Context-Aware Correlation Filter Tracking
Matthias Mueller, Neil Smith, Bernard Ghanem
King Abdullah University of Science and Technology (KAUST)

Contributions
- Generic and efficient framework to incorporate global context within CF trackers
- Reformulation of the ridge regression problem with closed form solution for single and multi-dimensional features in the primal and dual domain
- Significant performance improvement of many CF trackers with only a modest impact on their frame rate

Methodology

Context-Aware CF Solution

Primal Domain: Single-Channel Features
- Training:
  \[ \mathbf{\hat{w}} = \mathbf{\hat{A}}^\dagger \odot \mathbf{\hat{y}} \]
  \[ = \mathbf{\hat{A}}^\dagger \odot \mathbf{\hat{a}}_0 + \lambda_1 + \lambda_2 \sum_{l=1}^k \mathbf{\hat{a}}_l \]
- Detector:
  \[ \mathbf{\hat{f}}_p = \mathbf{\hat{x}} \odot \mathbf{\hat{w}} \]

Dual Domain: Single-Channel Features
- Training:
  \[ \mathbf{\hat{A}} = \begin{bmatrix} \text{diag}(\mathbf{d}_{00}) & \cdots & \text{diag}(\mathbf{d}_{0k}) \end{bmatrix} \]
  \[ \mathbf{\hat{y}} = \begin{bmatrix} \mathbf{\hat{y}}_0 \cdots \mathbf{\hat{y}}_k \end{bmatrix} \]
  \[ \mathbf{\hat{y}}_l = \mathbf{\hat{x}} \odot \mathbf{\hat{a}}_0 + \sqrt{\lambda_1} \sum_{j=1}^k \mathbf{\hat{a}}_j \odot \mathbf{\hat{a}}_l \]
- Detector:
  \[ \mathbf{\hat{f}}_p = \mathbf{\hat{x}} \odot \mathbf{\hat{a}}_0 + \sqrt{\lambda_1} \sum_{j=1}^k \mathbf{\hat{a}}_j \odot \mathbf{\hat{a}}_l \]

Dual Domain: Multi-Channel Features
- Training:
  \[ \mathbf{\hat{C}} = \begin{bmatrix} \text{diag}(\mathbf{d}_{00}) & \cdots & \text{diag}(\mathbf{d}_{0k}) \end{bmatrix} \]
  \[ \mathbf{\hat{y}} = \begin{bmatrix} \mathbf{\hat{y}}_0 \cdots \mathbf{\hat{y}}_k \end{bmatrix} \]
- Detector:
  \[ \mathbf{\hat{f}}_p = \sum_{j=1}^k \mathbf{\hat{a}}_j \odot \mathbf{\hat{x}}_j \]

Experimental Results

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