HACETTEPE UNIVERSITY
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
SMARTPHONE-BASED AUTOPILOT FOR ROBOTIC SYSTEMS
LANE ROVER

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INTRODUCTION

The main objective of this project is to design a Smartphone-Based Autopilot for Robotic Systems. Lane detection was performed in Java using Android Studio, leveraging image processing focused on road driving.

METHODOLGY

- ✓ The camera of the smartphone utilized to implement lane detection. Gaussian and Median blur filters used to reduce the noise. HSV colormask applied to obtain lanes from input frame.

- ✓ The communication between the Android application and the ESP32 is accomplished withthe OkHttpClient library, which provides an efficient way to send and receive HTTP requests. The HTTP protocol is used to ensure compatibility and standardization in network communication.

- ✓ The motor driver circuit receives commands from the microcontroller (ESP32) and converts these commands into appropriate voltage and current PWM (Pulse Width Modulation)signals for the DC motor.

- ✓ The steering of the rover will be controlled with the servo motor. The necessary angle for steering is between 70-120 degrees.

- ✓ Mechanical body assembled with 3D printed parts.[2]
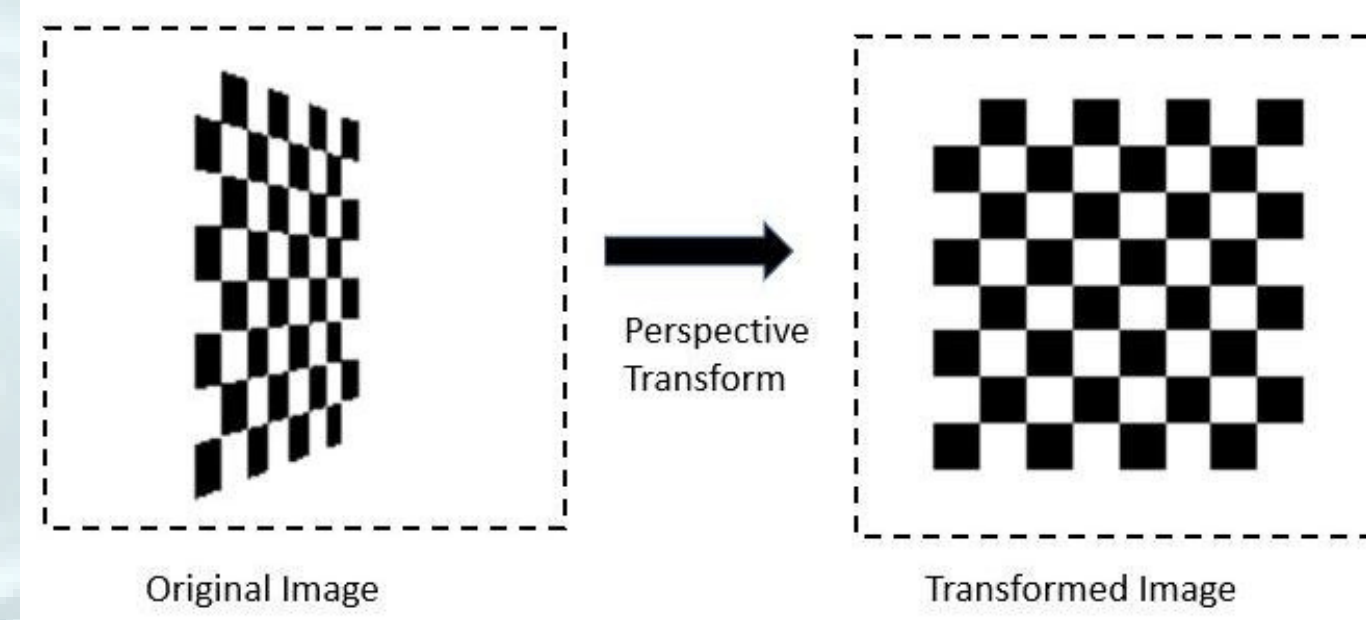

Figure 1. The System Model

TESTS AND RESULTS

Figure 2. Perspective Transform

Perspective Transform method used to wrapped the field of view.

