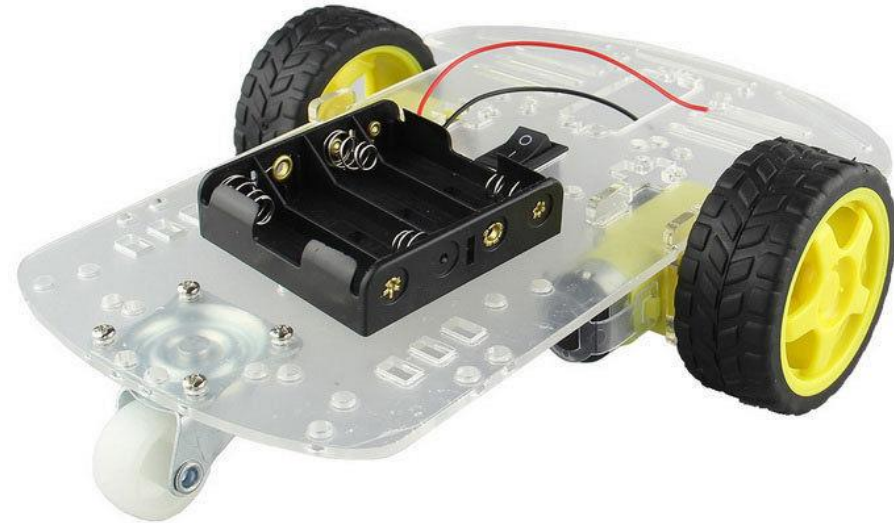# Robotics Lab

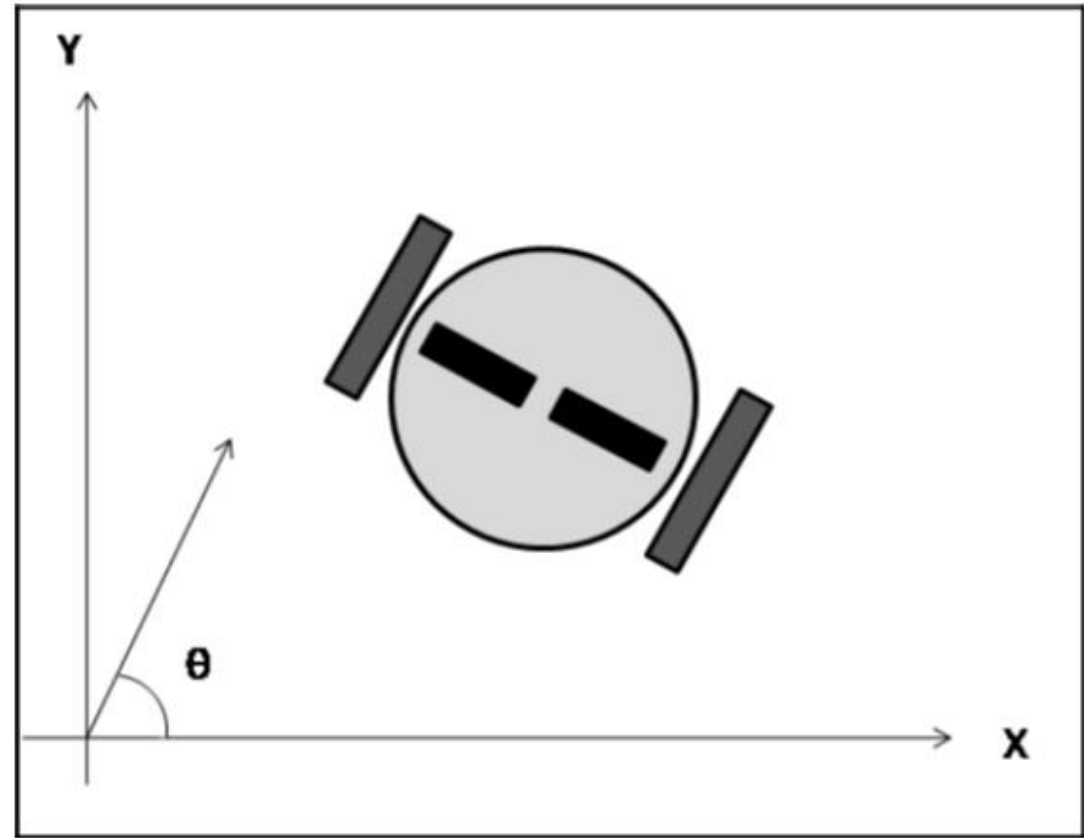## LECTURE 6.1: MOBILE ROBOTS KINEMATICS

Mobile Robots Types

2 Wheeled Robot (Differential)

- Base.
- 2 Wheels (Motors).
- Caster Wheel.

