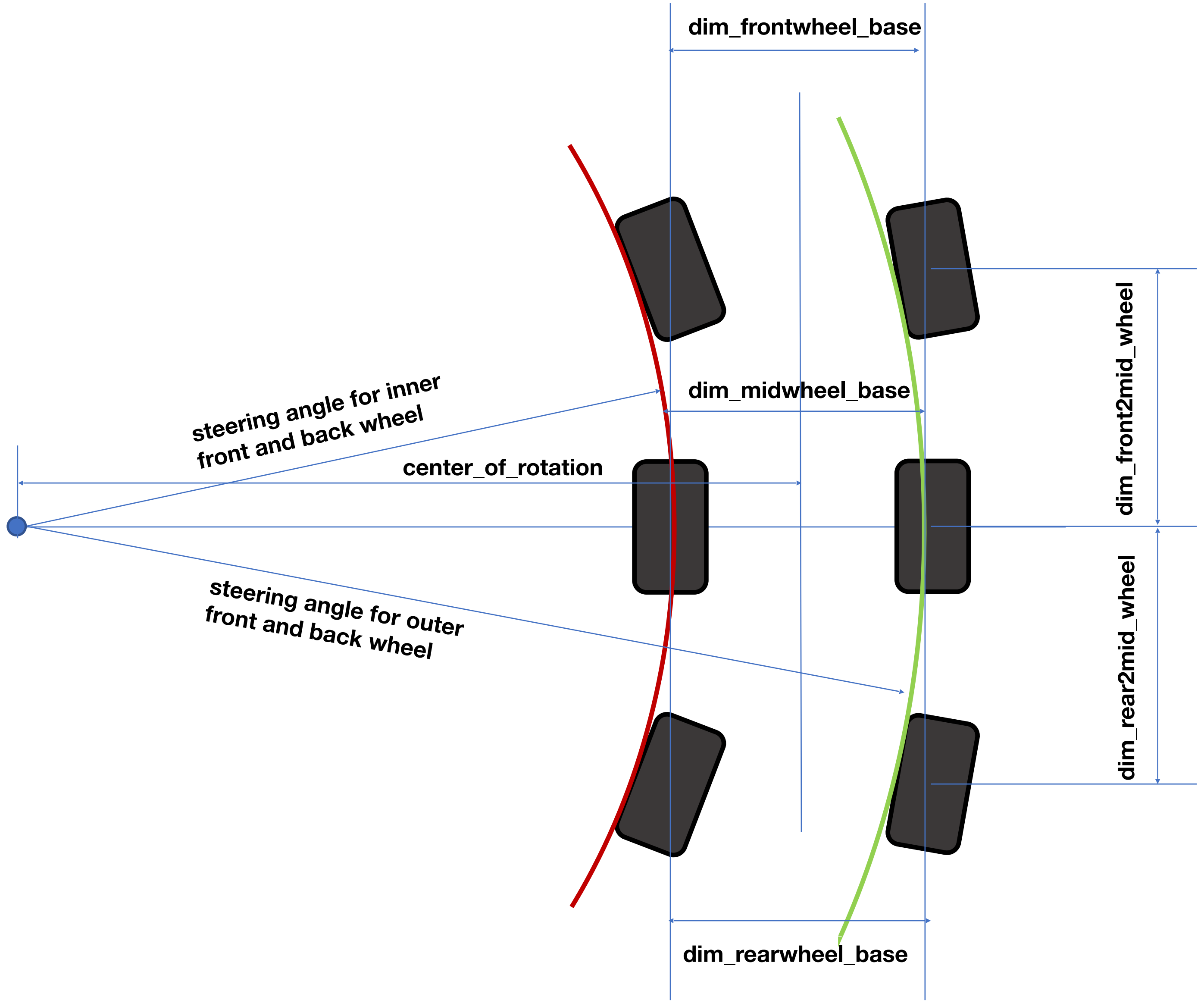
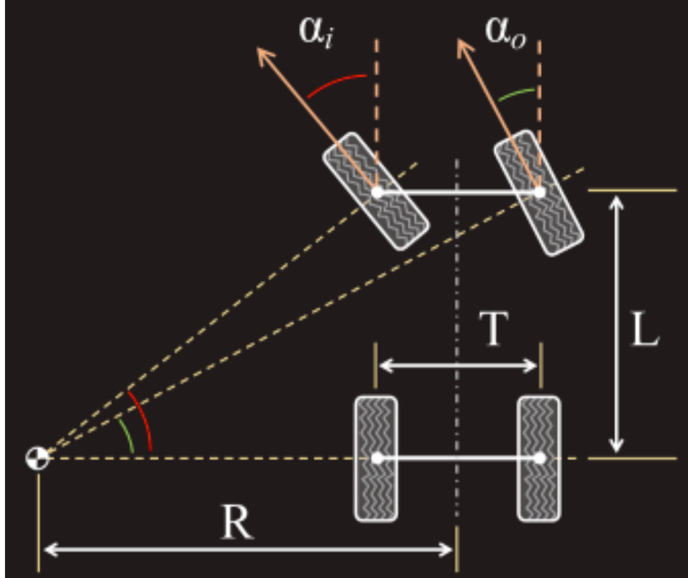