Wi-Fi tests were first conducted separately for the servo and DC motors, followed by combined tests of both.
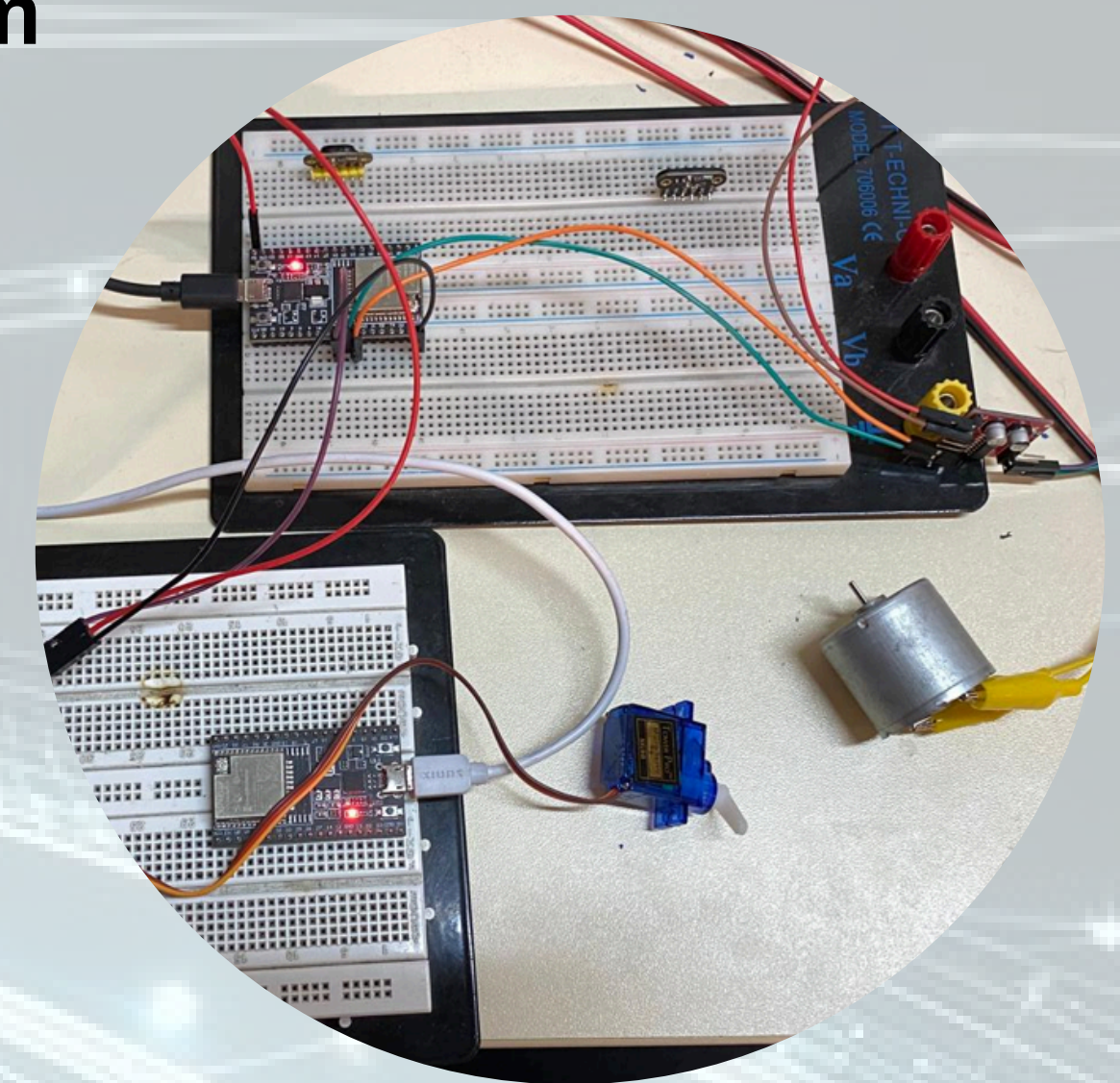

