

The performance comparison between EKF filter and PF filter can be divided into three different situations.

a). No landmark:

If the robot is moving for a while without sensing any landmark, EKF has a smooth moving trajectory, whereas PF is unable to move smoothly. It vibrates a lot and keeps changing positions.

b). One landmark:

Due to the truth that both filter might have multiple solutions when only one landmark is sensed, EKF and PF aren't very precise under this situation. EKF filter will have sudden nonlinear jump to the position, whereas PF filter will jump around and increasingly move away from real position

c). Multiple landmarks:

When multiple landmarks have been sensed, the EKF prediction will suddenly transport to the exact position, whereas PF will take some time before arriving the exact position. Moreover, although the PF prediction and the real position will be overlay into one, we can still observe that the vibration of PF result. This is due to the fact that PF is most likely to pick the position that has least position error, but the other further positions also have chances to be picked.