dim_frontwheel_base
dim_midwheel_base
steering angle for inner front and back wheel
center_of_rotation
steering angle for outer front and back wheel
dim_front2mid_wheel
dim_rear2mid_wheel
dim_rearwheel_base

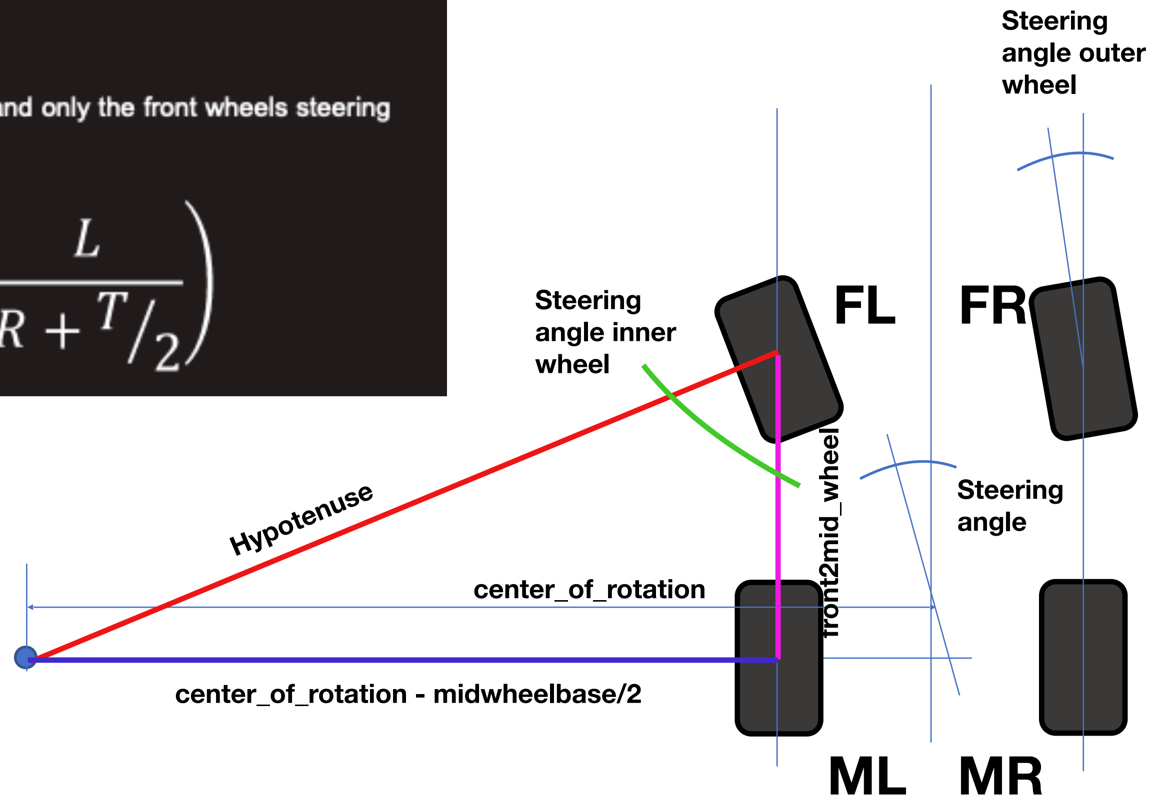


Here's the ideal setup. We can see that, when turning, the inside wheel turns with a larger angle than the outside.

