

Project 2

Reconstruction of
3D object / scene
from multiple views

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Initial assumptions

- A single camera is moving around in 3D space, taking pictures at multiple **distinct** positions of one and the same object/scene.
- These positions are **not known** with sufficient accuracy
- The camera has **known internal calibration** parameters that are constant
- Lens distortion effects are neglected
 - Or has been compensated for
 - **The pin-hole camera model is valid**

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Example: multiple views of a dinosaur



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Initial assumptions (II)

- The images are ordered, for example, over a temporal parameter
 - Two consecutive images in the sequence have a smaller baseline than images that are far apart in the sequence
 - Adjacent images in the sequence can be expected to have a significant overlap. This means that many points are visible in both images.
 - Many tentative correspondence can be found
- The camera path may or may not be closed

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Project goal

- Based only on these images and the camera calibration:

Generate a 3D representation
of the object/scene

- The 3D representation can then be rendered from any viewpoint, even one not included in the data set

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The 3D representation

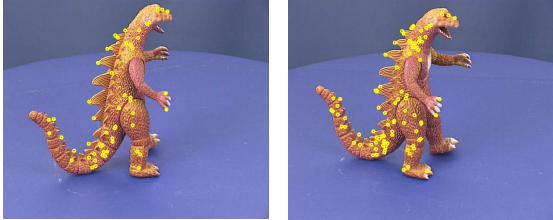
- The object(s) in the scene is represented in terms of a set of 3D points
 - Initially unordered (a *point cloud*)
 - Using spatial relations in 3D space and in the 2D images the 3D points can be connected into one or more 2D surfaces in 3D spaces
 - These surfaces can be texture-mapped using the 2D images

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Example: initial data



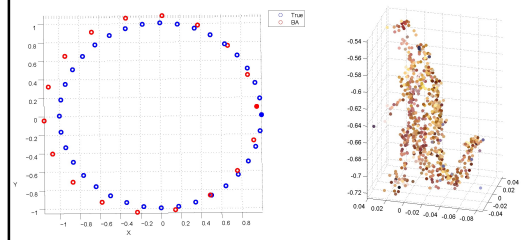
Two examples of images from the *dinosaur* sequence, with corresponding interest points

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Example: result



Results from 2011 project by Bertil Grelsson and Freddie Åström

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