LAB 3.2 CAR 'BIG DADDY'

BY TEAM CRASH TEST DUMMIES

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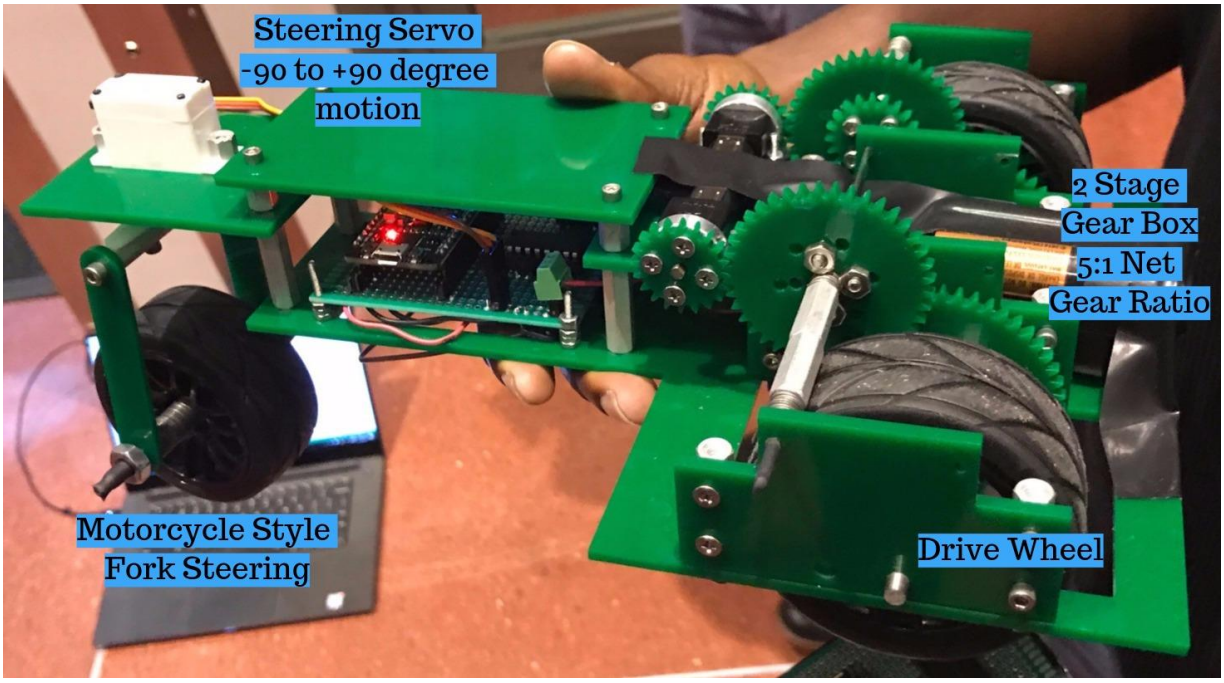
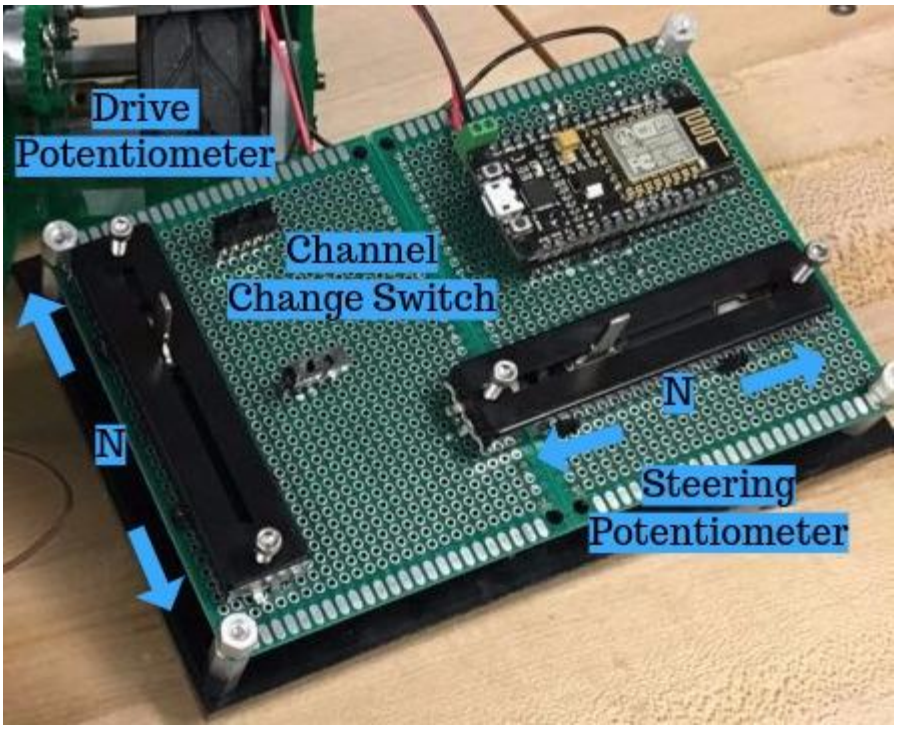
MECHANICAL DESIGN