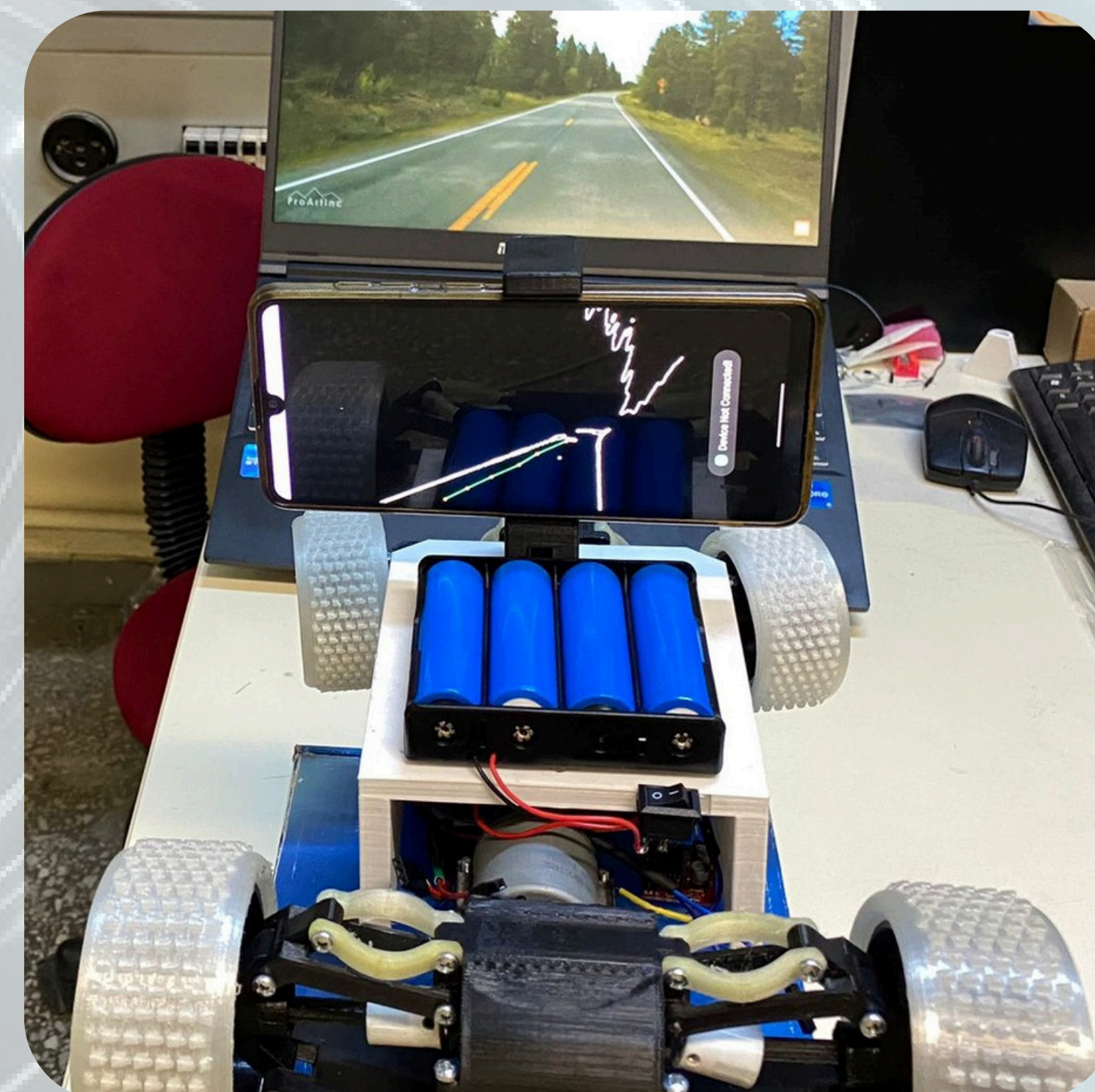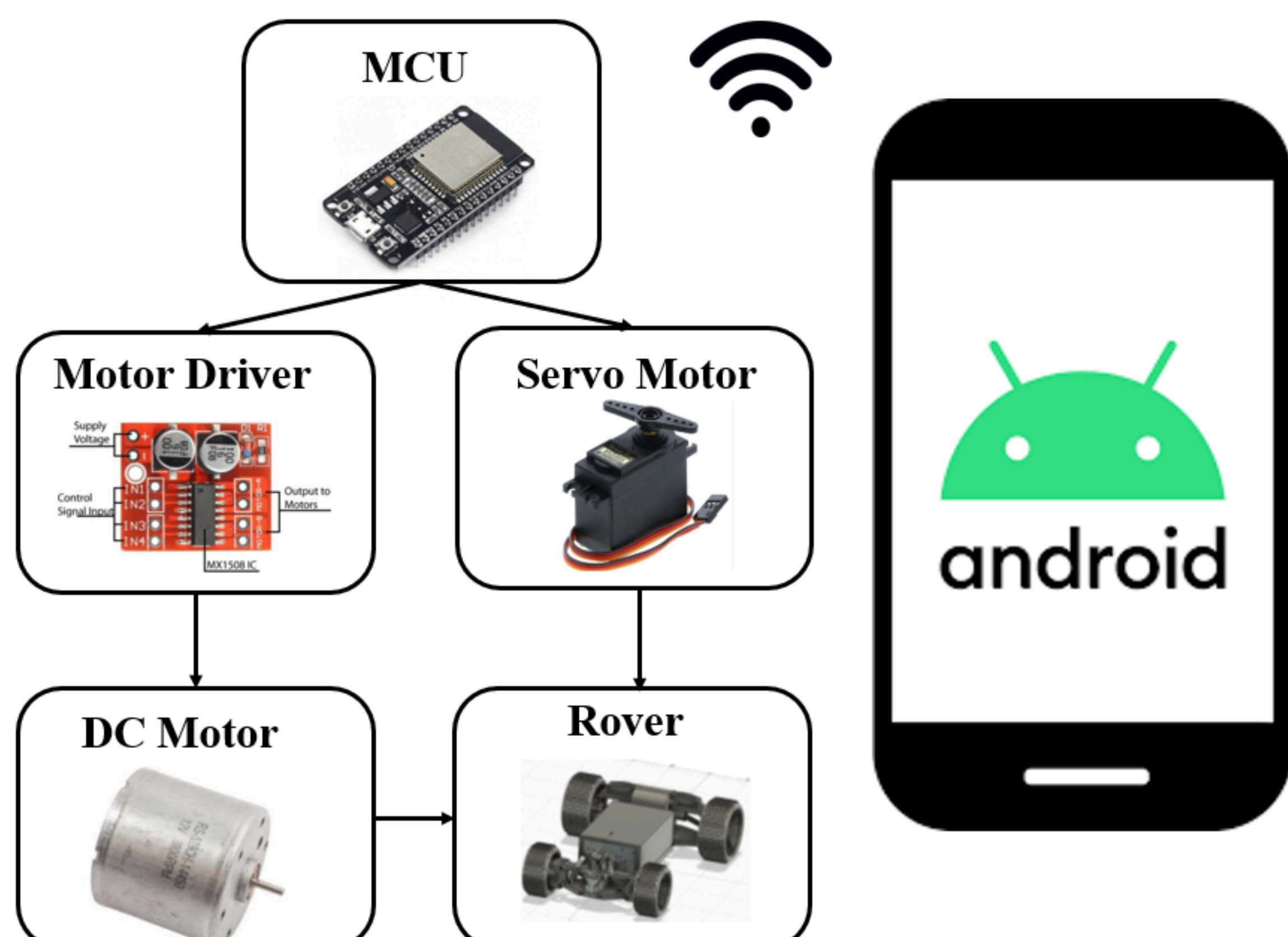Figure 2. Wi-Fi and Motor Control Set-up

Figure 3. Lane Detection

The pixel density was calculated by dividing the bottom part of the screen into sections. Six red dots were drawn on the pixel average and the deviation was calculated based on these points.

REFERENCES

[1] M. Müller and V. Koltun, "OpenBot: Turning Smartphones into Robots," in Proc. IEEE Int. Conf. Robot. Autom. (ICRA), 2021. [Online]. Available: https://doi.org/10.48550/arXiv.2008.10631, arXiv:2008.10631 [cs.RO]

[2] Instructables. "3D Printed RC Car." Instructables. Retrieved April 24, 2024, from https://www.instructables.com/3D-Printed-RC-Car/