# Load-Balancing Robot

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## Introduction

In this work. we designed a load-balancing robot using the HCS12 microcontroller to control the car's movement. A Bluetooth module receives the movement direction from the user (mobile app), and then the car moves according to the user's instructions. Also, we use an IR sensor to detect obstacles as the car moves. On the other hand, the load will be hung above the robot on a flat surface, and the Arduino will balance the load and keep it stable on the surface under any circumstances using a PID controller. We use an accelerometer to determine the orientation of the surface, and servomotors will control this orientation.

## Design

Our Load Balancing Robot excels in Bluetooth mode. Integrated components include HCS12, H-bridge, and Bluetooth HC-06. IR sensor connected to PORTE as an interrupt, the Bluetooth to PS0 and PS1. Motor control is managed via PORTB.

Additionally, an Arduino Uno is used to maintain the balance of the load above the car. It uses accelerometer reading as an input and adjusts the position of a servo motor to keep the load balanced.

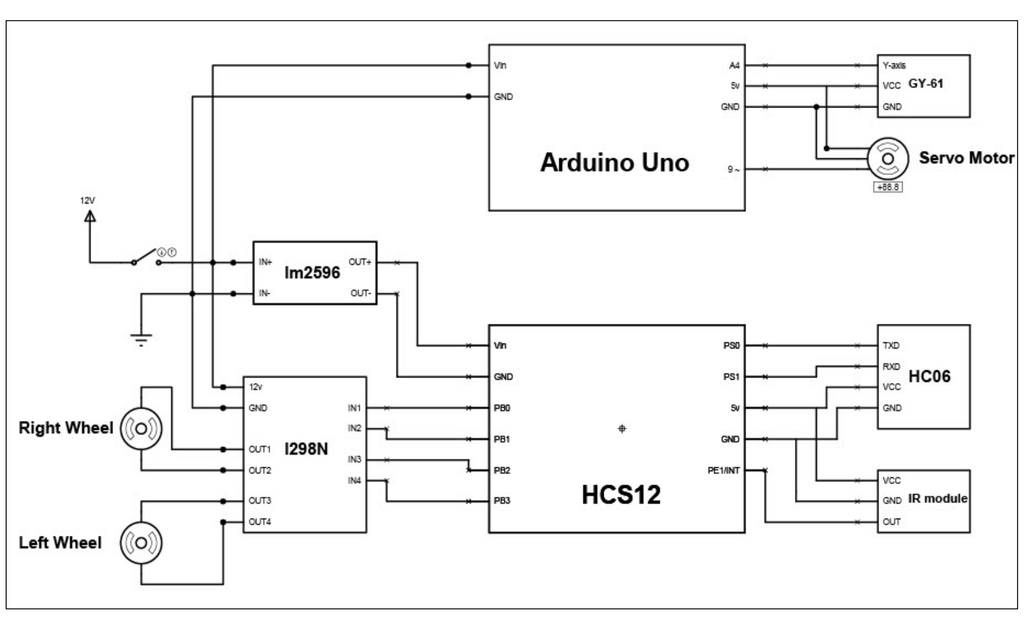


