

## Multi-Frame Automatic Target Recognition using Correlation filters

Prof. Vijayakumar Bhagavatula  
Data Storage Systems Center (DSSC)  
Carnegie Mellon University, Pittsburgh, PA, USA

Target recognition and tracking can be challenging in image sequences where multiple moving targets may appear in unknown positions with variable pose and appearance. Correlation filters [1] are attractive for target recognition due to their properties such as shift invariance, distortion tolerance, graceful degradation, and closed-form solutions. In spite of the many advances in correlation filter designs [2], following challenges remain.

- Designing correlation filters that respond in a prescribed manner to distortions such as rotations, scale changes, etc.,
- Achieving improved target recognition and tracking by combining correlation outputs from multiple frames in an image sequence (e.g., from a video camera),
- Achieving improved performance by combining correlation outputs from input images from multiple (possibly, collaborative) cameras, and
- Combining correlation outputs from multiple correlation filters in order to improve recognition and tracking performance.

In order to address the first challenge, we are developing a generalized distortion-tolerant correlation filter design that extends the earlier work in the design of correlation filters that respond in a prescribed manner to in-plane rotations [3] and in-plane scale changes [4]. To address the other three challenges, we are developing a new information-preserving probabilistic framework for merging correlation outputs from both multiple images and multiple filters. This probabilistic framework exploits spatial and temporal relationships between the correlation outputs. In some sense, this probabilistic framework allows simultaneous target recognition and tracking in contrast to earlier approaches that separated the tasks of recognition and tracking.

### References

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