



1. Target Detection



Corner Finding



Computing Pyramid Lucas-Kanade Optical Flow



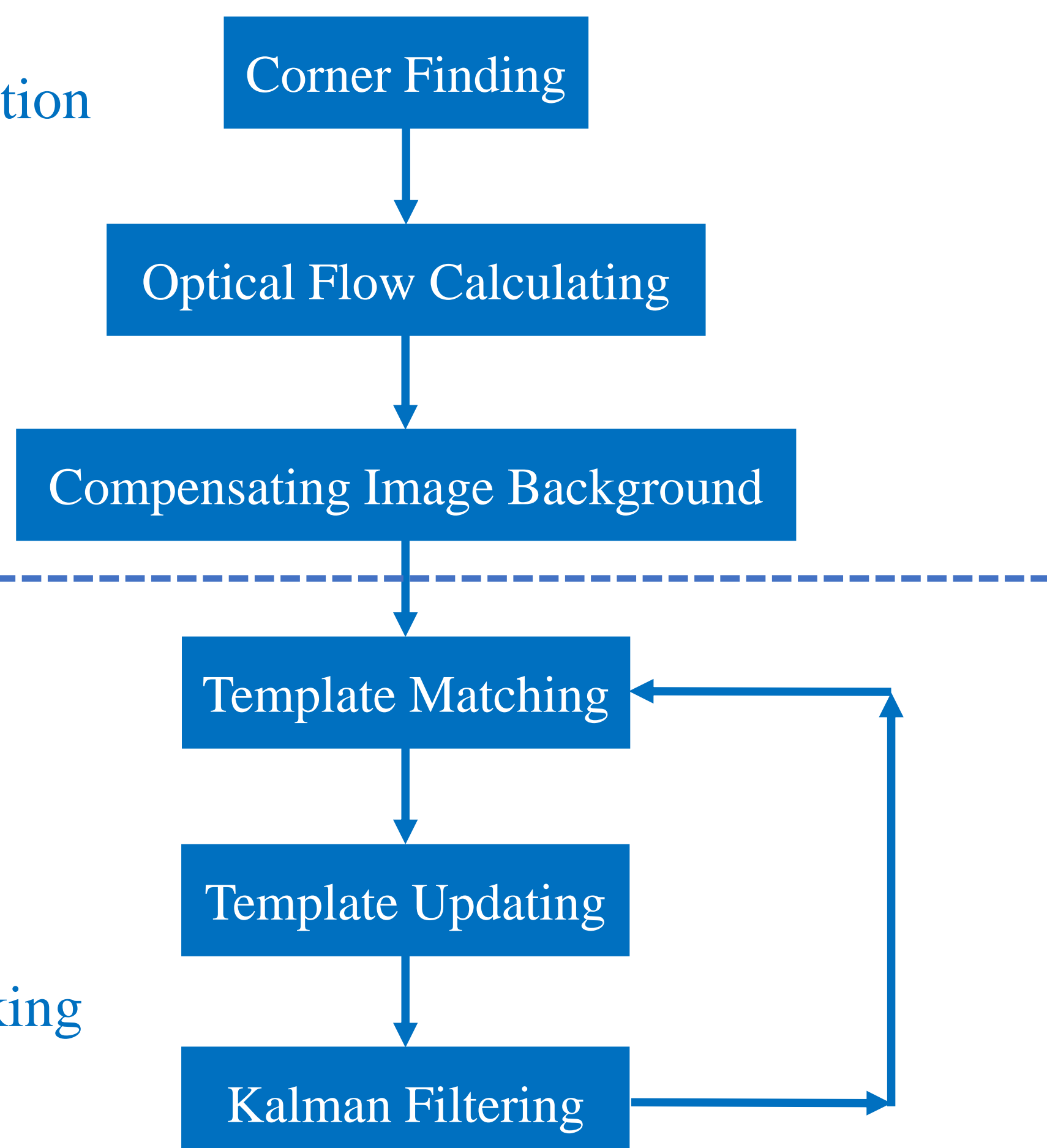
Compensating Image Background

$$\vec{v}_{background} = \frac{1}{n} \sum_{i=1}^n \vec{v}_m^{(i)}$$

$$\Delta \vec{v}_m^{(i)} = \vec{v}_m^{(i)} - \vec{v}_{background}$$

Target Detection

Target Tracking



2. Target Matching



