* Technical Sketch

Relative Epipolar Motion of Tracked Features for Correspondence in Binocular Stereo

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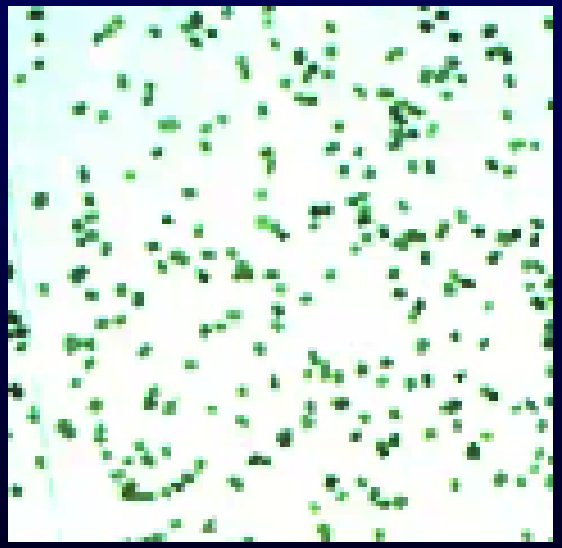
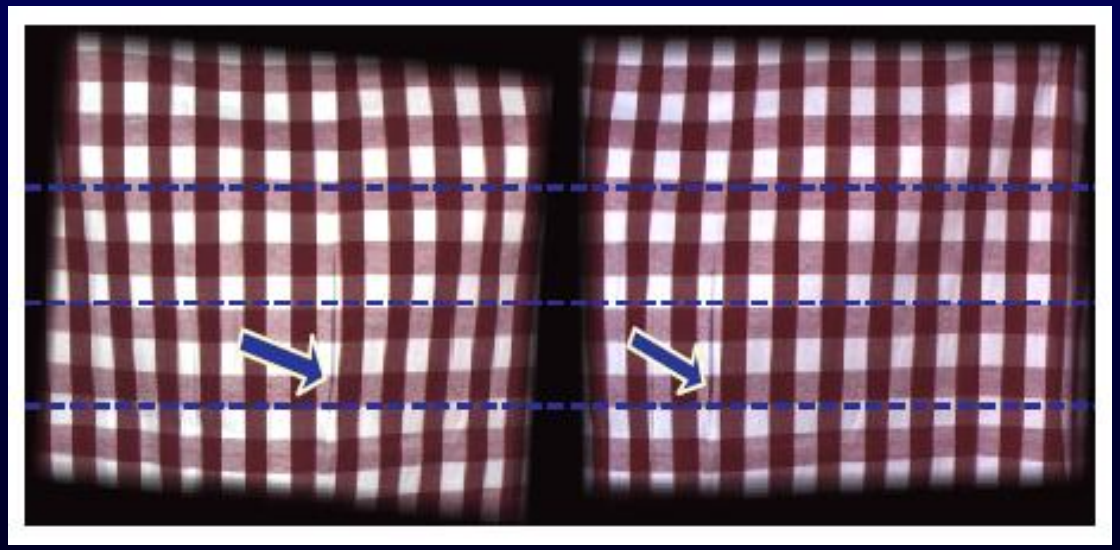
Undistinguishable features