- In the diagram L is the wheelbase of the vehicle (distance between the two axles).
- T is the track (distance between center line of each tyre).
- R is the radius of the turn as experienced by the centerline of the vehicle.
- α_i is the angle of inside wheel from straight ahead.
- α_o is the angle of outside wheel from straight ahead.

If we assume constant speed (no weight transfer or external forces), no body roll or suspension effects, and only the front wheels steering then we can use simple trigonometery to find the ideal angles for the wheels:

$$\propto_i = \tan^{-1}\left(\frac{L}{R - T/2}\right) \qquad \propto_o = \tan^{-1}\left(\frac{L}{R + T/2}\right)$$



Get the steering angle from the system or user input

Calculate the center of rotation

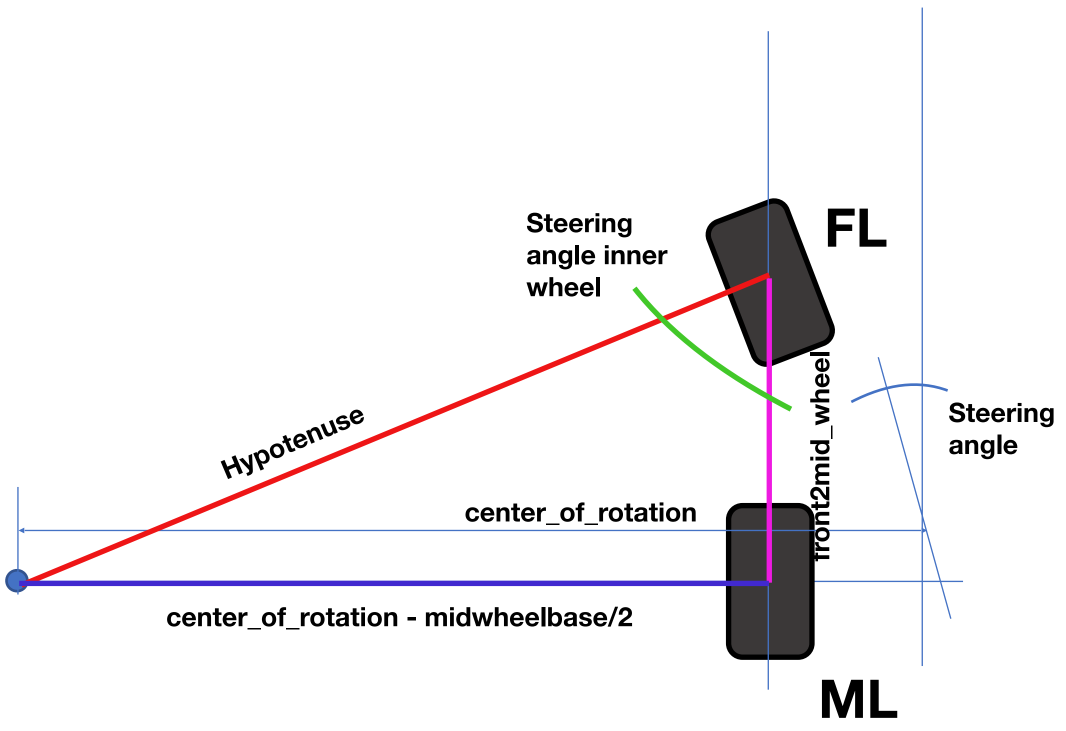
function -> ackermann_steering(degree, speed)

Calculate the individual steering and speed value for each wheel

function -> cal_steering_and_speed(speed, center_of_rotation)

Calculate the PWM value and servo value for each wheel

function -> set_pwm_values_at_bbb()



$$\text{Steering angle} = \frac{\text{front2mid\_wheel}}{\text{center\_of\_rotation - midwheelbase/2}}$$

$$\text{Hypotenuse value} = \frac{\text{center\_of\_rotation - midwheelbase/2}}{\text{cos(Steering angle)}}$$

$$\text{Speed value} = \text{Hypotenuse value(max) * Hypotenuse value}$$