Dual Template with Boundary of Obstacle Detection based Particle filter for Occlusion

修士課程修了　孫源澤

Background

■Occlusion problem: the object is occluded behind the obstacle in an image.

1. Partial Occlusion: partially invisible.
2. Full Occlusion: fully invisible.

■Particle Filter Concept:

◆ Main idea of particle filter is the approximation of probability density function using a set of samples with their associated weights which are called particle filter.

It's suitable for non-linear occlusion situation by using particle filter.

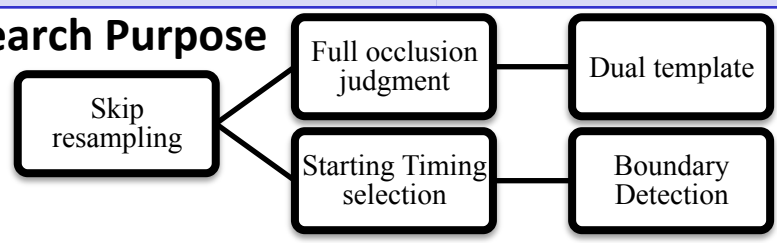
Example: Irregular speed, reversed direction and stopover.

Handling occlusion problems based on particle filter.

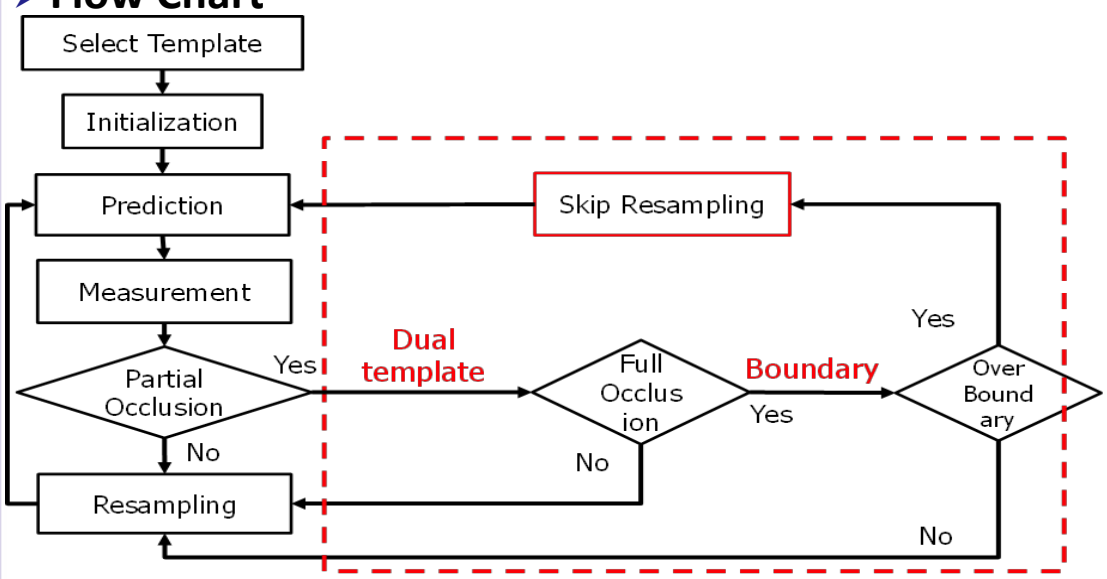
Related Research and Problem Statement

Related Method	Merit	Demerit
Enlarge search region of particle	Providing a high possibility of detecting object's feature	Low accuracy in the large obstacle scene
Increase number of particles		Computational burden
Skip resampling		1. Differentiate event of occlusion 2. Start timing selection

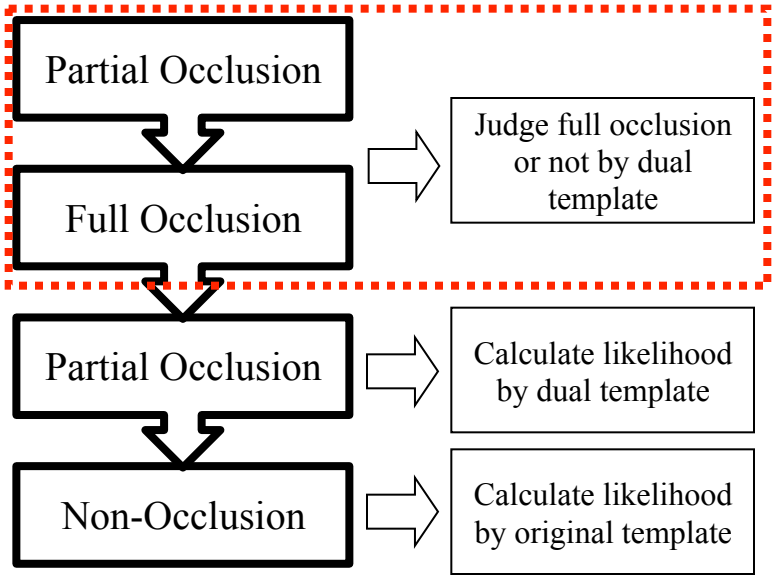
Research Purpose



Flow Chart



Dual Template



Boundary Detection

Creating Boundary of Obstacle

◆Find the boundary

The position of the m_{th} particle

$$x_{boundary} = \arg\max\{\sum_{m=1}^{M}(x_m - x_0)\}$$

The position of particle which is the closest to the obstacle

The position of particle with the largest similarity

Creating dual template

The position of particle with the largest similarity

An original template

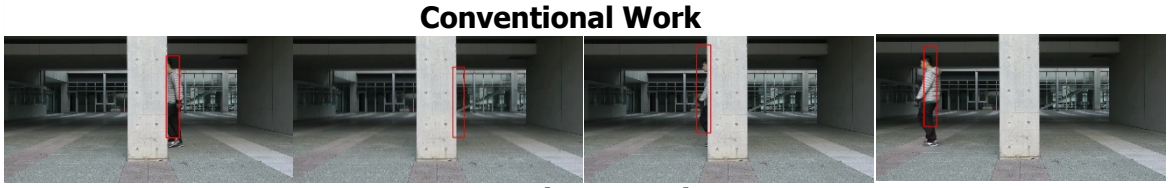
$$q_{dual} = (1-\alpha)p_{t-1} + \alpha q_{original}$$

The newly created template in the event of partial occlusion

Updating ratio

Experimental Result

Conventional Work



Proposed Approach

Frame 162　Frame 188　Frame 195　Frame 258

Result Evaluation

	Conventional Work	Proposed Approach
Success rate	53.7%	99.3%

Chengjiao GUO, Ying LU, Takeshi IKENAGA, " Multiple Likelihood based Particle Filter for Long-term Full Occlusion ", *The Journal of IIEEEJ*, vol. 39, pp. 580-589, 2010.

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