**Figure 1 Electrical Design.**

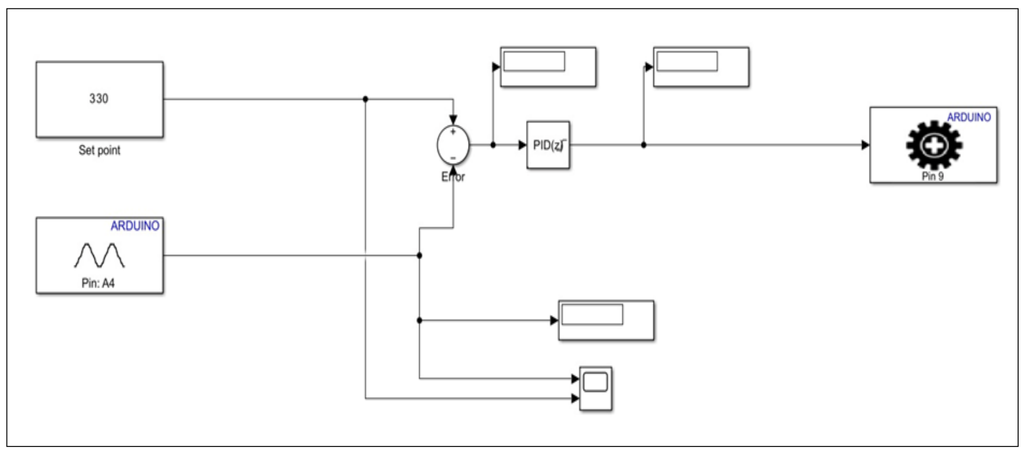


**Figure 2 MATLAB Block Diagram.**

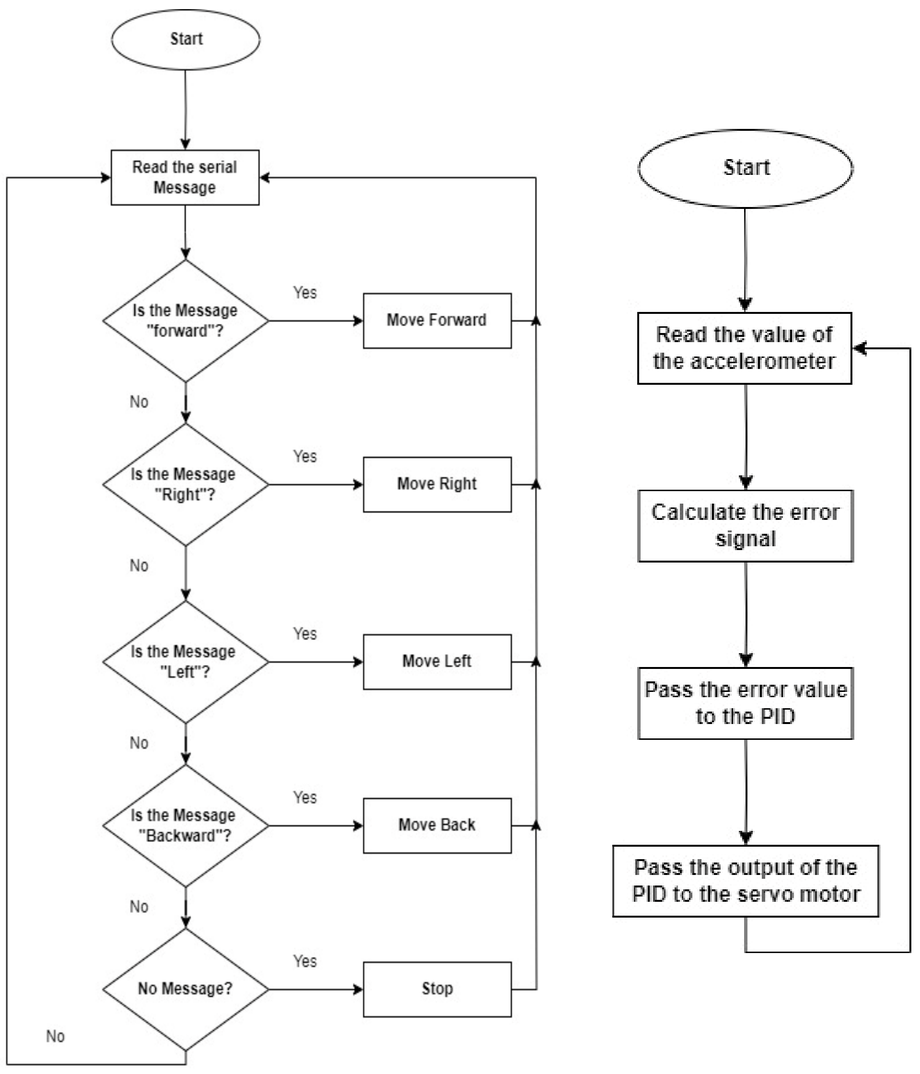


**Figure 3 Software Design.**

## Results

The layout of our load-balancing robot is strategically designed to optimize functionality and ease of maintenance. The following figures illustrate the design layout.

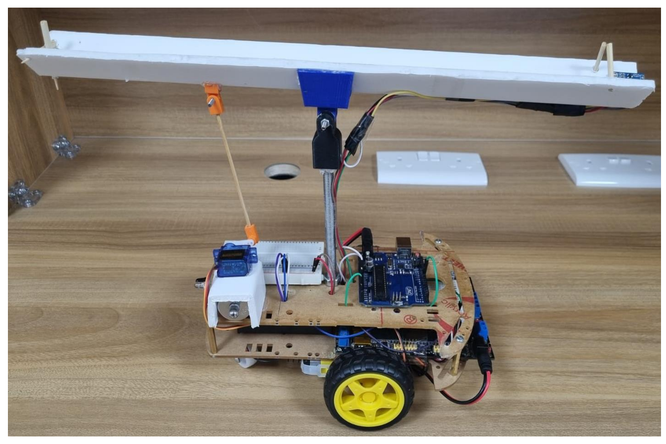

**Figure 4: Load-Balancing Robot Layout.**

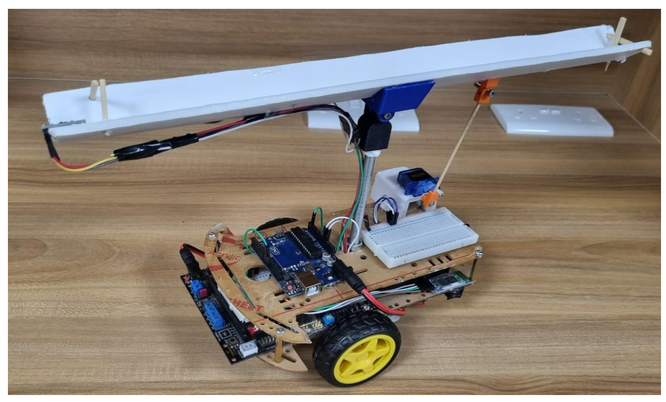

**Figure 5: Load-Balancing Robot Layout.**

## Conclusion

A load-balancing robot can balance and stabilize its load under any circumstances, making it an essential application in transportation. Self-balancing applications are widely popular and useful in scooters or other moving wheels, such as self-balancing trays, racks, or anything else. We use a Bluetooth module to receive the direction of movement and an IR sensor to detect obstacles as the car moves it is connected to HSC12. The Arduino will balance the load and keep it stable on the surface using a PID controller and an accelerometer to determine the orientation of the surface, and servomotors will control this orientation.

We could upgrade it to be self-balanced on two axes instead of just one for future work.