DISCRIMINATIVE OBJECT TRACKING WITH SCALE RATIO ADAPTATION

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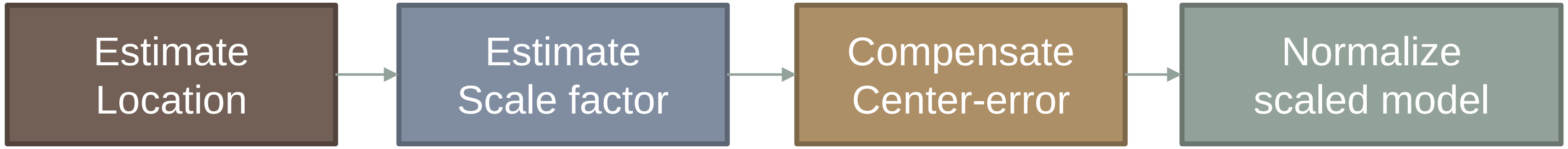
Proposed algorithm

Proposed process



More accurate, robust
With little speed degradation
(37 fps -> 34 fps)

Input :

Image I_t.
Previous target position $\boldsymbol{p}_{t-1}$ and scale s_{t-1}
Discriminant function F_{t-1}
Momentum vector $\boldsymbol{m}_{t-1}$

Output :

Estimated target position $\boldsymbol{p}_t$ and scale s_t.
Updated discriminant function F_t
Updated momentum vector $\boldsymbol{m}_t$

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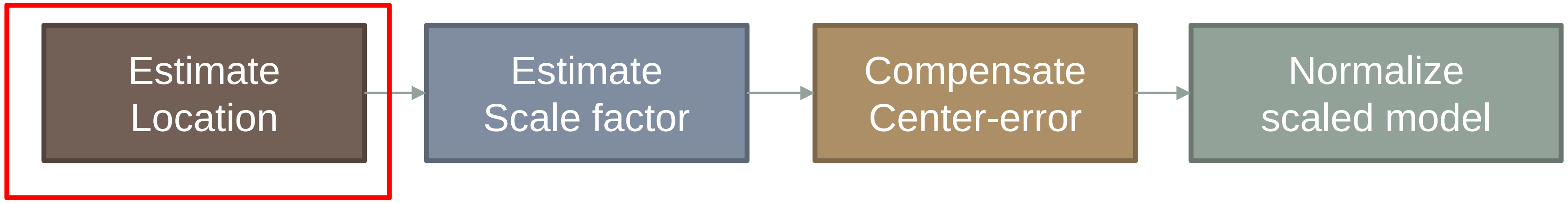

Estimate location:

1. Extract samples z_{trans} from I_t at $\boldsymbol{p}_{t-1}$ and s_{t-1}.
2. Compute the responsibility y_{trans} using discriminant function F_{t-1}
3. Apply Gaussian kernel on the y_{trans} to reflect the momentum factor $\boldsymbol{m}_{t-1}$
4. Set $\boldsymbol{p}_t$ to the target position that maximizes y_{trans}
5. Update the momentum factor $\boldsymbol{m}_t$ with exponential learning rate.

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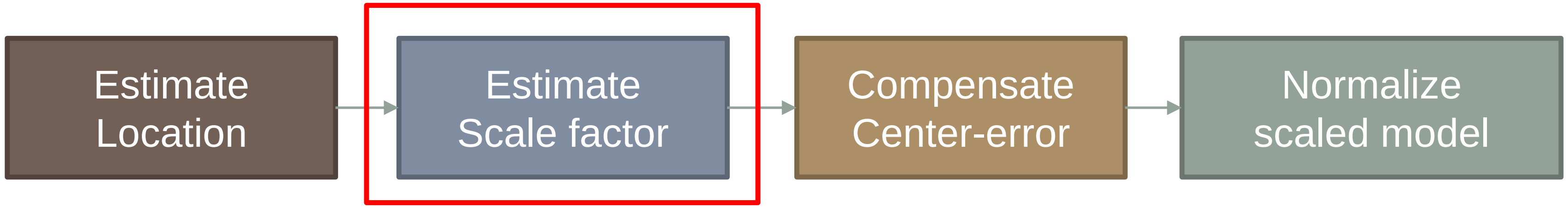

Estimate Scale factor:

1. Extract scale samples z_{scale} from I_t at $\boldsymbol{p}_t$ and s_{t-1}.
2. Compute the responsibility y_{scale} using discriminant function F_{t-1}
3. Set $\boldsymbol{s}_t$ to the target scale that maximizes y_{scale}
4. Adjust $\boldsymbol{s}_t$ if the scale ratio exceed some limit with respect to initial scale.