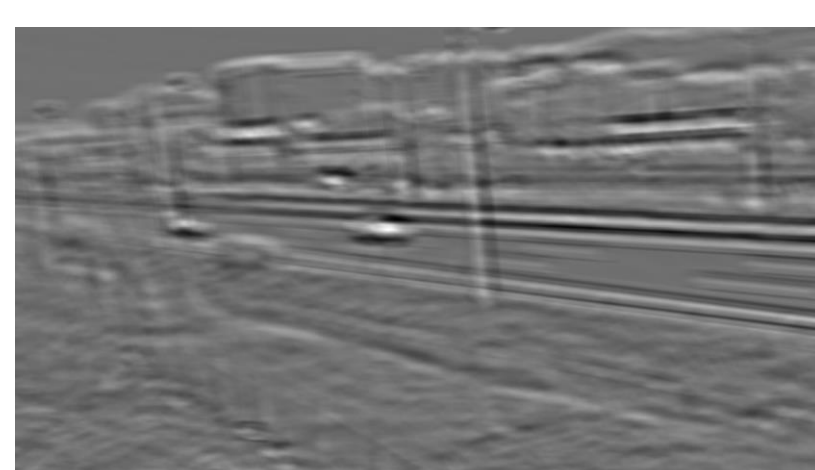
- a: Square Difference Matching Method
- b: Correlation Matching Method
- c: Correlation Coefficient Matching Method
- d, e and f are the normalized versions of a, b and c respectively.



a



b



c



a



b



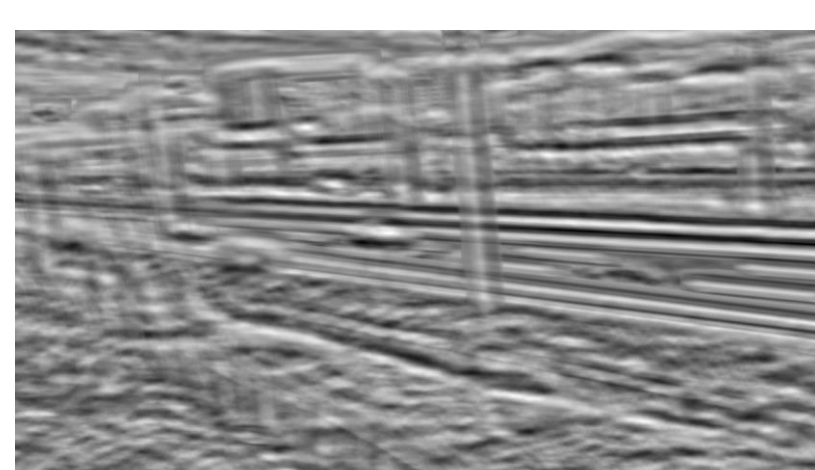
c



d



e



f



d



e



f

Correlation Coefficient Matching Method:

