Soccer bot

Components:

1. Arduino uno
2. Bluetooth module - **HC-05**
3. Motor Controller - **L298** (read data sheet to check whether it is compatible for our dc motor. L298 compatible for 12v dc motor).(BTS7960 - amp rating more)
4. Motor - DC
5. Wheel
6. Battery - watt calculation to know how long battery will last and how many batteries will be required. Say the total power of the system is 70w. Calculate total current and the current ratings can tell us how many batteries will be required. P = VI watt
7. Chassis
8. remote/mobile

Motor driver(MD) and microcontroller(MC) relation

We can not directly connect MC to the motor because motor functions with high voltage and MC can only operate under 5v. So, if we directly connect MC with battery MC will burn.
From MD power goes to motor and MC

1. Microcontroller takes decisions based on the sensor and runs on 3.3 - 5v. Powered by MD 5v separately.
2. Then based on that decision MC processes the signal and sends it to the motor driver.
3. MD runs on 12v mostly and powered separately by battery.
4. MD receives the 5V signal from MC as a switch to allow 12V power from the battery to flow to the motor.
5. Like MC is saying, turn the left motor in reverse and right motor fast, MD receives these PWM signals, then using 12v from the battery sends necessary voltage & amp; to the motor to accomplish the task. So, here 5v from MC acts as a switch for MD. Based on those signals MD gets turned on & off and calculates how much voltage and amp needs to send to the motor to accomplish the task.

Motor driver connections

All the pins of MD:
In 1,2,3,4 pin - controls directions of motors (connected to the digital pin of MC)
EN A& EN B - controls speed of motors (connected to the PWM pin of MC - voltage variation - PWM)
Out pin 1 & 2 - sends voltage to the motor. Connected with motors from MD.

ENA + Inp 1 + Inp 2 - one side's speed + direction
ENB + Inp 3 + Inp 4 - another side's speed + direction

Output 1 + out 2 - connected to the one side's motors & send voltage.
Output 3 + output 4 - connected to another side's motors & send voltage.

If MD can handle 2A then each side will have 1A and we have to add motors based on that amp rating. If more amps are required we will use multiple MD or high power MD. buck converter step down transformer where mc will be connected if 5v not present on the MD

Our MD set up

EN B - 9 pin of MC
EN A - 10 pin of MC
Inp 1 - 7 pin of MC
Inp 2 - 6 pin of MC
Inp 3 - 5 pin of MC
Inp 4 - 4 pin of MC

MD to Battery connection

12V pin of MD - battery (+)
GND pin of MD - Battery (-) & MC GND
5V pin of MD - MC 5v

Bluetooth to MC connection

MC GND - bluetooth GND
MC Vin - bluetooth Vic
MC Tx - bluetooth Rx
MC Rx - bluetooth Tx

Tx Rx - UART protocol
Tx - Transmitter
Rx - Receiver

5000 mah meaning:
If your device (like a robot) is drawing **5000 milliamps (5A)** continuously, → the battery would last for **1 hour**. It stands for **5000 milliamp-hours**, or **5 amp-hours**

Example:

- Battery = 5000mAh
- Your robot uses = 2500mA (2.5A)

Battery Life (in hours)= Battery Capacity (mAh) / Load Current (mA)

Battery Life= 5000 / 2500=2 hours

To change the direction of current to rotate the motor cw & acw we use MC

Initially
D1(pin 7) - hight
D2 (pin 6)- low
Motor rotate - cw
D1 - low
D2 - high
Motor rotate - acw

Voltage calculation of MC to Motor through to MD

MC -0 - 5v
PWM - 0 -256v
Motor driver - 0 -12V

If Mc gets 5v - pwm converts to 256v, motor driver will get 12v from battery which will be passed to motor

Mc 2.5v pwm converts 128v motor driver - 6V
Analogwrite (128v) - MD - 2.5v - motor - 6V

Pwm 8 bit

With Bluetooth Arduino communicate with serial class