

CSCI 497P/597P: Computer Vision

Scott Wehrwein

Two-View Geometry



Reading

- Szeliski, Ch. 7.2

Happenings

- Wednesday, 2/20 – [Peer Lecture Series: Unity Workshop](#) – 5 pm in CF 420
- Wednesday, 2/20 – [CS Research Info Session](#) – 5 pm in CF 105
- Wednesday, 2/20 – [Grace Hopper Info Panel](#) – 5 pm in AW 203
- Thursday, 2/21 – CSCI Faculty Candidate: Research Talk – 4 pm in **CF 226**
- Friday, 2/22 – CSCI Faculty Candidate: Teaching Talk – 4 pm in **CF 227**
- Saturday & Sunday, 2/23 – 2/24 – [Winter Game Jam](#) – 10 am – 10 pm in CF 105, 162, 164

Announcements

- Exam is Wednesday
 - Covers material through Friday
 - One double-sided sheet of notes.
 - Calculator allowed but shouldn't be needed.
 - Study guide is available as a Page on Canvas
 - The handwritten notes linked on the course webpage may be ugly, but they are usually more pertinent than the slides when available.

Announcements

- Still looking for help with a bite-sized research project vectorizing some remote sensing code.
- HW1 graded on completion. Many people have many incorrect answers – suggest diffing your version with the solutions.
 - Solutions have one known bug: the R_b matrix in problem 12 should not have a 1 in the bottom right corner.

Goals

- Understand the interpretation of points in 2D projective space as vectors (rays) in 3D space.
- Understand the geometric interpretation of a homography as a camera rotation.
- Understand the interpretation of lines in 2D projective space as planes in 3D space.
- Understand the duality of points and lines:
 - How to calculate the line through two points
 - How to check whether a point lies on a line

Projective Geometry: Homogeneous Points

- whiteboard / lecture notes

Projective Geometry: Homogeneous Points

Which of the following 3-vectors does not represent the same projective point as the others?

- A. $[12, 8, 4]$
- B. $[8, 6, 3]$
- C. $[24, 16, 8]$
- D. $[15, 10, 5]$

Projective Geometry: Homogeneous Points

Which of the following 3-vectors does not represent the same projective point as the others?

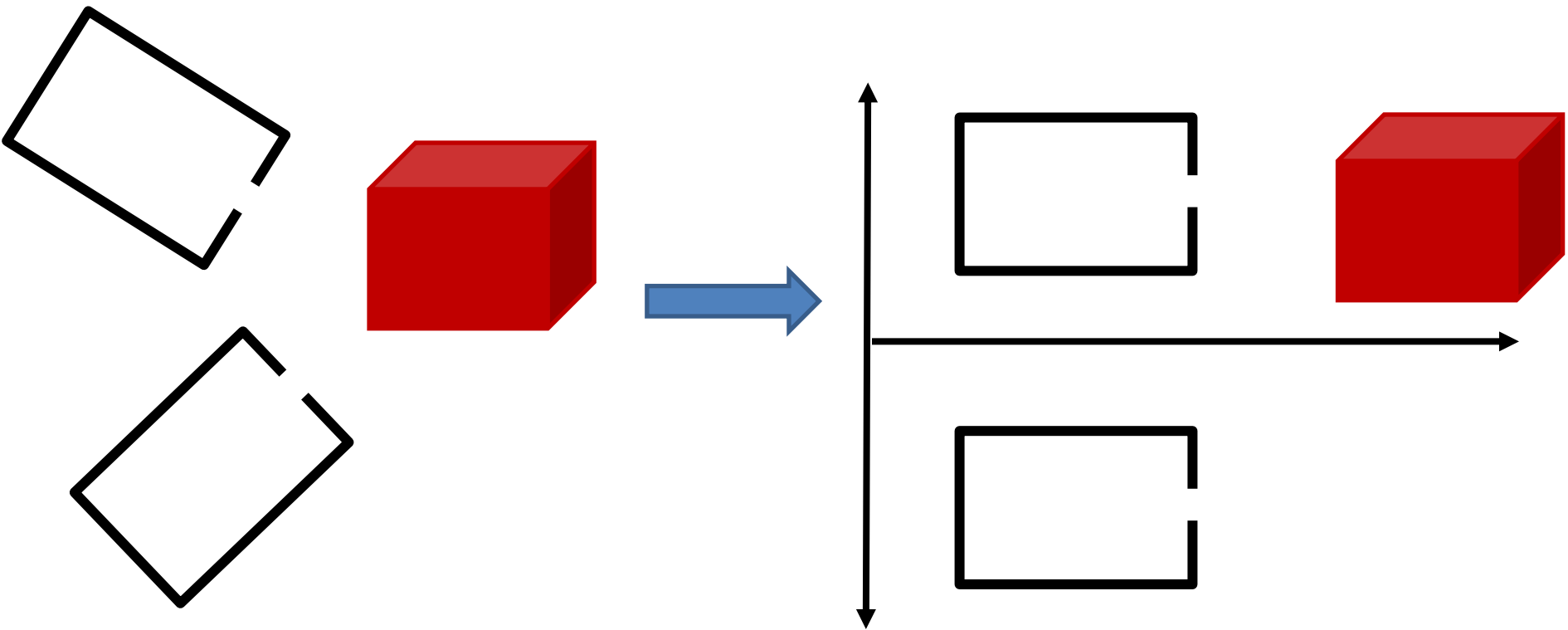
- A. $[12, 8, 4]$
- B. $[8, 6, 3]$
- C. $[24, 16, 8]$
- D. $[15, 10, 5]$