2 Wheeled Robot Kinematics

- Degree of freedom (DOF):
  - Translation (x, y, z).
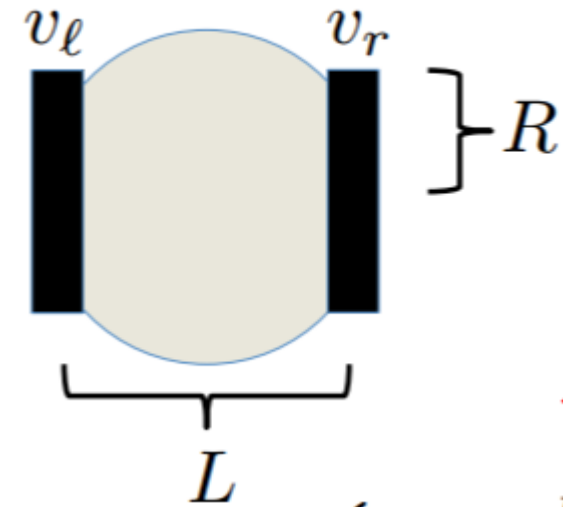 - Rotation (roll, pitch, yaw).

Source: ROS Robotics Projects book (pp.278)

2 Wheeled Robot Kinematics

- Forward Kinematics: (Get the pose of the robot)
  - Robot Parameters:
    - r: The radius of the wheel.
    - L: The distance between the two wheels.
    - vr: The speed of the right wheel.
    - vl: The speed of the left wheel.
- vl & vr are calculated like this:
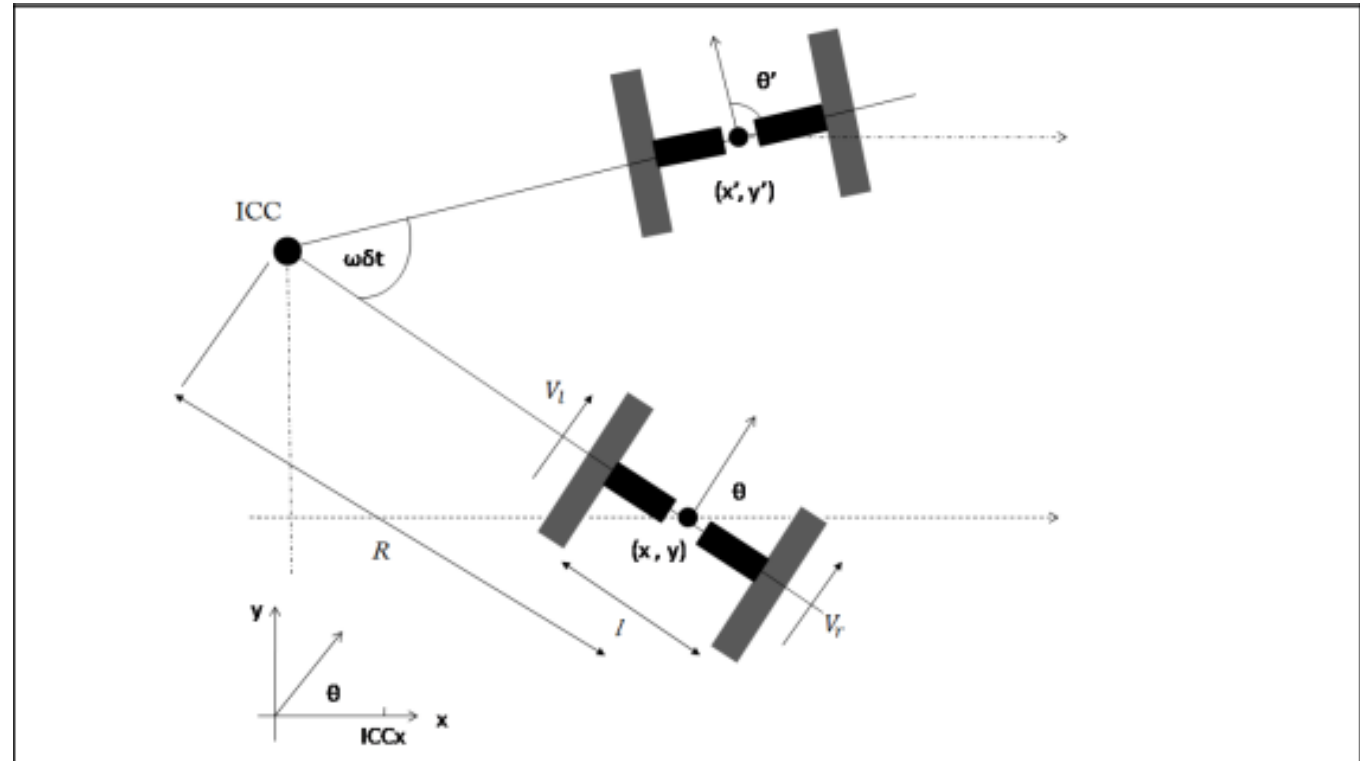
$$v = \frac{(2\pi r) * (NumWheelRotation)}{t}$$