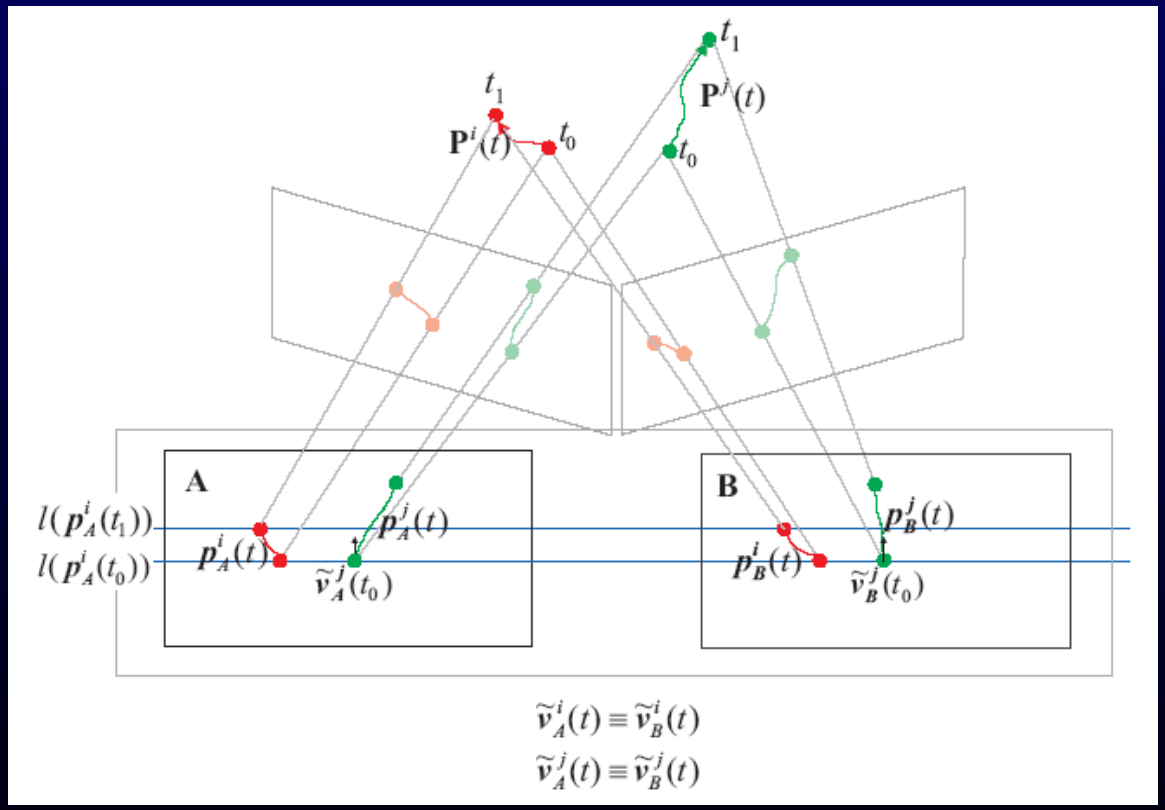
- 3D-PIV example : PIV.mov
- from local textures





Motion Clues

- #1: true matching remains on the same epipolar lines
- #2: true matching remains the same motion velocities perpendicular to the epipolar lines



Method

- We match feature trajectories
  - Tracking trajectories
  - Matching scores
  - Correspondence establishment

Tracking trajectories

- Tracking Ambiguity:
  - Simply remove it by cutting trajectories into pieces.

Matching Score

- Matching scores:

$$s = \alpha s_1 + \beta s_2 + \gamma s_3,$$

  - Motion clue #1:

$$s_1(\mathbf{T}_A^i, \mathbf{T}_B^j; \varepsilon) = \begin{cases} e(\mathbf{T}_A^i, \mathbf{T}_B^j) & e(\mathbf{T}_A^i, \mathbf{T}_B^j) < \varepsilon \\ \infty & otherwise \end{cases}$$

$$e(\mathbf{T}_A^i, \mathbf{T}_B^j) = \max_{t \in \eta(i,j)} \{|y_A^i(t) - y_B^j(t)|\}.$$

  - Motion clue #2:

$$s_2(\mathbf{T}_A^i, \mathbf{T}_B^j) = \frac{1}{|\eta(i,j)|} \sum_{t \in \eta(i,j)} |\widetilde{v}_A^i(t) - \widetilde{v}_B^j(t)|^2$$

  - Local texture:

$$s_3(\mathbf{T}_A^i, \mathbf{T}_B^j) = \frac{1}{|\eta(i,j)|} \sum_{t \in \eta(i,j)} C\big(w_A(q_A^i(t)), w_B(q_B^j(t))\big)$$

