

Improvements in Joint Domain-Range Modeling for Background Subtraction

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1 Supplementary discussion

1.1 Comparison experiments

For a 128x160 frame-size video, our normalization scheme that results in a pixel-wise conditional background model takes about 10 seconds per frame. By comparison, the Sheikh and Shah normalization scheme requires 7 seconds per frame for the same video.

Using the adaptive kernel variance method increases the processing time to 15 seconds per frame. For the adaptive kernel variance method, the caching scheme of Narayana *et al.*, where the previous frame's optimal per-pixel variances are reused, can reduce the cost significantly.

While our current system is not a real-time system, we believe that modeling the influence of neighboring pixels, along with the improvements suggested in this paper - the use of pixel-wise conditional distributions and the use of informative spatial priors for the processes, can improve the accuracy of real-time systems.

1.2 Spatial prior values

We assume that when a pixel is classified as background, it has a 95% probability of being background in the next frame as well. This assumption worked well for our data set. For videos that differ significantly from these videos, it may be useful to pick this parameter after some careful consideration.