Consider the mobile robot shown in Figure 1.

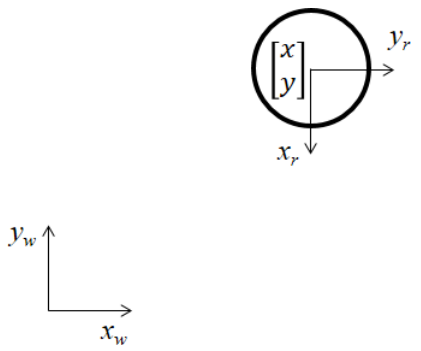

Figure 1: A mobile robot with constant bearing relative to the world frame $\{W\}$.

The state of robot x_t at time t is the position of the robot

$$x_t = \begin{bmatrix} x \\ y \end{bmatrix}$$

expressed in the world coordinate frame $\{W\}$. Note that the bearing of the robot never changes, and is not considered in this question.

The robot can move freely in the directions along its x_r axis and its y_r axis (x_r is always anti-parallel to y_w and y_r is always parallel to x_w). The control input u_t for the robot at time t is:

$$u_t = \begin{bmatrix} v_{x_r} \\ v_{y_r} \end{bmatrix}$$

where v_{x_r} is the linear velocity in direction x_r, and v_{y_r} is the linear velocity in direction y_r.

Develop a velocity motion model for the robot; i.e., provide an algorithm that computes $p(x_t|u_t, x_{t-1})$.