3d shape reconstruction from photographs: a Multi-View Stereo approach

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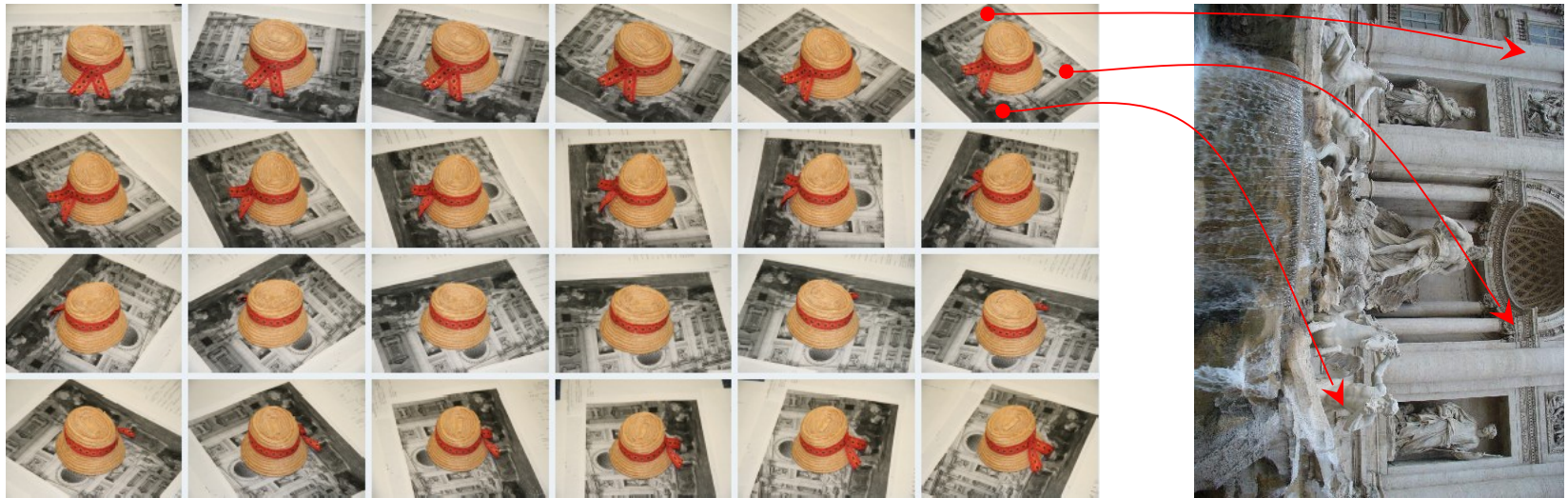
Google   Aston University   Google
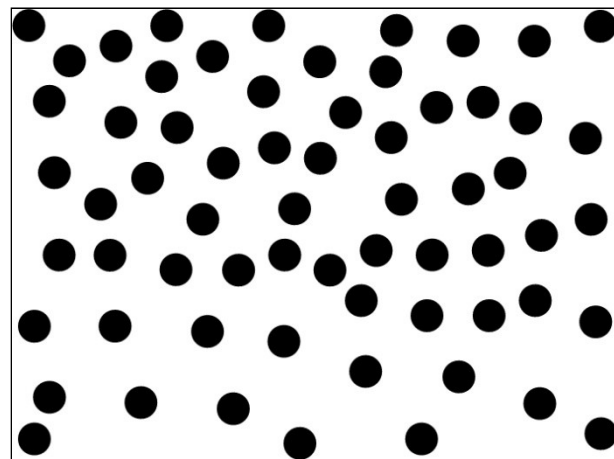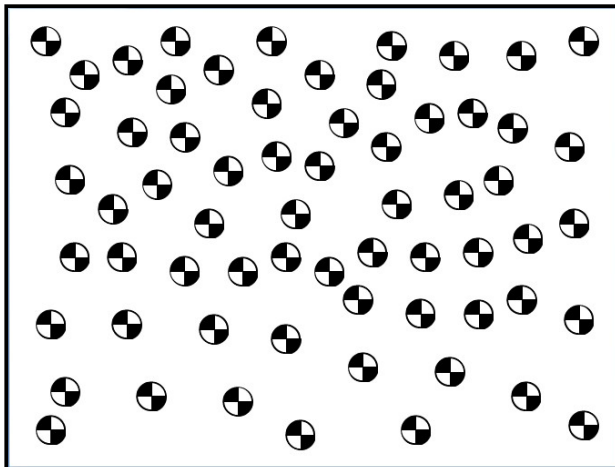
Practical camera pose estimation