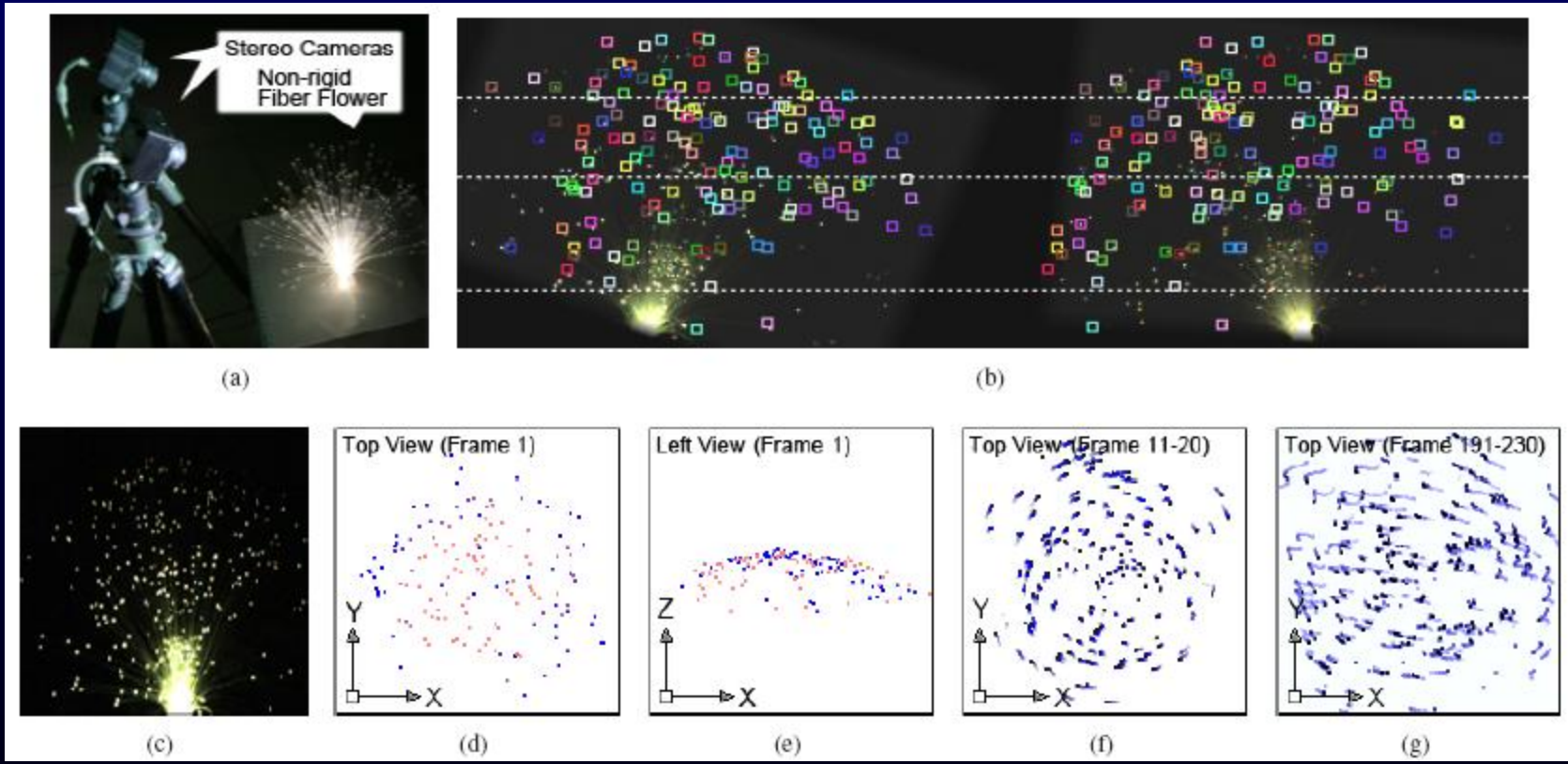
Correspondence

- The Problem,
- maximum weighted bipartite matching
  - based on “matching score matrix”
  - optimizing

