

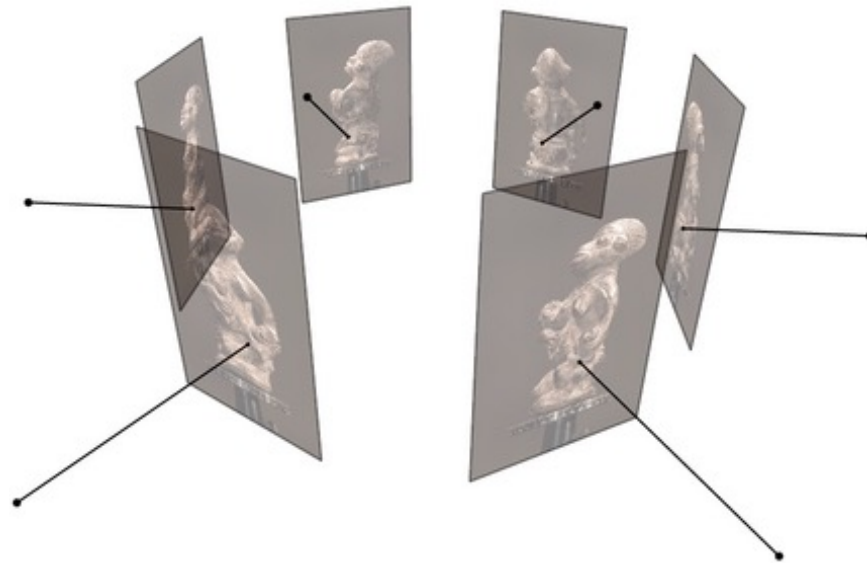
Recovering Dense Geometry

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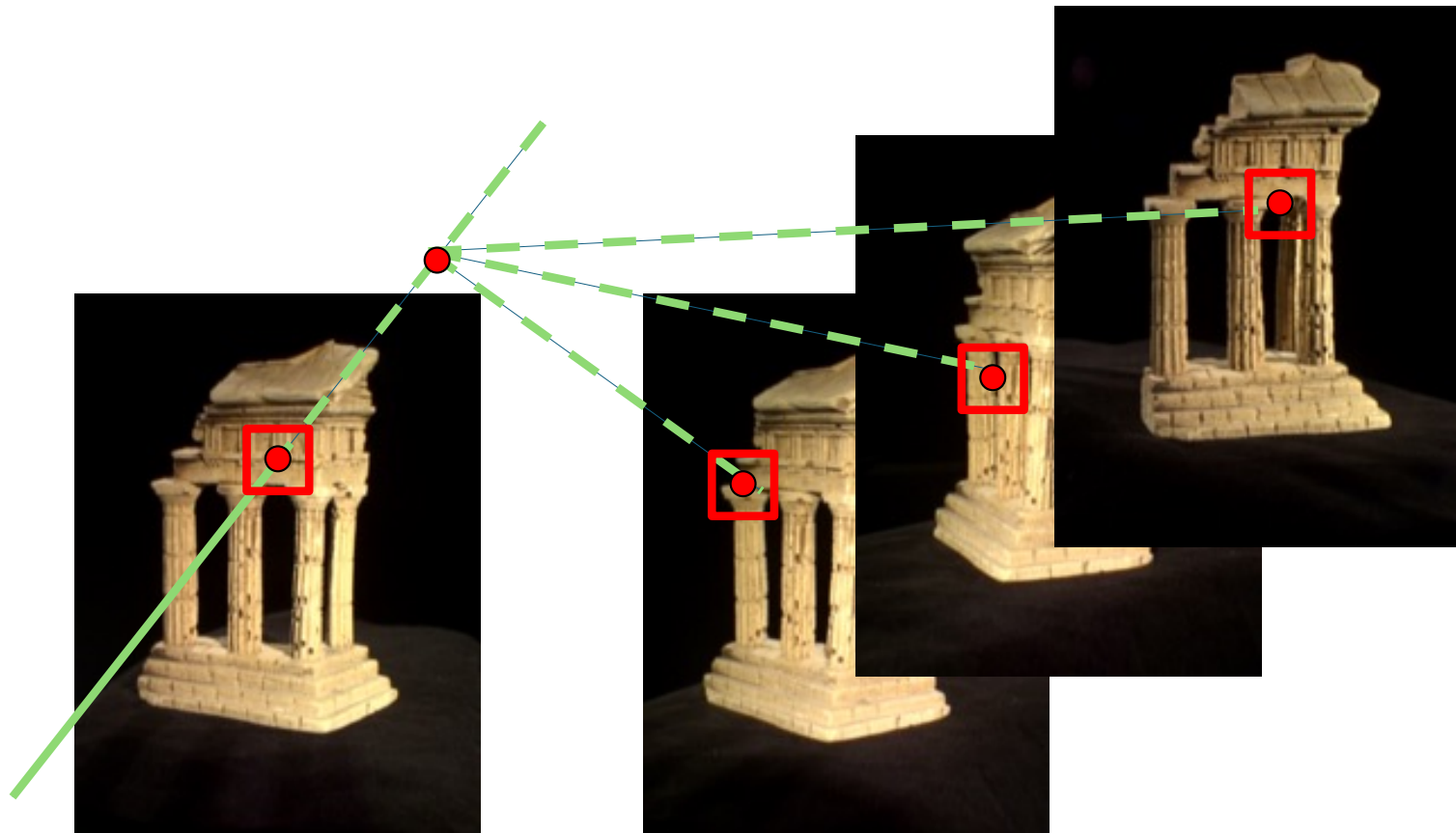
Multi-view stereo