- Fiduciary **unknown planar** pattern
 - Robustness against strong occlusion
  - Automatic detection

Practical camera pose estimation

- Fiduciary **ellipse planar** pattern
  - Robustness against strong occlusion
  - Automatic detection
  - **Very good accuracy (< 0.01 pixels)**
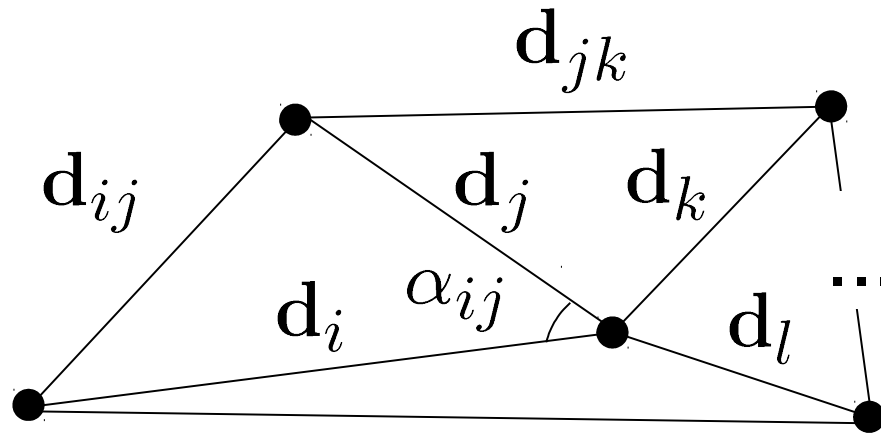 - **No descriptor available**

Matching without descriptors

- No descriptors
- Automatic matching: open problem
- Use Delaunay triangulation
  (if view is not too oblique)
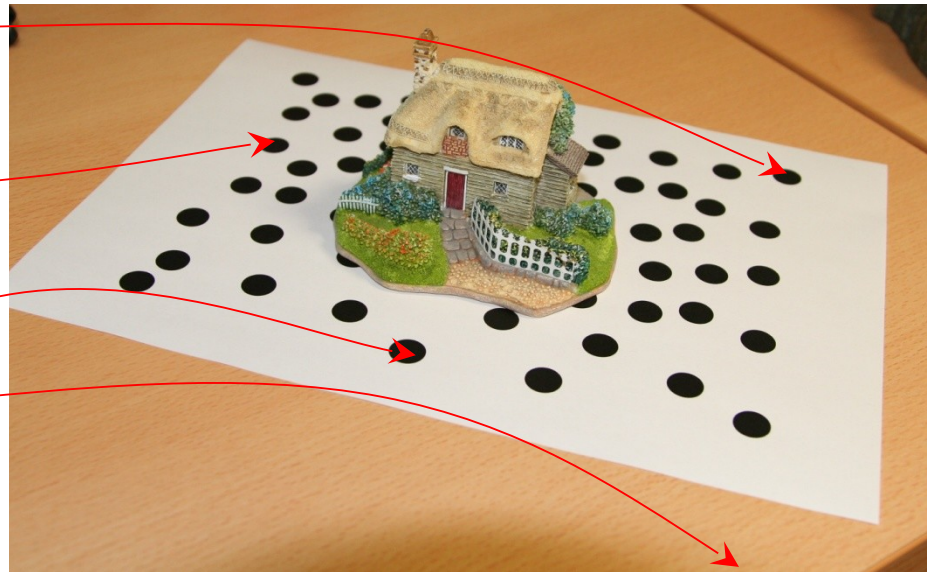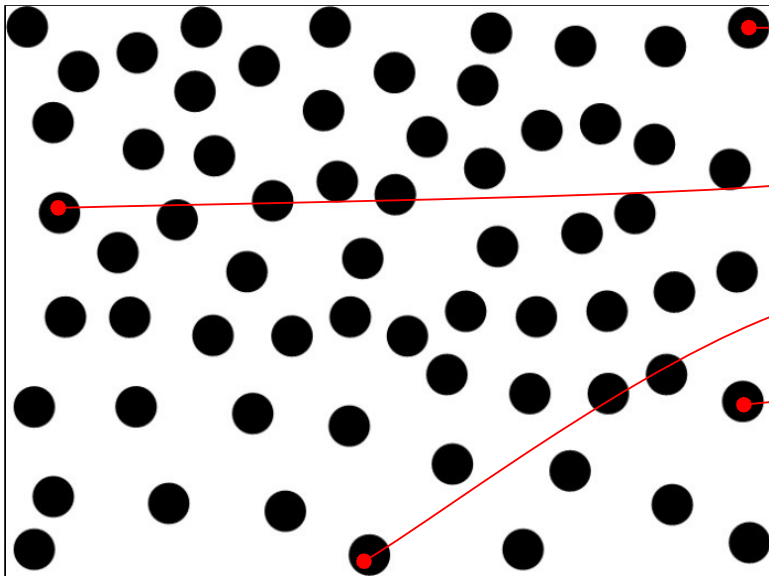
Delaunay descriptor