$$h(t) = \sum_i \rho(\mathbf{T}_A^i, g(\mathbf{T}_A^i); t),$$

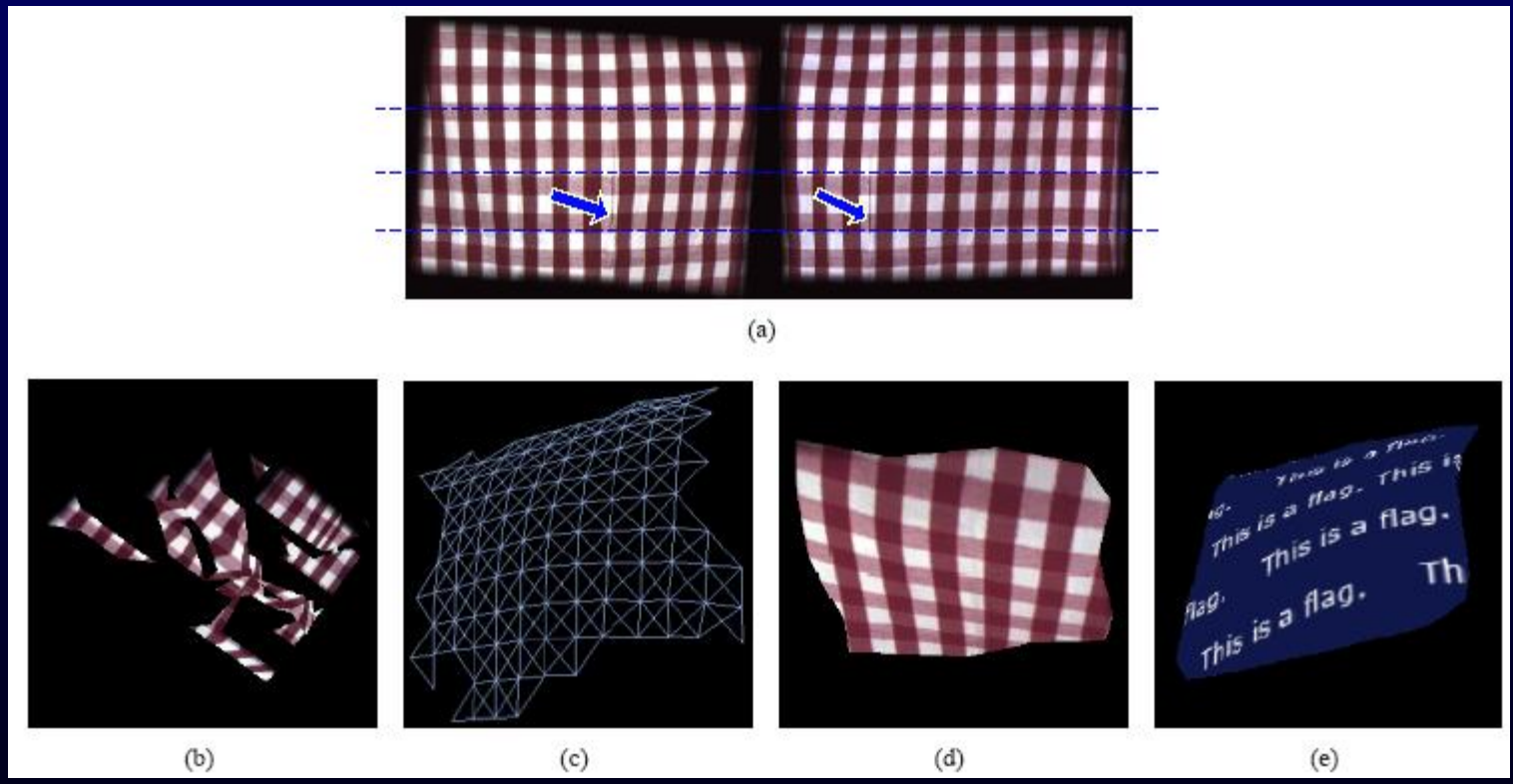
Results : particles

- Tree.mov



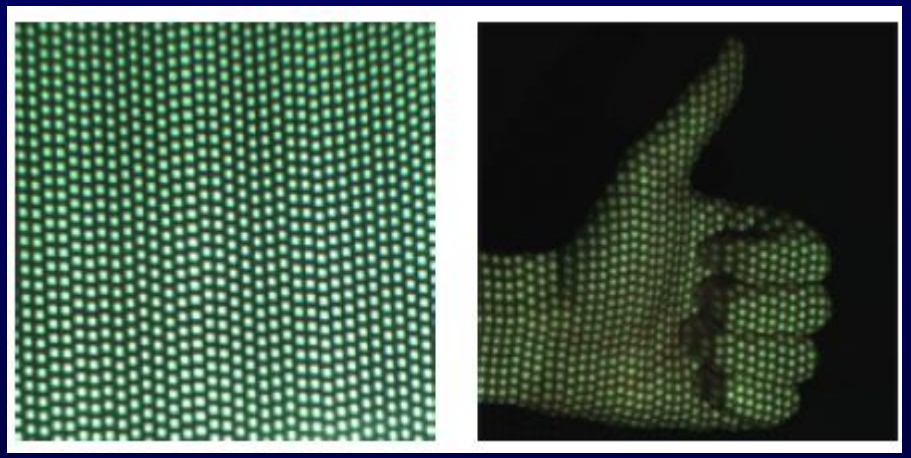
Results : passive features

- output_s.mov



Results: Active particles

- face_ZhaoQi.mov



- 3DZhaoQi.avi