

Particle Filter Programming Assignment

In this assignment, you will program a particle filter algorithm on a two-wheeled robot. Robot's motion is described by r_1 , r_2 , and t , which are left wheel rotation, right wheel rotation, and forward translation respectively. The robot is equipped with sensors to sense its range from each specific landmark.

We have provided the code skeleton. A visualization of the particle filter state is also provided by the framework. You should only modify `particle_filter.py`. **Do not modify code in files other than `particle_filter.py`.** Otherwise, the grader may be unable to run your code and/or may decide that your outputs are incorrect.

In `particle_filter.py`

1. A completed function of ***sample_motion_model()*** is provided. This function samples new particle positions based on the old positions and the robot's motion.
2. Complete the function ***eval_sensor_model()***. This function implements the measurement update step of a particle filter, using a range-only sensor. It takes as input landmark positions and landmark observations. It returns a list of weights for the particle set.
3. Complete the function ***resample_particles()***. The function takes as an input a set of particles and the corresponding weights and returns a sampled set of particles.

The code will only work properly after you have completed all the functions above.

To better understand the particle filter's behavior under different configurations, observe how the parameters (e.g. number of particles, number, and position of landmarks, measurement uncertainty, resampling strategy, and motion noises) affect the convergence of localization error.

Submissions

- ***particle_filter.py*** as ***<your metric number>.py*** python code
- A report describing the programming assignment, your solution, and your findings.
- Remember to support your findings with graphs and figures and describe how your findings are relevant to a practical implementation of particle filter.