Proposed algorithm

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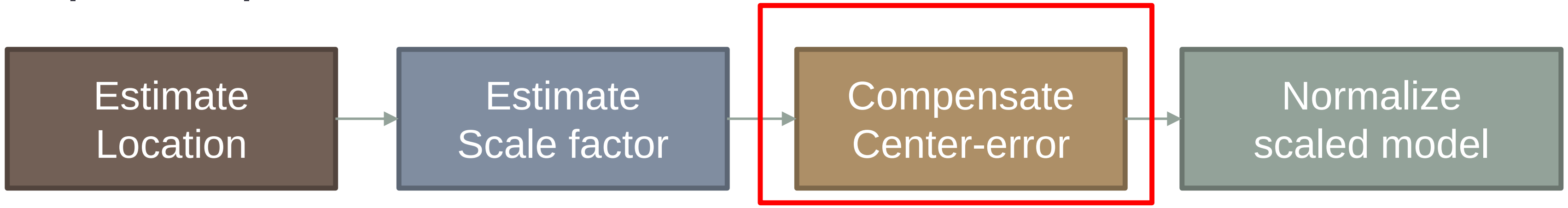
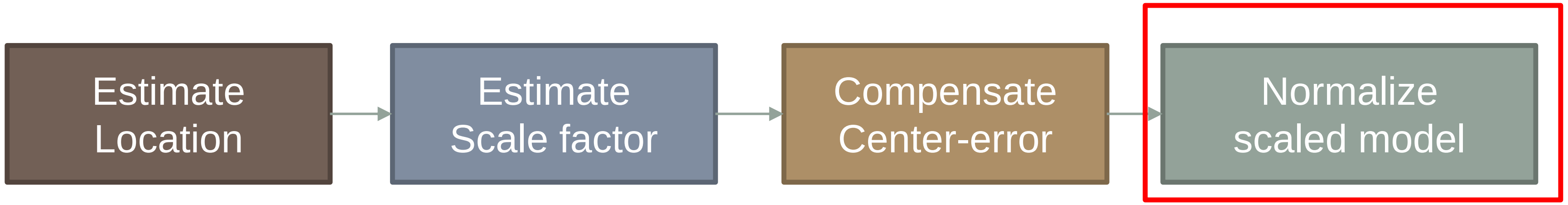


Compensate Center-error:

1. Extract samples z_{comp} from I_t at $\boldsymbol{p}_t$ and s_t within center-boundary caused by scale change.
2. Compute the responsibility y_{comp} using discriminant function F_{t-1}
3. Set $\boldsymbol{p}_t$ to the target position that maximize y_{comp}.