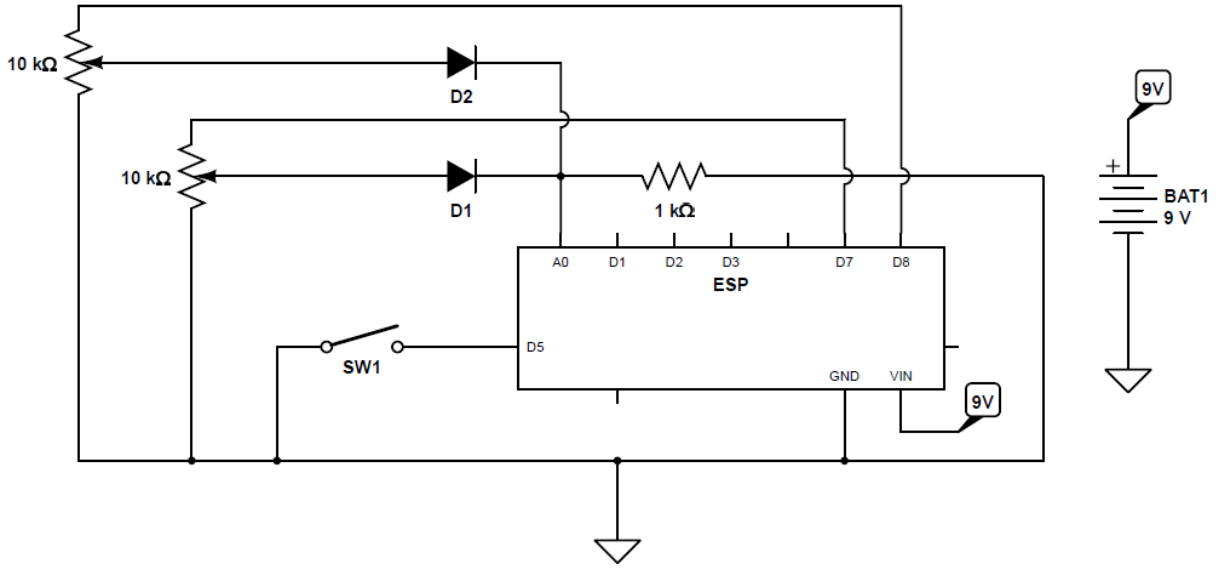
The design of the Car consists of a servo controlled Fork Steering Mechanism and 2 DC Motor Driven Wheels at the back for linear motion and steering motion control to be decoupled from each other.The wheel shafts and DC Motors were driven using a 2 Stage Custom Gear box with each stage of Gear ratio 2.5:1 to provide enough torque to the wheels. The fork steering can Steer at full servo range of –90 to +90 degrees(from neutral position-Absolute angle of servo is 91 degree at Neutral Position) but the steering is software limited to +-30 degrees for smooth turning of the car. The chassis is laser cut from 1/8 inch acryllic and all parts are mounted using standard fasteners.



