Bayes Filter Implementations

Particle filters
### Particle Filter Algorithm

1. **Algorithm** `particle_filter(S_{i-1}, u_{i-1}, z_i)`:
2. \( S_i = \emptyset, \ \eta = 0 \)
3. For \( i = 1 \ldots n \) **Generate new samples**
4. Sample index \( j(i) \) from the discrete distribution given by \( w_{i-1} \)
5. Sample \( x'_i \) from \( p(x'_i | x_{i-1}, u_{i-1}) \) using \( x^{(i)}_{i-1} \) and \( u_{i-1} \)
6. \( w'_i = p(z_i | x'_i) \) **Compute importance weight**
7. \( \eta = \eta + w'_i \) **Update normalization factor**
8. \( S_i = S_i \cup \{ < x'_i, w'_i > \} \) **Insert**
9. For \( i = 1 \ldots n \) **Normalize weights**
10. \( w'_i = w'_i / \eta \)