- Goal: given several images of the same object or scene, compute a representation of its 3D shape



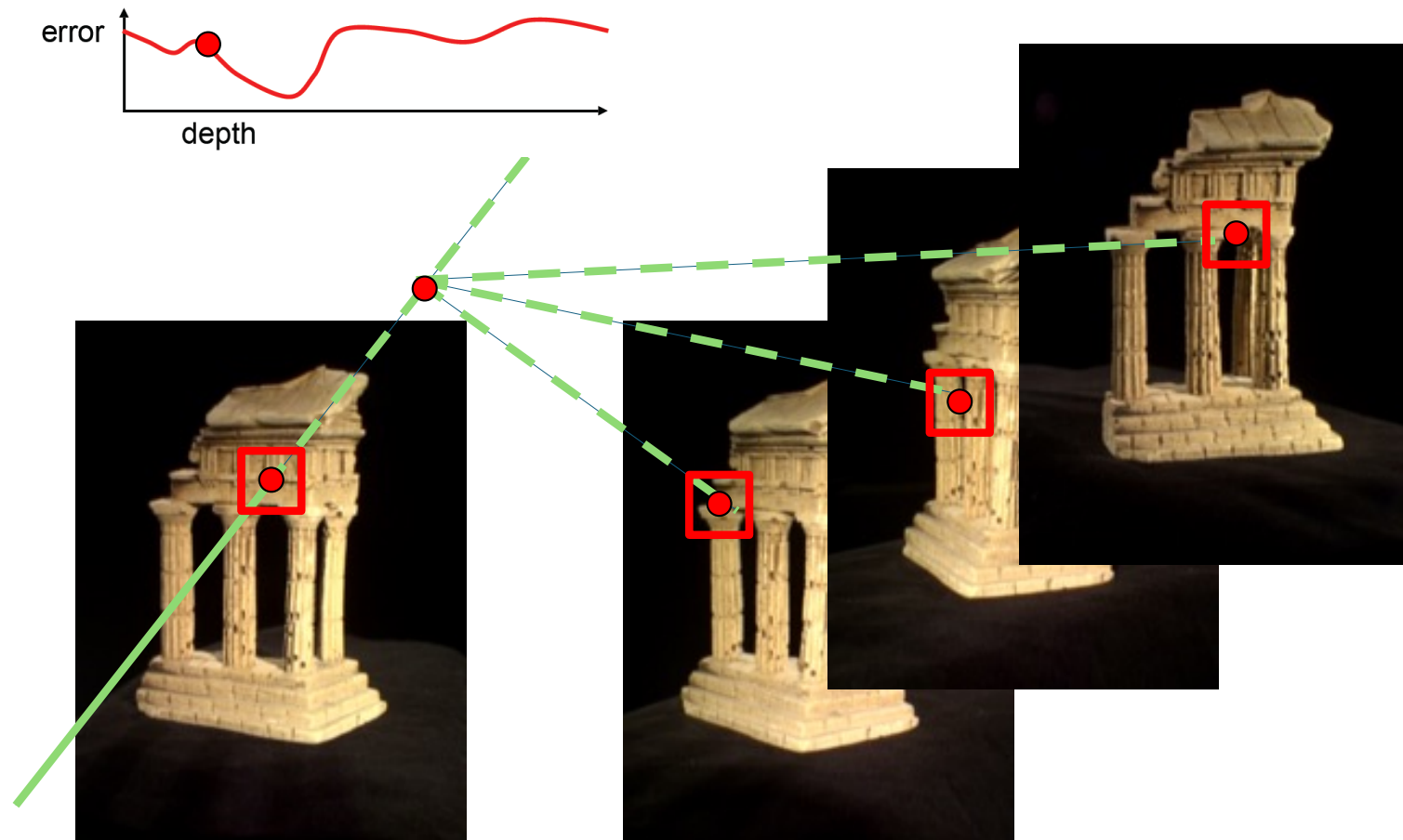
Source: C. Hernandez, N. Snavely

Multi-view stereo: Basic idea



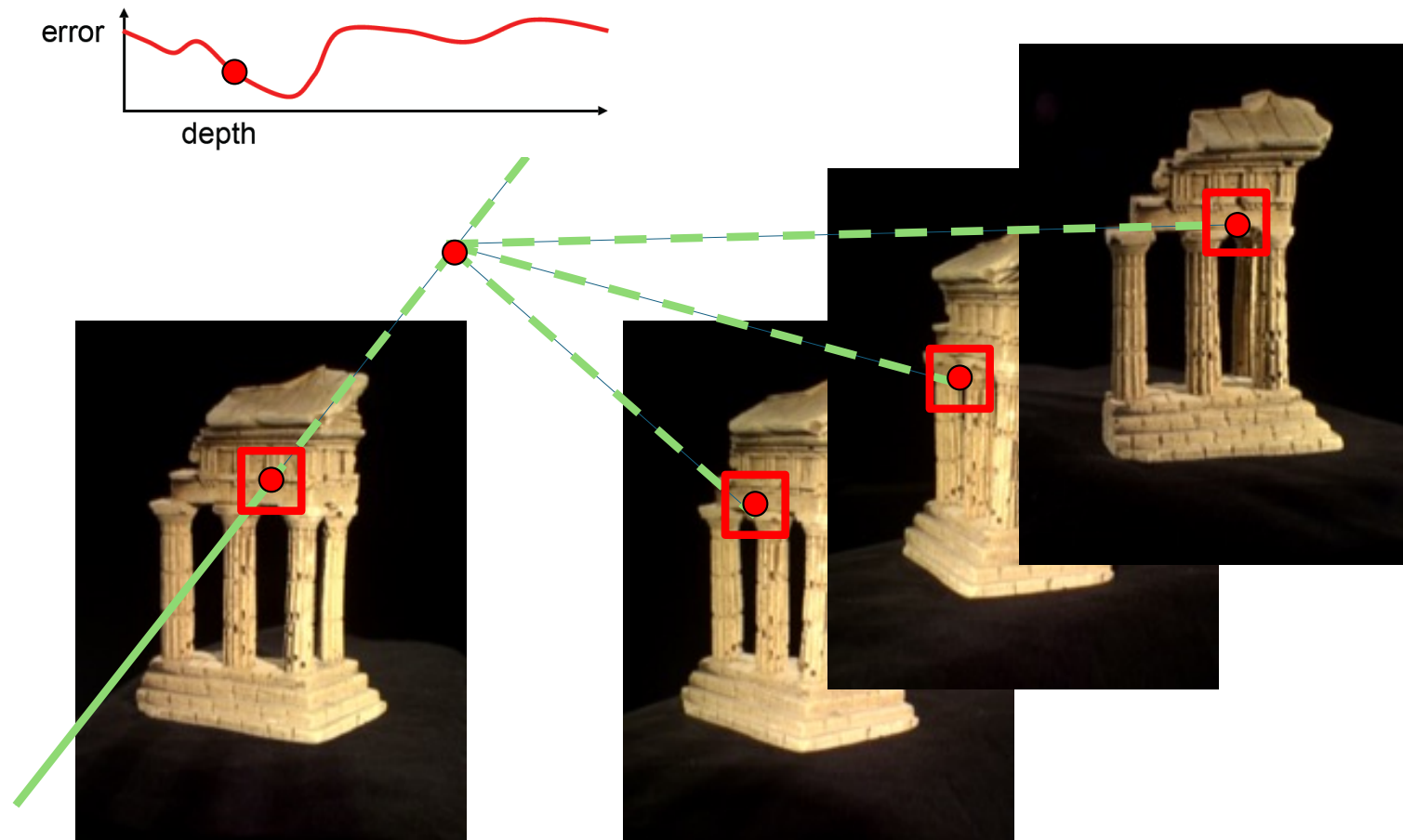
Source: Y. Furukawa

Multi-view stereo: Basic idea



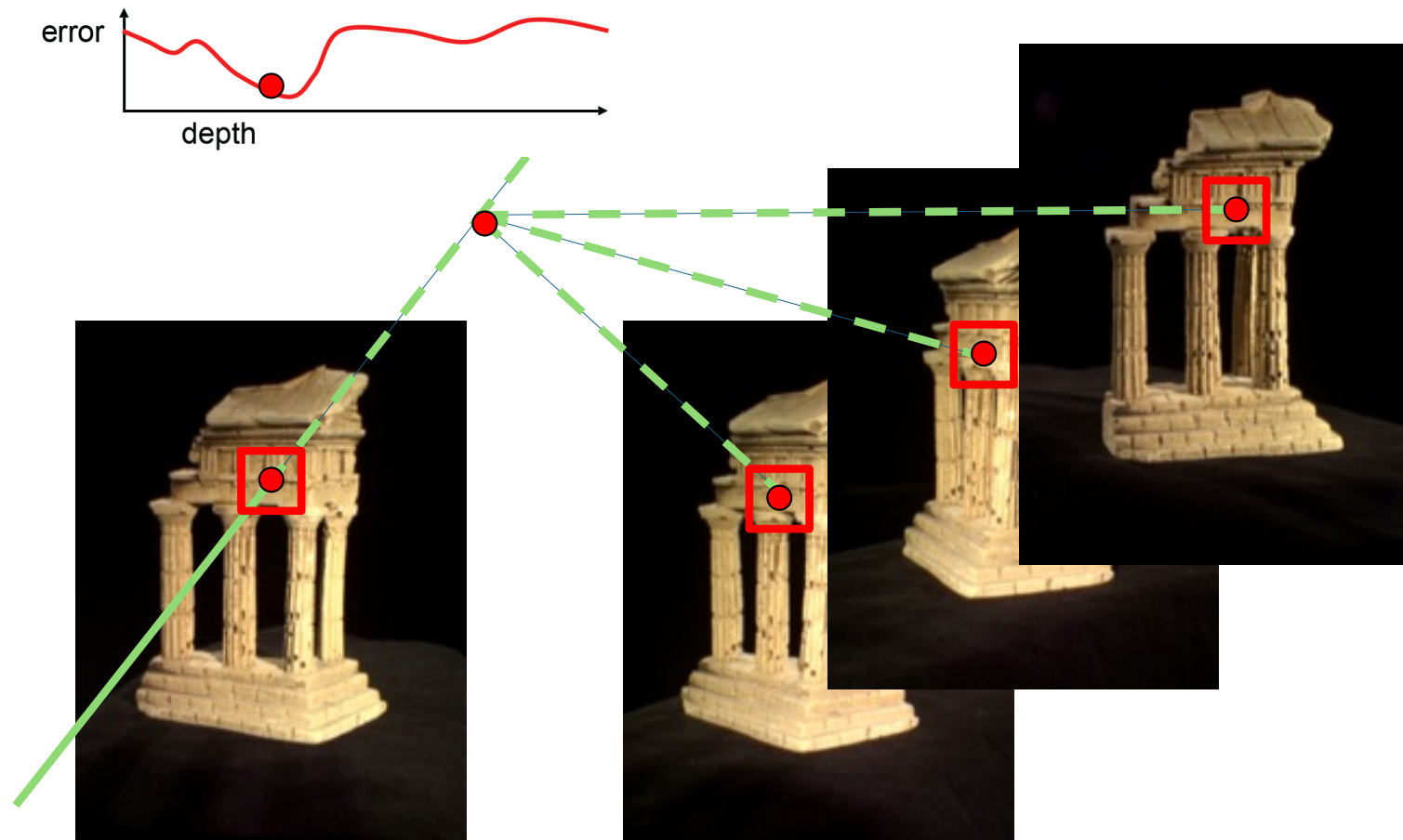
Source: Y. Furukawa

