

18CSE390T
Computer Vision

Constrained Structure and
Motion

Constrained Structure and Motion

- If the object of interest is rotating around a fixed but unknown axis, specialized techniques can be used to recover this motion.
- In other situation, the camera itself may be moving in a fixed arc around some center of rotation.
- Specialized capture steps, such as mobile stereo camera rigs or moving vehicles equipped with multiple fixed cameras, can also take advantage of the knowledge that individual cameras are mostly fixed with respect to the capture rig.

Constrained Structure and Motion (cont).

Line-based technique:

- Pairwise epipolar geometry cannot be recovered from line matches alone, even if the cameras are calibrated.
- Consider projecting the set of lines in each image into a set of 3D planes in space. You can move the two cameras around into any configuration and still obtain a valid reconstruction for 3D lines.

Constrained Structure and Motion (cont).

- When lines are visible in three or more views, the trifocal tensor can be used to transfer lines from one pair of image to another.
- The trifocal tensor can also be computed on the basis line matches alone.
- For triples of images, the trifocal tensor is used to verify that the lines are in geometric correspondence before evaluating the correlations between line segments.

Constrained Structure and Motion (cont).

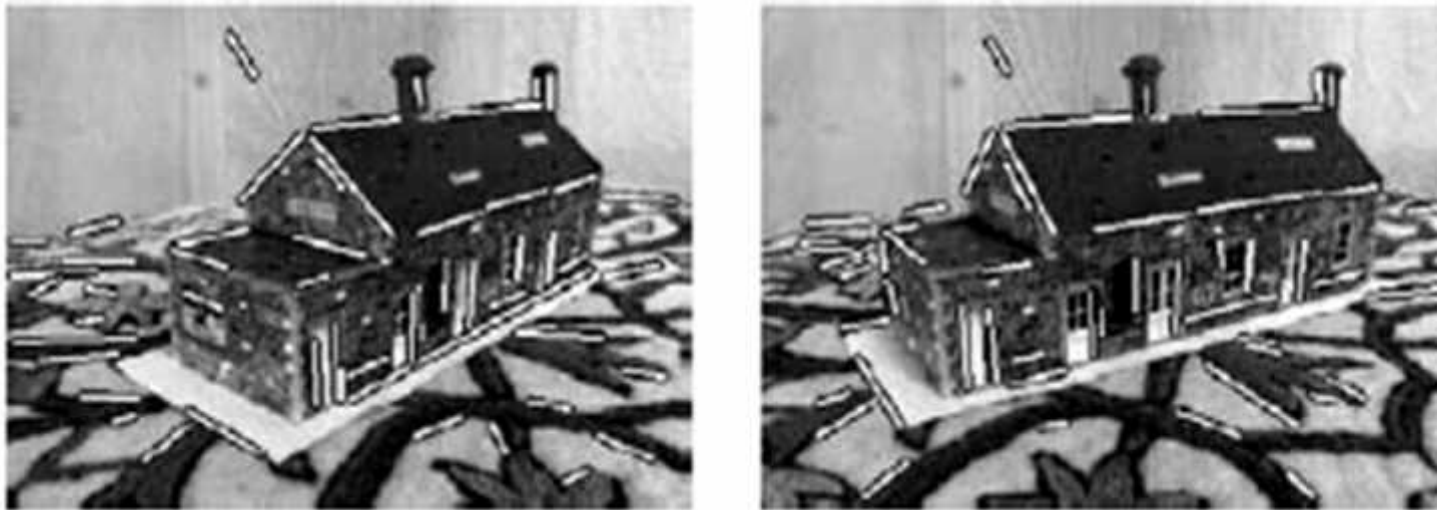


Figure: Two images of toy house along with their matched 3D line segments.

Constrained Structure and Motion (cont).

- Plane-based technique:

Better approach is to hallucinate virtual point correspondences within the area from which each homography was computed and to feed them into a standard structure from motion algorithm.