Proposed algorithm

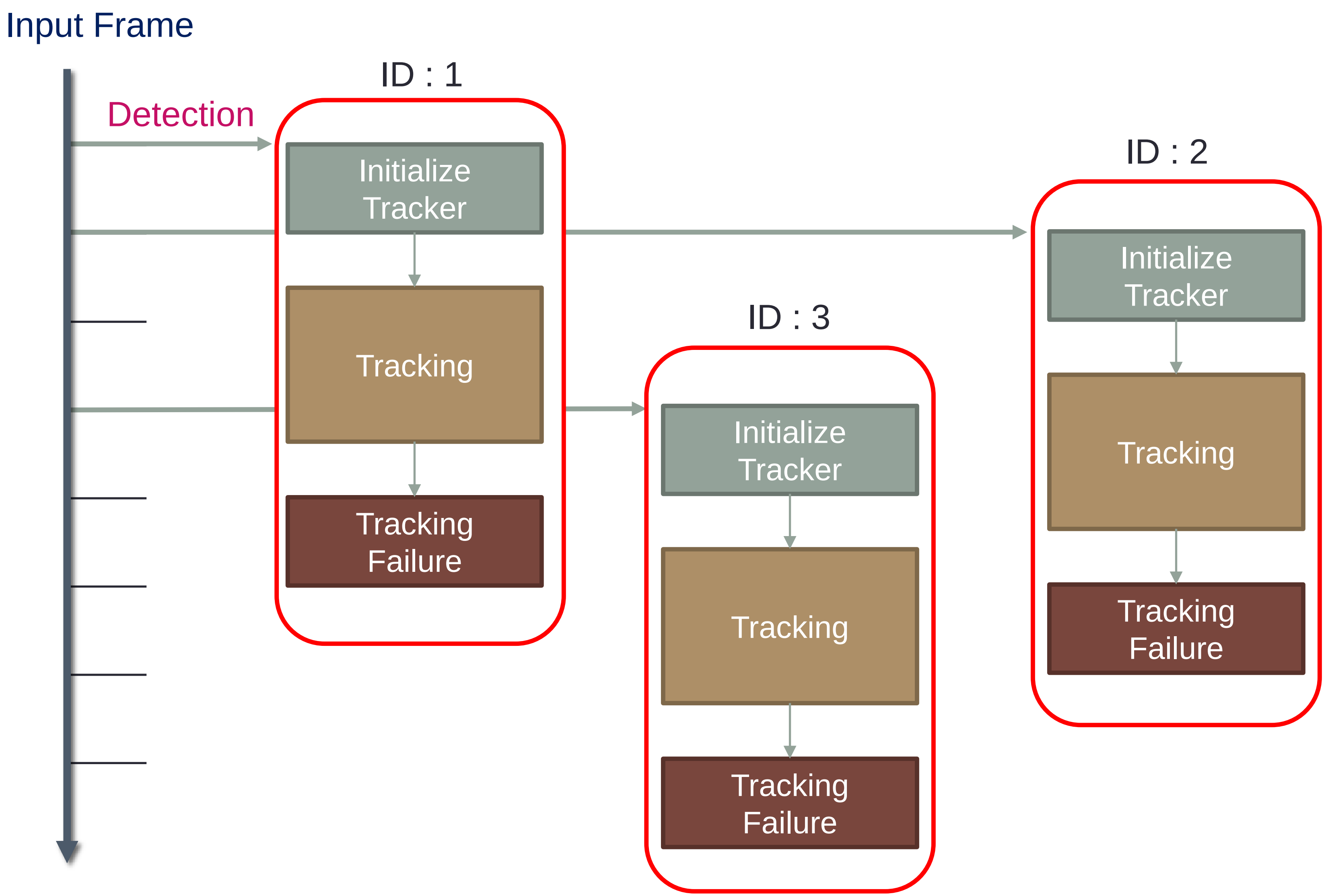
Proposed process



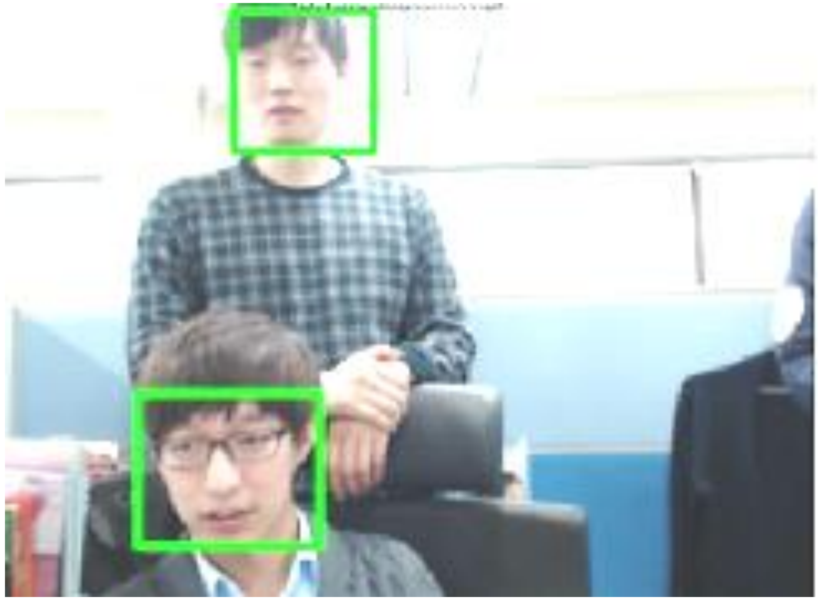
Normalize scaled model:

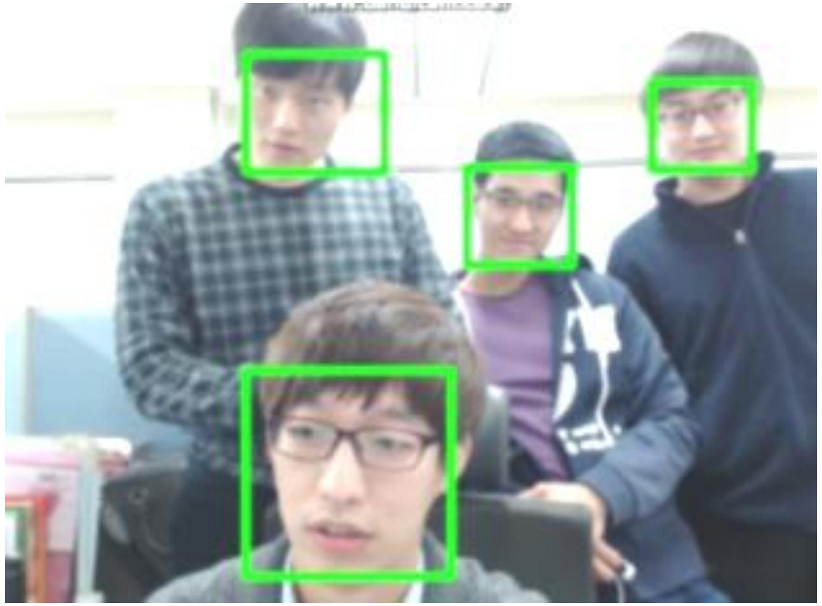
1. Extract training samples a_{trans} from I_t at $\boldsymbol{p}_t$ and updated s_t.
2. Update discriminant function F_t.
3. Adjust the size of support vector budget if it exceed the limit.

Integration Issue with detector



Live Demo





Live Demo