Multi-view stereo: Basic idea



Source: Y. Furukawa

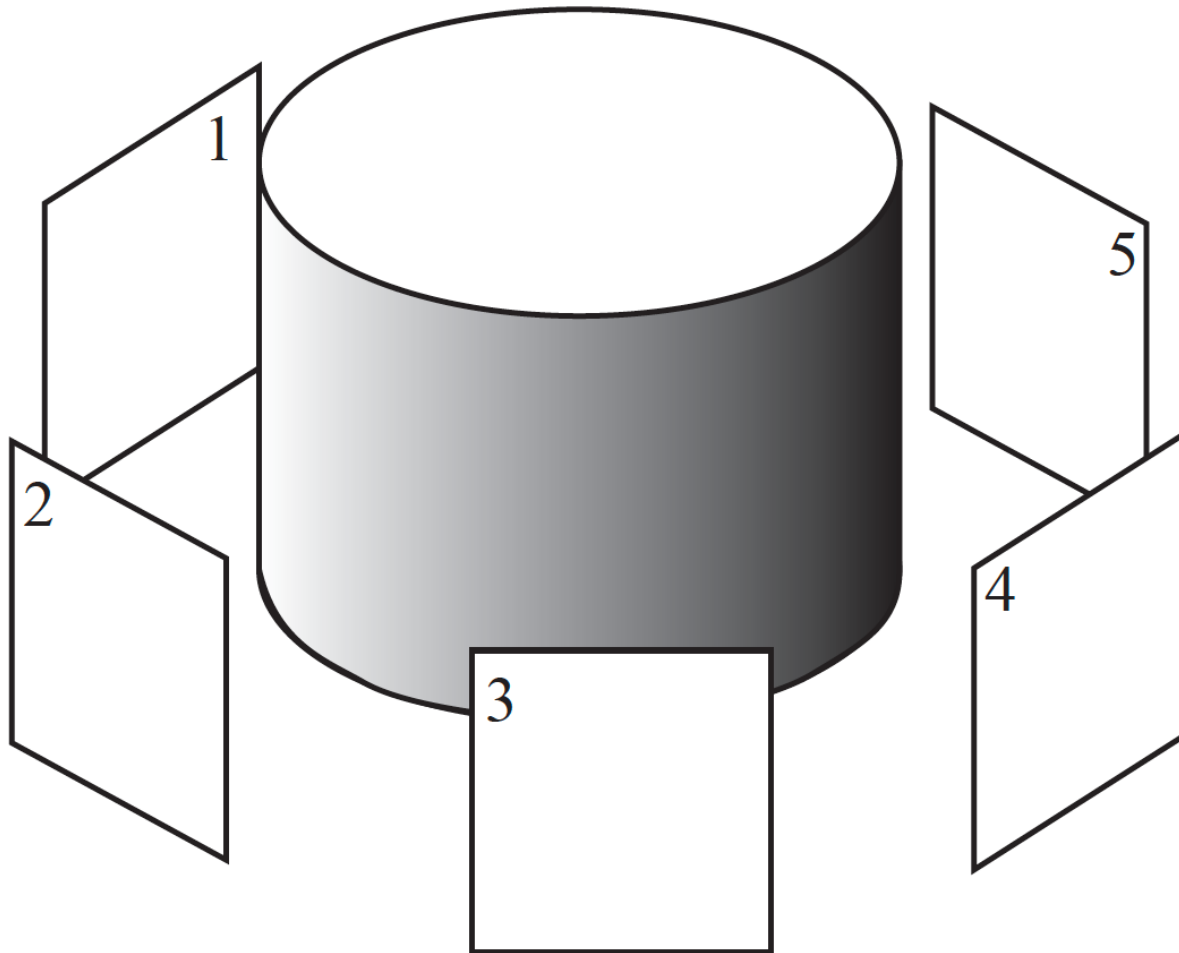
Multi-view stereo: Basic idea



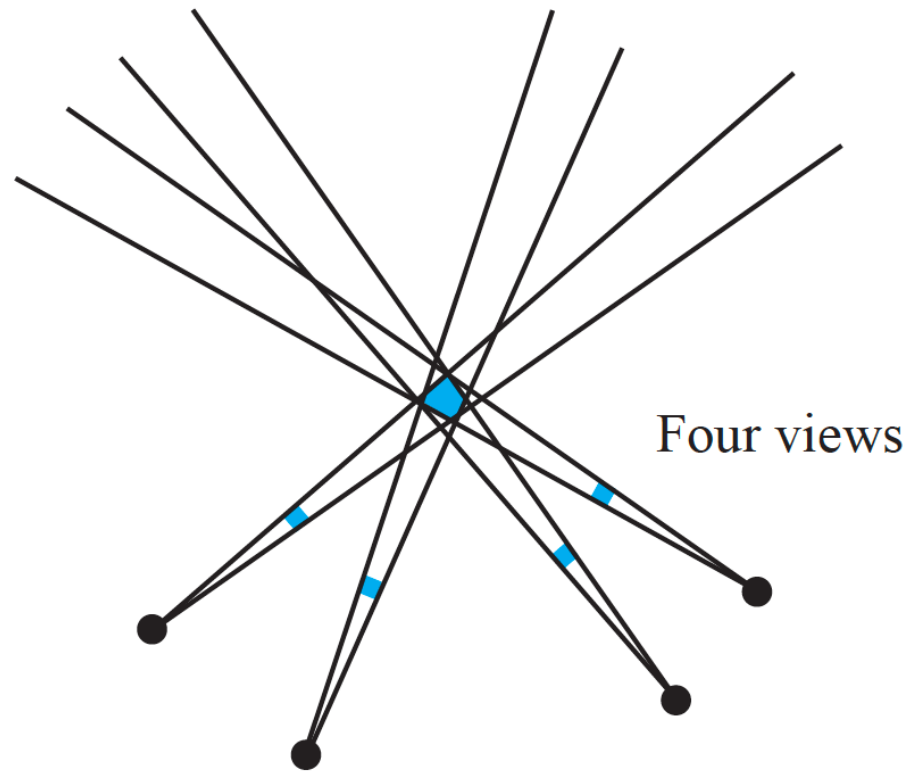
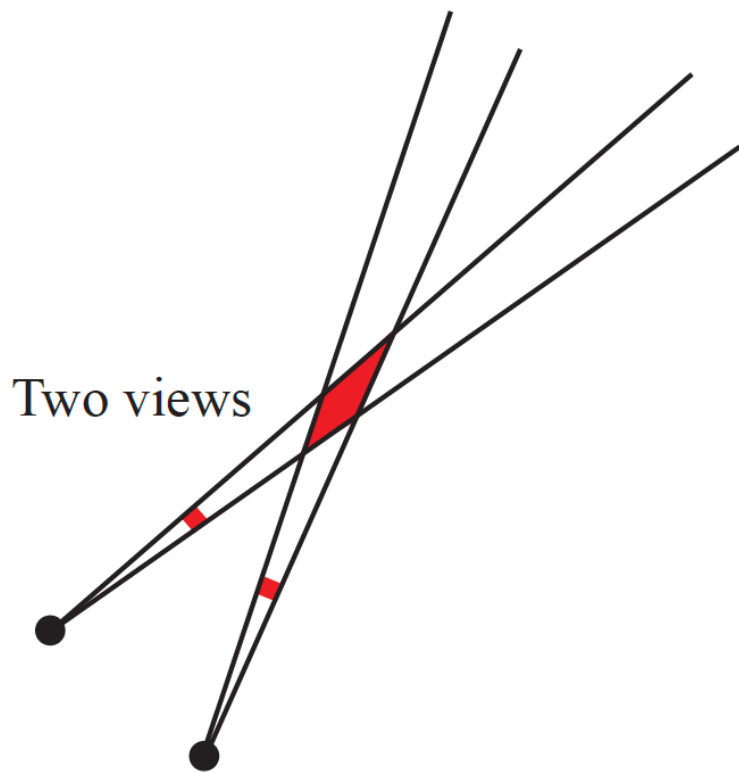
Source: Y. Furukawa

Visibility issues

- 1 and 2 see things that 3 and 4 can't, etc...



Improved error estimates



What representation of geometry?

- The one that is most useful
 - Geometric representation = query answer system
 - (Malcolm Sabin)
- Original sin of geometric modelling
 - computations are easy in one rep'n, hard in another
 - eg compute volume in point map?
 - eg intersect two B-Reps (do-able, but a performance)
 - eg intersect ray with surface
 - NURBS – tricky; Sturm sequence
 - Triangle mesh – straightforward
 - CSG – depends on primitives, but often easy
 - transforming between rep'ns can be tricky
 - CSG -> mesh – easy
 - mesh -> CSG - hard

What is it for?

- Rendering
 - make a new picture of this thing
 - applications:
 - simulation; entertainment; access to antiquities; etc
- Computations
 - intersection; volume; length; area; etc
 - applications:
 - maintenance; support construction; etc
- Editing
 - adjust the scene, then render some of it
 - meaningful segmentation
 - applications:
 - simulation; entertainment; access to antiquities; etc

Options

- Here:
 - Multiple depth maps
 - Point clouds
 - Voxel grids
 - Implicit functions
 - Density functions
 - Primitives
- Others
 - CSG rep'ns
 - NURBS
 - etc.