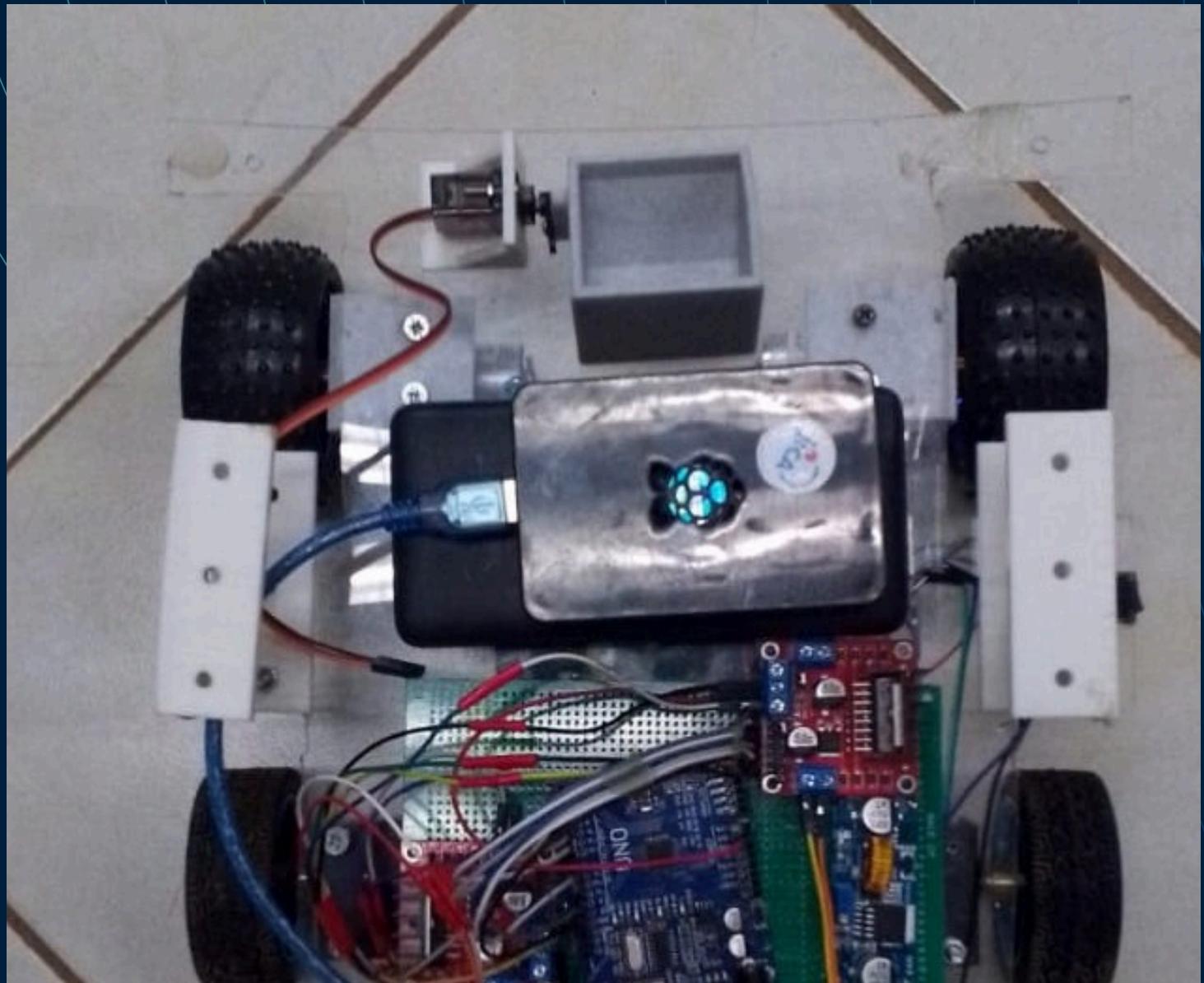


# Jabari Designers

## Mission Overview

Autonomous navigation and object transport in structured competition environment using advanced sensor fusion and real-time decision making.

- Real-time SLAM mapping
- Autonomous object detection
- Payload transport & offloading
- Obstacle avoidance
- Goal-oriented navigation



## Key Features

### 360° LiDAR Environmental Sensing

- 4-Wheel Drive System: Enhanced traction and payload stability with independent DC motor control.
- Servo-Actuated Platform: Precision payload handling with automated lowering mechanism.
- Multi-Modal Sensing: LiDAR, camera vision, and ultrasonic sensors for comprehensive environmental awareness.

## Technical Architecture

### Dual-Controller Design:

Raspberry Pi: ROS 2, SLAM, navigation  
Arduino Uno: Motor control, encoders

### Communication: USB Serial interface

ROS 2 SLAM Toolbox Nav2 Stack OpenCV Gazebo L298N Drivers

## Design Strategy

**Mechanical:** Laser-cut acrylic chassis with 3D printed components for rapid prototyping and modularity.

**Electrical:** Dual power architecture - 18650 Li-ion pack for motors, USB power bank for Pi, ensuring system stability.

**Software:** Layered architecture with hardware abstraction, real-time control, and high-level autonomy.

## Experimental Results & Testing

15+  
Hours of  
Physical  
Testing

40-50  
Minutes  
Runtime

3x3m  
Mapping  
Coverage

✓ Successful SLAM mapping ✓ Obstacle avoidance ✓ Point-to-point navigation ✓ Reliable payload handling