14.3, Kinematic analysis of four-wheel drive car

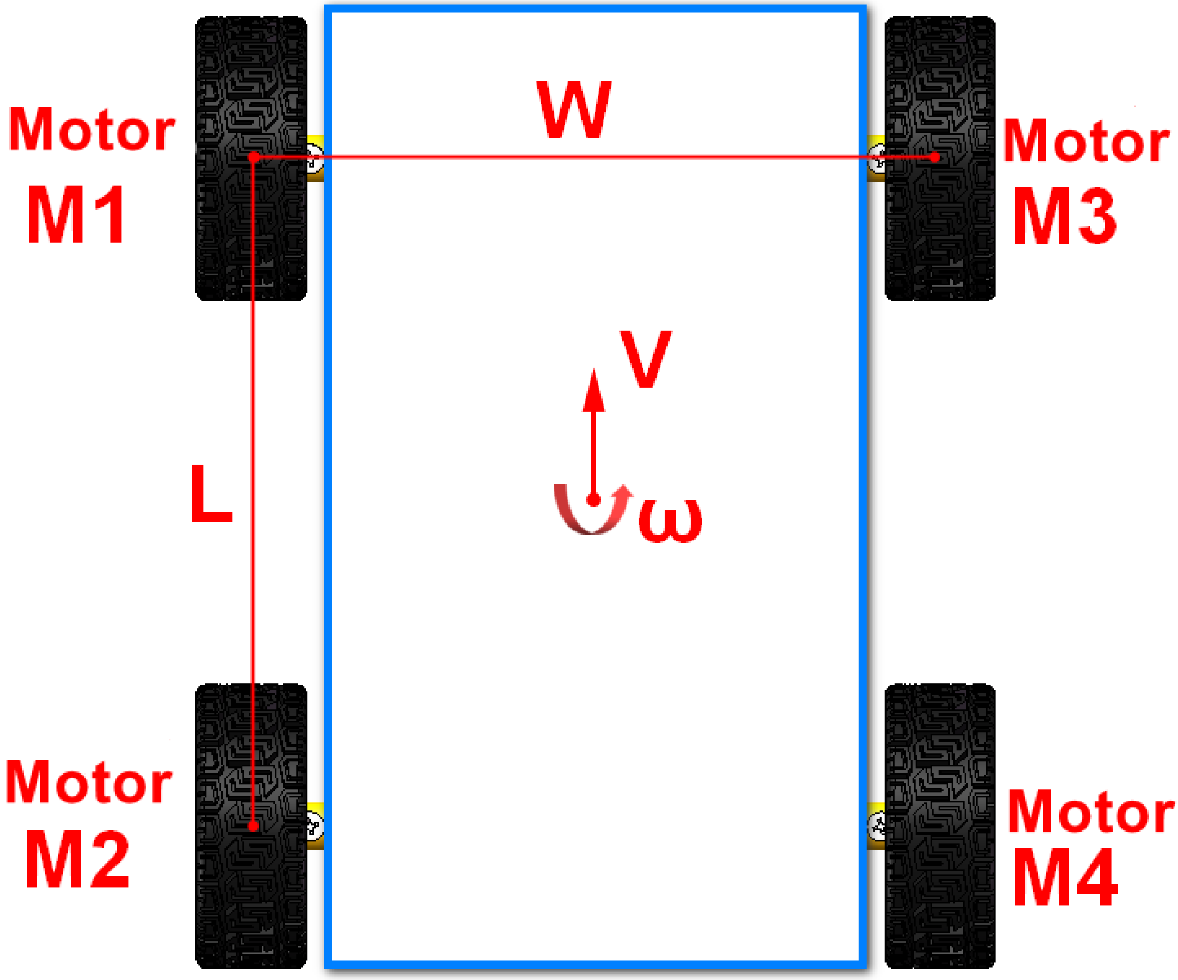
14.3.1, Limitations

This section will analyze the kinematic equation of four-wheel drive car from the perspective of four-wheel drive car kinematics. Due to the structural errors of real cars, there will be resistance and friction during the movement, which is relatively complicated. For the sake of simplicity, the analysis here is limited to the four-wheel drive car in an ideal state.

14.3.2, Establish kinematic model

The four-wheel drive car is abstracted into the model shown below, where W represents the interval between the center points of the left and right motors; L represents the interval between the center points of the front and rear motors; motors M1, M2, M3, and M4 represent the four drive motors of the car; V represents the linear velocity of the car (forward and backward speed), and ω represents the angular velocity of the car (rotation speed).

In an ideal state, the linear velocity V and angular velocity ω are controlled to control the four motors, thereby controlling the movement of the four-wheel drive car.



14.3.3 Kinematic Analysis

Let V~m1~, V~m2~, V~m3~, and V~m4~ be the speed values of motors M1, M2, M3, and M4, that is, the rotation speed of the wheels. V~x~ is the linear speed of the car. V~x~ is positive for forward movement and V~x~ is negative for backward movement. V~z~ is the angular speed of the car. V~z~ is positive for left movement and V~z~ is negative for right movement. A is half the distance W between the center points of the left and right motors of the car, A=$\frac{W}{2}$. B is half the distance L between the center points of the front and rear motors of the car, B=$\frac{L}{2}$.

When the car moves forward or backward,

V~m1~=V~x~

V~m2~=V~x~

V~m3~=V~x~

V~m4~=V~x~

When the car rotates around the geometric center point,

V~m1~=-V~z~*(A+B)

V~m2~=-V~z~*(A+B)

V~m3~=V~z~*(A+B)

V~m4~=V~z~*(A+B)

According to the above formula, we can get

V~m1~=V~x~-V~z~*(A+B)

V~m2~=V~x~-V~z~*(A+B)

V~m3~=V~x~+V~z~*(A+B)

V~m4~=V~x~+V~z~*(A+B)