

Exercise: Particle Filter

1. Learning goal

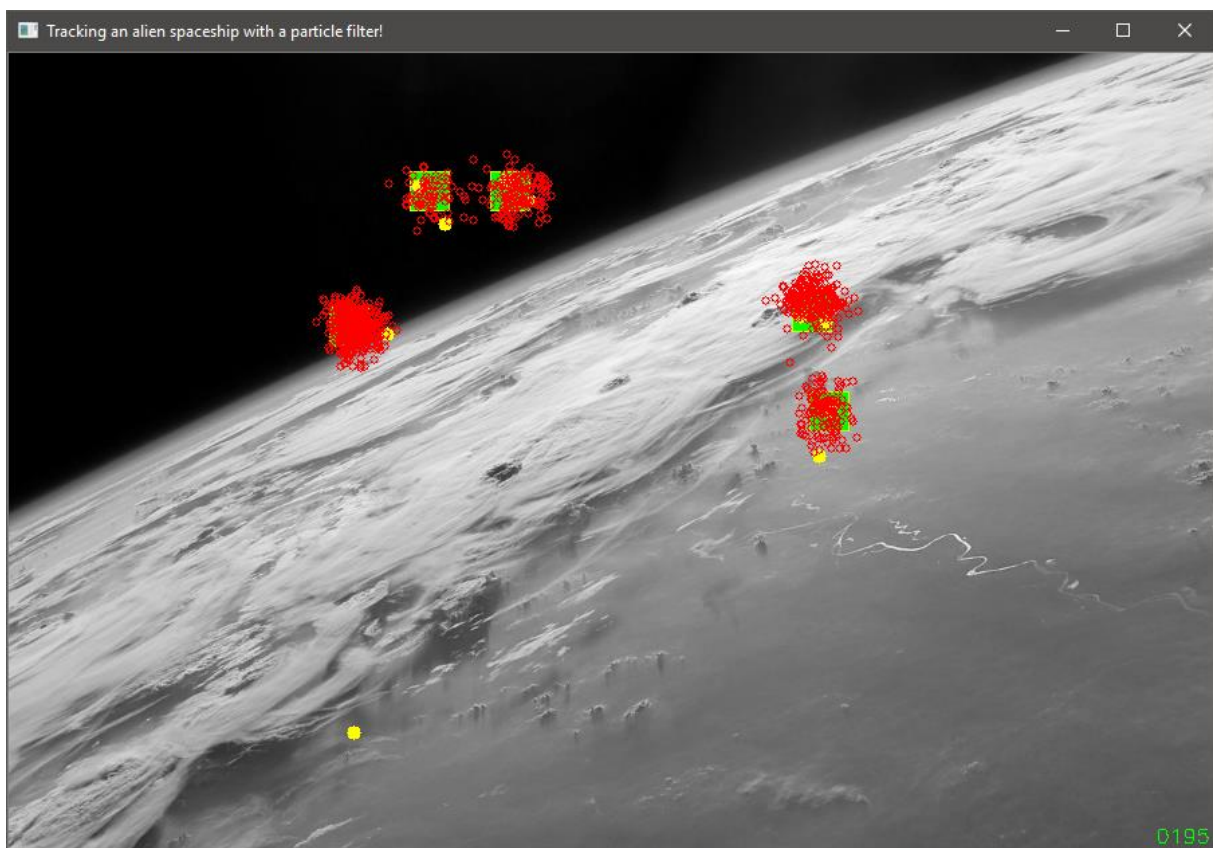
State estimation based on sensor data is one of the most important topics for Advanced Driver Assistance Systems and many other areas, as, e.g., robotics. For this, often **particle filters** are used. In this exercise the learning goal is to understand *how to implement a particle filter* and what the *benefits (and disadvantages) of population resampling* are.

2. Understand the implementation

Download the particle filter demo

<https://github.com/juebrauer/Solutions-Exercises-MultimodalSensorSystems/tree/master/Particle%20Filter>

In this demo a spaceship will be tracked with a particle filter!



Questions

- 1.) Is it a 1D, 2D, 3D, or 4D state estimation demo?
- 2.) What happens if we do not add noise to the particle's state vector in the prediction step?
- 3.) What happens if you set the parameter `MOVE_TO_MEASUREMENT_SPEED` to 1.0?
- 4.) For what is the line `#pragma omp parallel for` used for?
- 5.) What happens if we have 15 space ship parts, but only 100 particles?

3. Resampling

- 6.) Where and how is the resampling step implemented in the code?
- 7.) What are the benefits of resampling?
- 8.) What are the disadvantages of resampling?