2 Wheeled Robot Kinematics

- Linear Velocity:
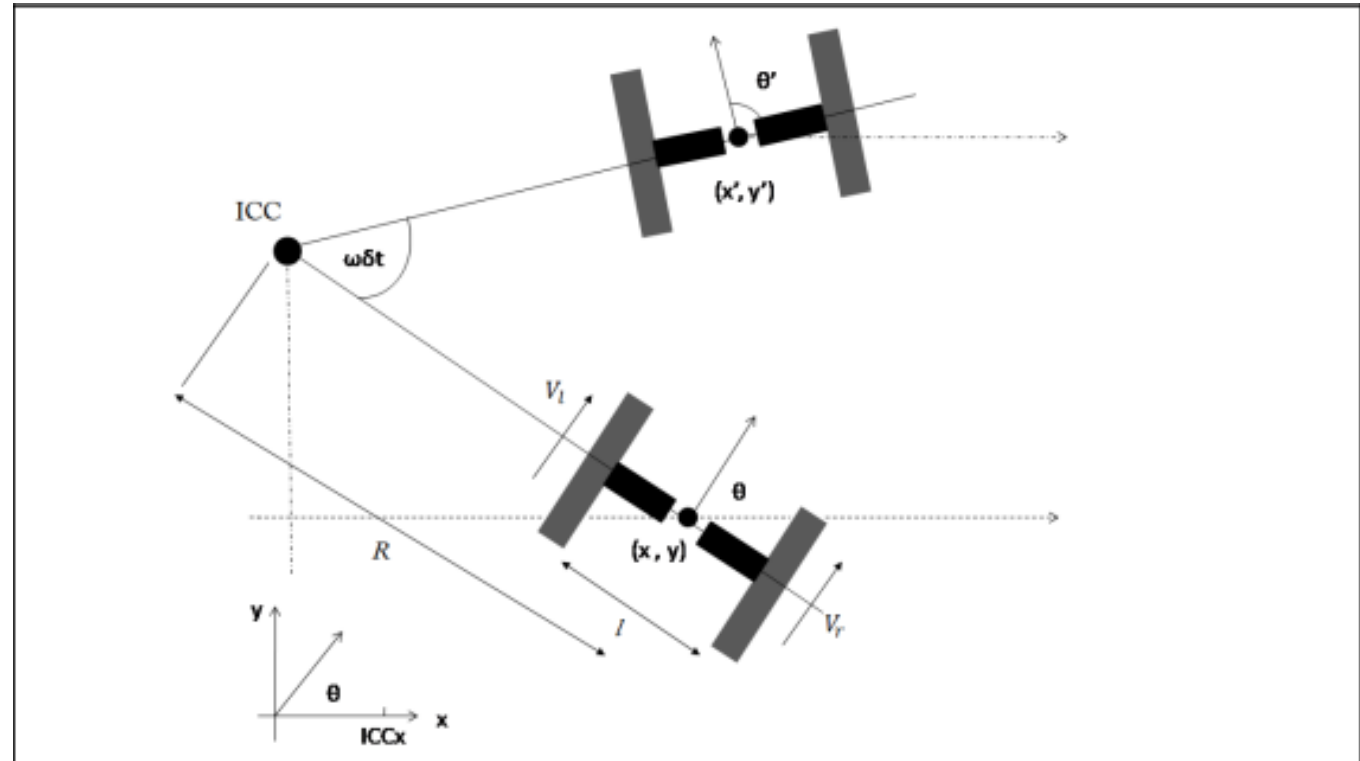 $$v = \frac{vr + vl}{2}$$
- Angular Velocity:
  $$w = \frac{vr - vl}{L}$$

Source: ROS Robotics Projects book (pp.280)

2 Wheeled Robot Kinematics

- Calculate the pose:
  - $dx = v * \cos(\theta) * dt$
  - $dy = v * \sin(\theta) * dt$
  - $\theta = w * dt$

- dt: is the change in time.

Source: ROS Robotics Projects book (pp.280)