Inverse Kinematics - Mecanum/Omni Wheeled Robot
## ME597: Autonomous Systems

A wheel robot with one omni wheel and two mecanum wheels is shown below. The body frame is defined at the centroid of the robot. At this instant, the body frame is parallel to the inertia frame, s.t. $\theta = 0°$.

1. Derive the kinematic model that gives the robot's velocity in the inertia frame $[\dot{\theta}, \ddot{X}_e, \dot{Y}_e]^T$ as a function of the rotational velocities of the wheels $[\omega_1, \omega_2, \omega_3]^T$ at this instant. Work must be shown for full credit

Hint: recall that, in the lectures, the kinematic equation is given as

$$[\sin(\alpha + \beta + \gamma), -\cos(\alpha + \beta + \gamma), -l \cdot \cos(\beta + \gamma)]R(\theta)\dot{\xi}_I = r\dot{\varphi}\cos(\gamma)$$
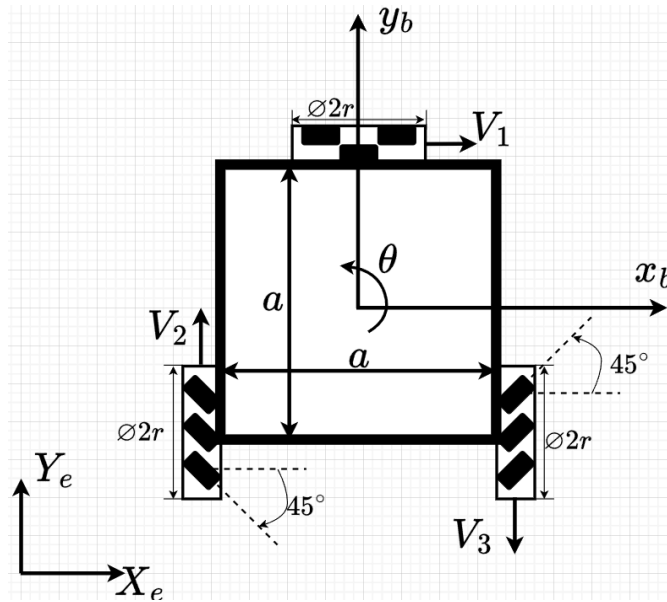
Make sure to follow the wheel numbering on the figure above for full credit.