$$\cos(\alpha_{ij}) = \frac{d_i^2 + d_j^2 - d_{ij}d_{ji}}{2d_id_j}$$

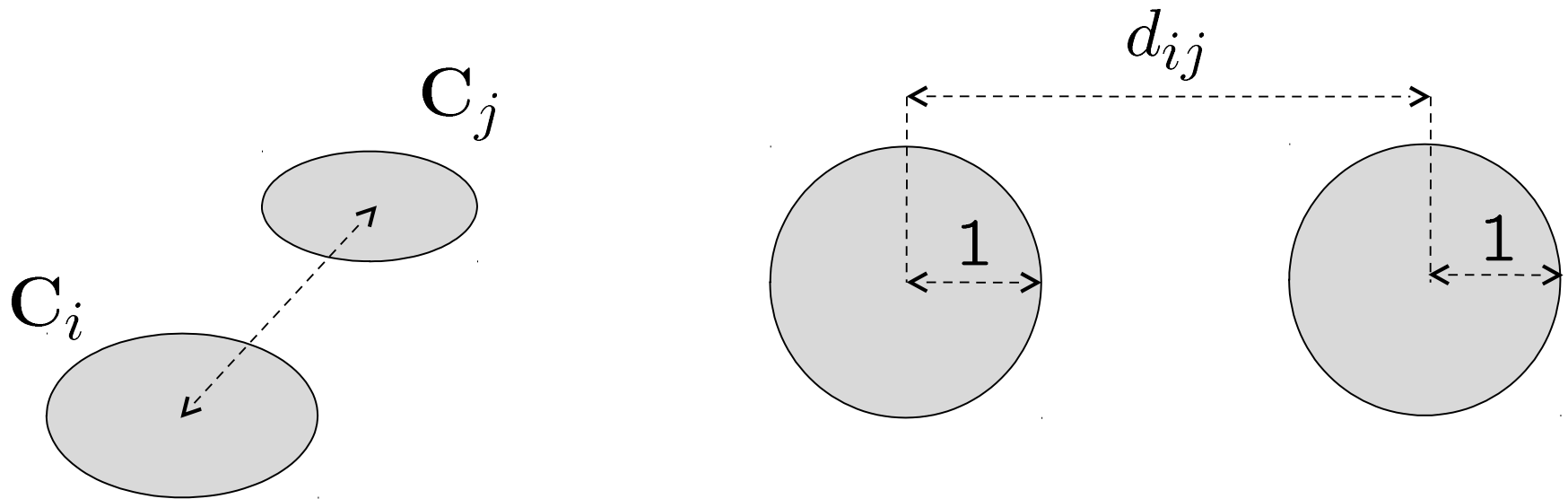$$[\cos(\alpha_{ij}), \cos(\alpha_{jk}) \ldots \cos(\alpha_{li})]$$

What if strong perspective distortion is present?

- Delaunay is not perspective invariant...

...not even affine invariant...

...the solution is to exploit conics.

Two-conic perspective invariant

$$\mathbf{M} = \mathbf{C}_i^{-1}\mathbf{C}_j$$

$$d_{ij}^2 = 3 - trace(\mathbf{M})det(\mathbf{M})^{-\frac{1}{3}}$$

Fiduciary pattern video example