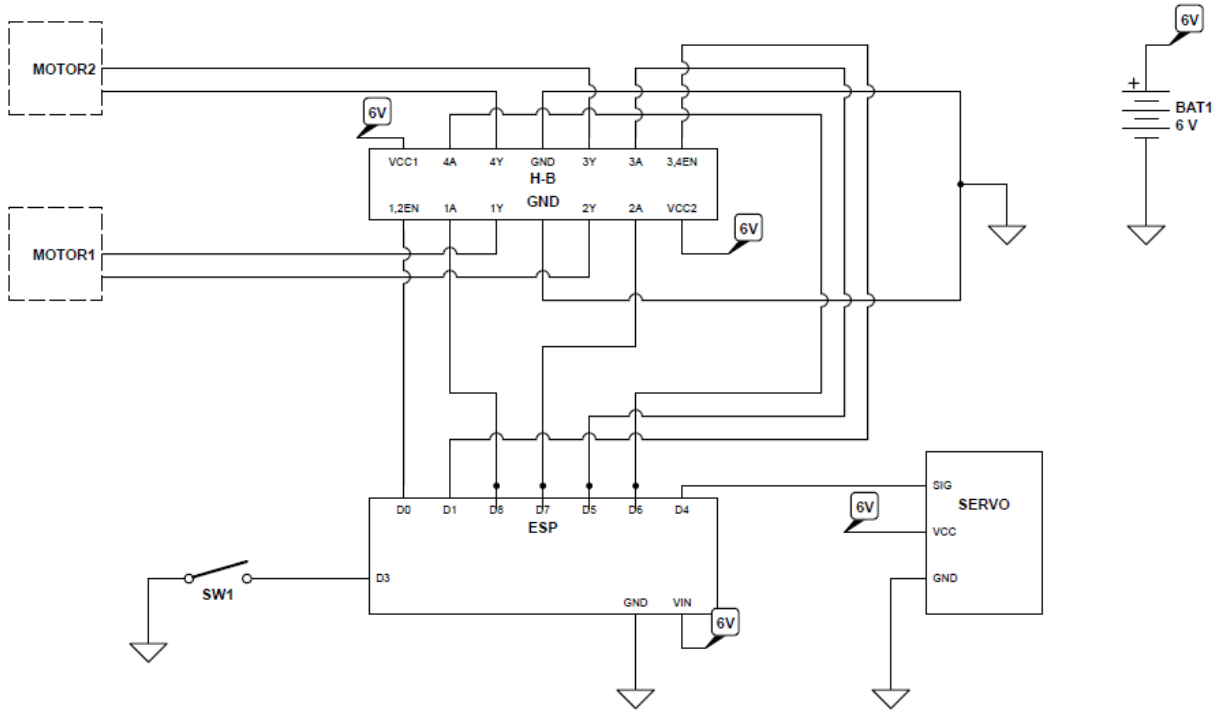
The controller design consists of a 2 Slide Potentiometers One for Steering Left and Right (with a 10 mm dead zone in the middle for going to neutral position) and another for driving forward and backward (again with a 10 mm dead zone in the middle for going to neutral position)

ELECTRONICS DESIGN

The functionality of the remote-control car was controlled by two different circuitries: Remote Circuitry and Receiver Circuitry. The remote circuit include two 10kΩ potentiometer, two diodes, a switch and a 1kΩ resistor. The potentiometers were used as voltage dividers and the high voltage reference was provided from the digital output of the ESP8266 pins (D7 and D8). Diodes were connected to the middle pin of the potentiometers before the potentiometer readings were sent to ADC pin (A0). Using the ESP8266, by sending a logical HIGH or LOW to the most positive end of the potentiometer, we were able to switch which potentiometer value we wanted to read from the single ADC pin. The diodes prevented additional current from the potentiometer not being read to be sent to the ADC. The ADC values of each potentiometer was then used to control the speed and direction of the car. A switch was added to change the Wi-Fi channel and a software pull up resistor was used. The figure below shows the complete circuitry.



The receiver circuitry included an H-bridge, ESP8266, servo, a switch, and two DC motor. The switch allowed us to switch to a different Wi-Fi channel, the H-bridge controlled the speed of the car and the servo controlled the direction of the car. All processing was done mostly by the ESP8266 on the remote circuitry, while the ESP8266 on the receiver parsed the received signal and sent output to the motors and servo. The figure below shows the complete circuitry.



SOFTWARE DESIGN

The software consists of a remote file for the controller and a reciever file for the reciever in the CAR.The remote file takes in the values of the potentiometers and linearizes and scales them directly into direction,angle and PWM values which are then sent to the reciever as data packets.
The reciever parses the packets and applies the drive and steering control.