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CSE495A Section-01 Assignment-01

Answer of .01②①

State Equation:

ⓐ Unicycle Model:

$$\begin{bmatrix} \dot{x} \\ \dot{y} \\ \dot{\theta} \end{bmatrix} = \begin{bmatrix} v\cos\theta \\ v\sin\theta \\ \omega \end{bmatrix}$$

ⓑ Differential Drive Robot:

$$\begin{bmatrix} \dot{x} \\ \dot{y} \\ \dot{\theta} \end{bmatrix} = \begin{bmatrix} v\cos\theta \\ v\sin\theta \\ \frac{v}{L}\tan\theta \end{bmatrix}$$

where,

$x =$ horizontal ans of 2D space

$y =$ vertical of 2D space

$\theta =$ orientation Angle

ⓒ Simplified Car Model:

$$\begin{bmatrix} \dot{x} \\ \dot{y} \\ \dot{\theta} \\ \dot{v} \end{bmatrix} = \begin{bmatrix} v\cos\theta \\ v\sin\theta \\ \frac{v}{L}\tan\theta \\ \dot{v}=a \end{bmatrix}$$

For Control variable,

$v =$ linear velocity

$\omega =$ angular velocity

Answer 01(i)

State Variable: State variable represents the essential parts of the robot's current state or configurations. These variables are used to describe robot's position, orientation & other relevant.

Control Variable: Control variables are parameter that can be adjusted by an external controller to influence the robot's behaviour and motion. They represent the inputs or commands given to the robot to controls it's behaviour.

<u>Answer 01 (iii)</u>

	State Variable	Control Variable
① Linear Motion Robot	~~Depo~~ , x,y,~~θ~~ - position , Orientational Angle , Linear & Angular Velocity	, Linear & Angular Velocity
② 3-D Motion Robot	, x,y,z - position , Altitude , Linear & Angular Velocity	, Linear & Angular Velocity

Answer 2 & 3 are submitted as jupyter Note book file.

③