

COMS30121 Image Processing and Computer Vision

Motion III

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Motion III : Motion Segmentation

- Segmenting video – is a region defined by colour, texture or motion?
- Generalised aperture problem
- Motion segmentation: an example
 - **Representing Moving Images with Layers**
Wang and Adelson

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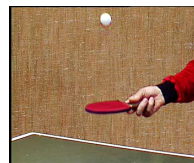
Motion Segmentation

- Motion is a strong cue for identifying different objects and inferring depth
- Motion estimates can be used for segmenting regions in frames, e.g.
 - to extract foreground from background
 - to isolate individual objects
- BUT – not straightforward

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Examples



Stationary camera(s)



Right panning camera

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Motion is Complex

- **Motion is ambiguous for segmentation**
 - also need colour, shape, texture, etc
- **What is a 'homogeneous motion' region?**
 - single motion? parametric variation?
 - articulated and non-rigid motion?
- **Generalised aperture problem:**
 - large regions needed for good motion estimates
 - but then more likely to contain complex motions

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Motion Segmentation : Example

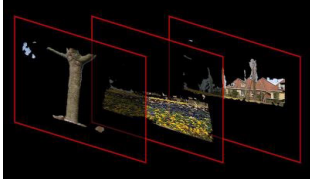
J. Y. A Wang and E. H. Adelson.
Representing Moving Images with Layers.
IEEE Transactions on Image Processing
Special Issue: Image Sequence Compression,
 3(5):625-638, September 1994.

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Layered Representation

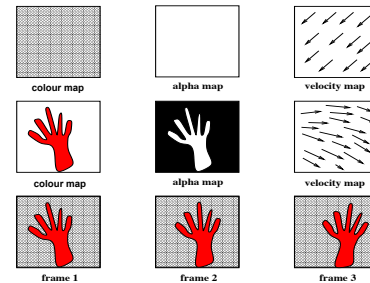
- Video represented as the superposition of layers at different depths:



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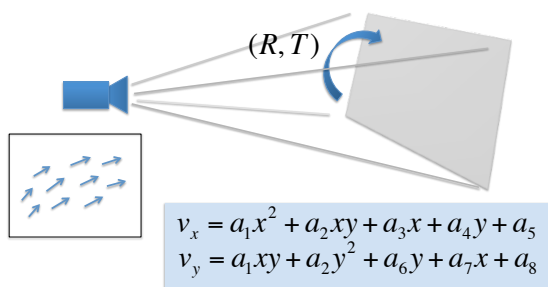
Layered Video : Simple Example



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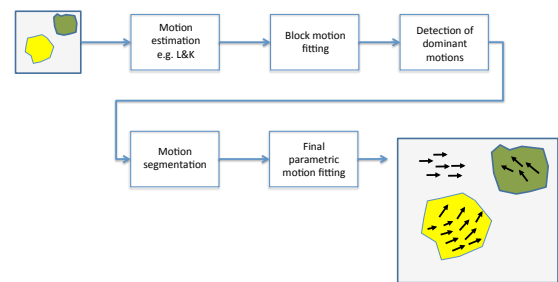
Plane Motion



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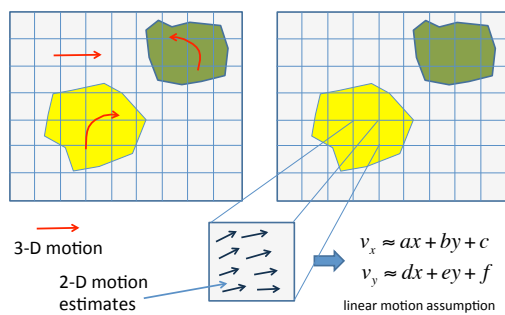
Motion Segmentation - Overview



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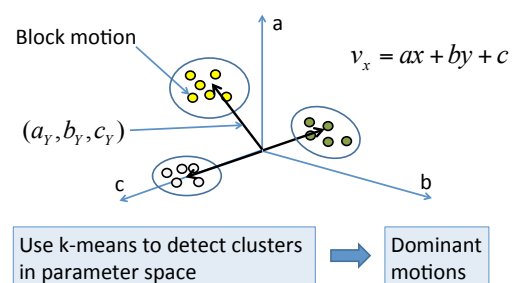
Block Motion Fitting



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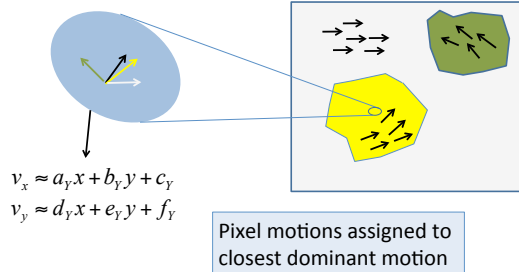
Detect Dominant Motions



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Motion Segmentation



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Parametric Motion Regions

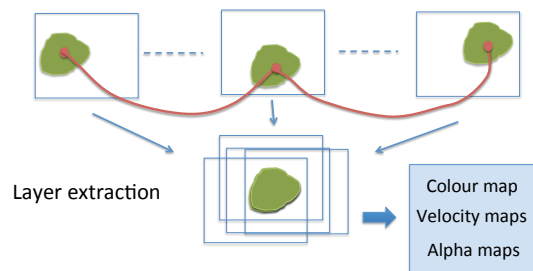
Parametric representations updated using assigned pixel motions

$$v_x \approx \hat{a}_y x + \hat{b}_y y + \hat{c}_y \quad v_y \approx \hat{d}_y x + \hat{e}_y y + \hat{f}_y$$

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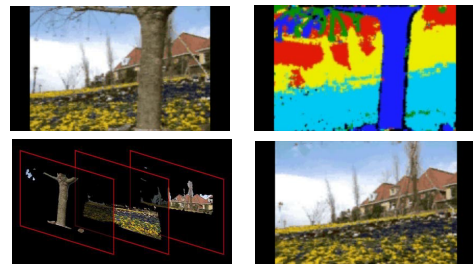
Region Linking and Alignment



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Example

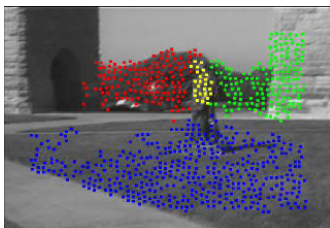


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Motion Segmentation – Grouping Feature Points

Pundlik and Birchfield, BMVC 2006



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Motion segmentation –model based



Real-Time Monocular Segmentation and Pose Tracking of Multiple Objects
Henning Tjaden, Ulrich Schwanecke, and Elmar Schomer
ECCV 2016

<https://www.youtube.com/watch?v=nFkNPqf1LU>

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