**A SLAM algorithm for indoor mobile robot localization using an Extended Kalman Filter and a segment-based environment mapping**

1. Problem statement
2. Robot model

Discrete-time model

where:

* is the robot position and is the angle between the robot axle and the -axis, at time
* is the robot linear velocity and are the wheels angular velocities
* are zero-mean uncorrelated Gaussian noises
* is the wheels radius and is the distance between the active two wheels
* is the rotation within the sampling period

The model input variables are the wheels angular velocities , and they have been precomputed so that the robot follows the desired trajectories. The model’s state variables are . The Gaussian disturbances consider unmodeled dynamics, friction, wheels slipping and, if the case external disturbances such as wind.

1. Environment model

The robot is assumed to be equipped with ultrasonic sensors, placed as shown in Figure 1. The environment will be modeled as a set of segments such that each of them intersects at least at one point of the environment boundaries.

Diagram

Description automatically generated

Each sensor provides, at each step , the distance from the robot center, denoted by , to one point on the environment boundaries, denoted by 

Considering the model used for the environment, the measurement provided by the sensor is approximated, as shown in Figure 1.