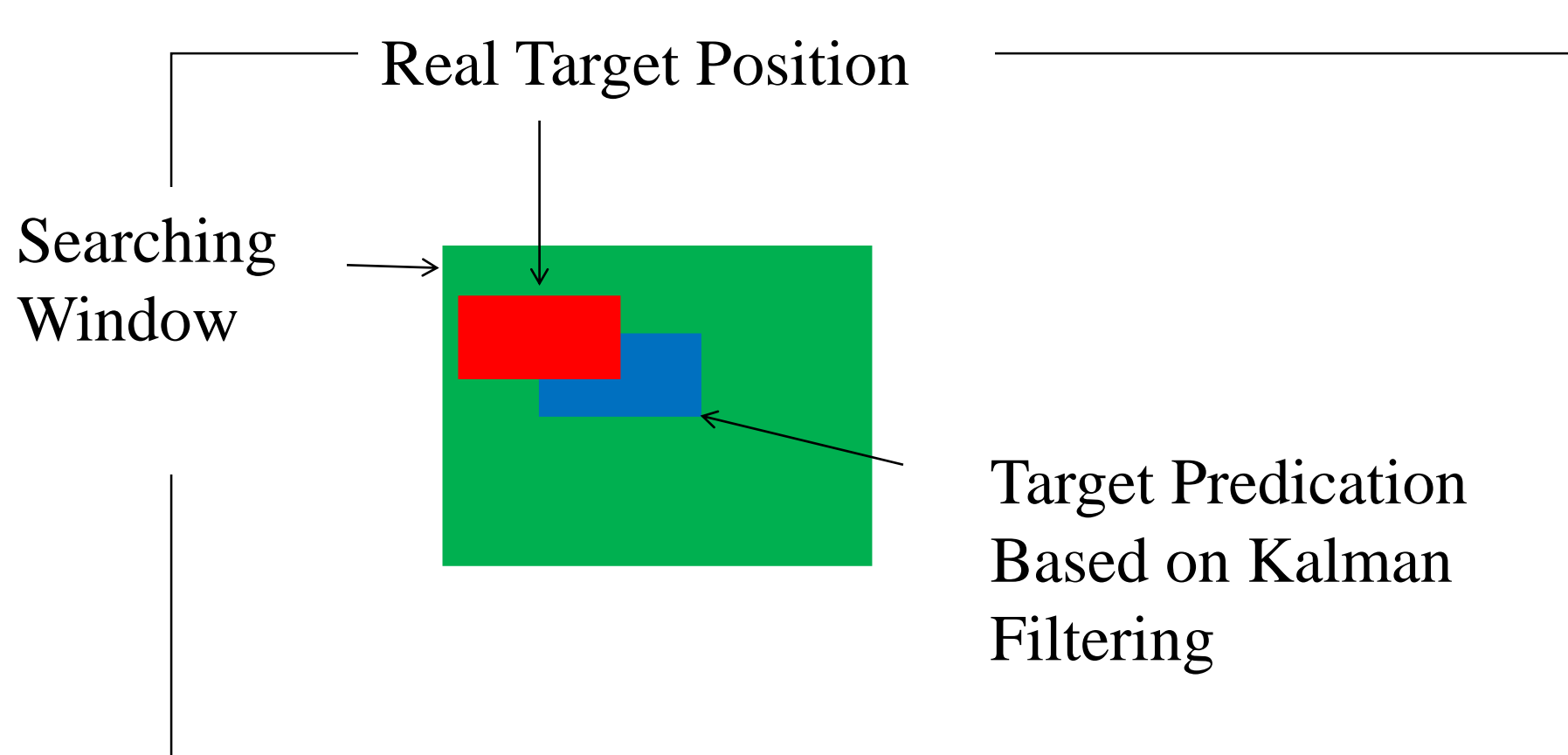
$$\bar{T}(x', y') = T(x', y') - \frac{1}{(w \cdot h) \sum_{x'', y''} T(x'', y'')} \quad \bar{I}(x + x', y + y') = I(x + x', y + y') - \frac{1}{(w \cdot h) \sum_{x'', y''} I(x + x'', y + y'')}$$

$$R_{ccoeff}(x, y) = \sum_{x', y'} \left[\bar{T}(x', y') \cdot \bar{I}(x + x', y + y') \right]^2$$

Template Updating:

$$T_{new} = T_{old} \cdot R_{ccoeff_normed} + T_{cur} \cdot (1 - R_{ccoeff_normed})$$

3. Target Tracking



Frame 13



Frame 26



Frame 37



Frame 49