Braitenberg Vehicles

Simulating a Braitenberg Vehicle

Consider the braitenberg vehicle, a vehicle with wheels that spin in proportion to their respective sensor reading.

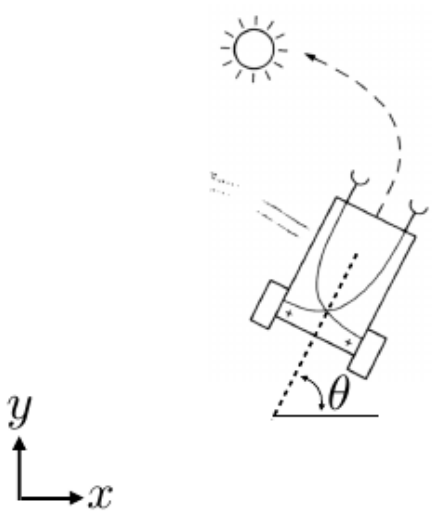

Figure 1: Braitenberg vehicle.

The state of the robot consists of its position and orientation and can be modeled as $q = \begin{bmatrix} x & y & \theta \end{bmatrix}^T$. Let v be the speed of the robot. We can model the state of the robot as it evolves over time as:

$$\dot{\boldsymbol{q}} = \begin{bmatrix} v\cos\theta \\ v\sin\theta \\ \dot{\theta} \end{bmatrix} \tag{1}$$

The flow of information through our system is modeled as follows:

Figure 2: Braitenburg System.

The system input is $\boldsymbol{u} = \left[v, \dot{\theta}\right]^T$. The robot dynamics can be simulated using the following functions:

- `robot_dynamics`: simulate system dynamics, $\dot{\boldsymbol{q}}$.
- `environment`: compute the distance from a light source to the robot's sensors.
- `light_response`: compute wheel velocities from light sensor readings.

Three versions, *coward*, *aggresive*, and *instincts*, of `light_response`, have been implemented below.