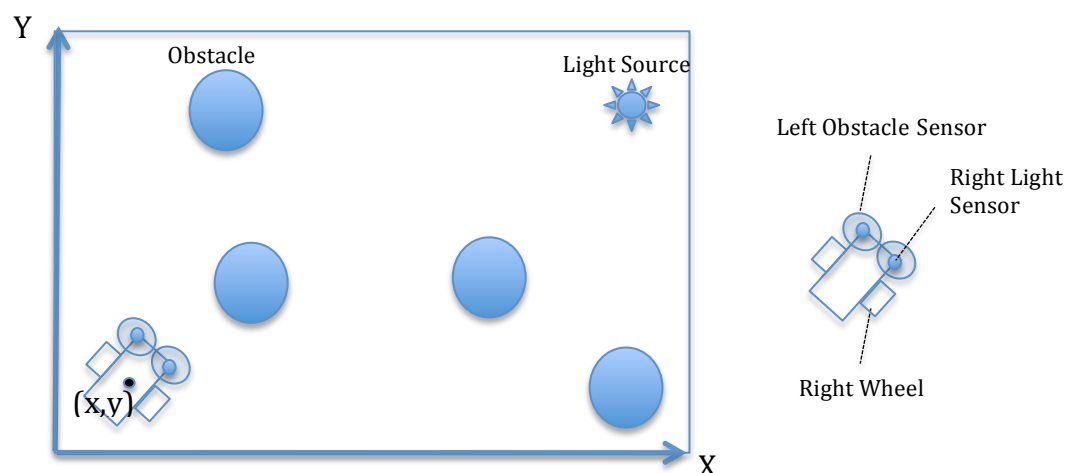


## Homework 3

### ROBT403: Robotics 2 Control, Modeling and Learning with Lab.

**Attention: For both Task 1 and Task2** submit in Moodle a single zip file enclosing the Matlab/ Simulink or Python3 code, a small video (mp4) showing that the robot can perform the task from 3 different initial positions, and a small report of 2 pages with description of the software and results.

**Task 1 (60 points):** By using one of the formulations of the Forward Kinematics of a differential drive configuration we reviewed during the lectures, by using 1) Matlab and/or Simulink **or alternatively** 2) Python3 with libraries like Matplotlib, Numpy, Scipy, etc., develop the model and the visualization for a mobile robot and its environment similar to the one represented in the picture, keep the same proportions. The inputs of the robot model are the angular velocities of the two wheels and the output the position and orientation of the robot.



**Task 2 (40 points):** Implement a simple ANN that receiving the input signals, as the contact with obstacles (0-1) and the intensity of the light received (0-1), controls the angular velocities of the wheels in a way that the robot will move and reach the light source while avoiding the obstacles. To generate a contact signal you can measure the overlapping between the circle representing the obstacles-sensor and the circle representing the obstacle. To generate the intensity light signal you can compute the distance between the center of the light sensor and the center of the light source and calculate the sensor signal as the inverse of this distance, opportunely normalized in the range (0-1).