What are the normalized homogeneous coordinates of the point from above?

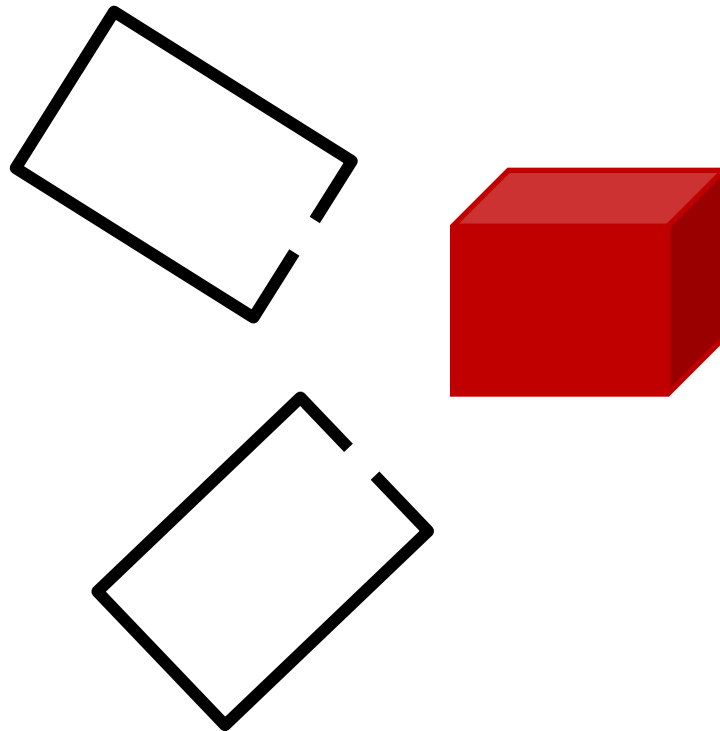
Homography as Rotation

- whiteboard / lecture notes

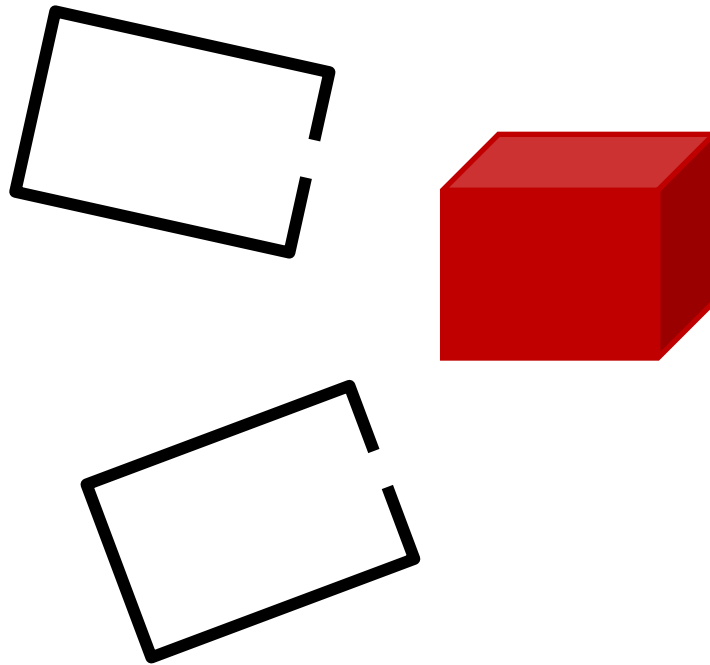
Rectifying cameras



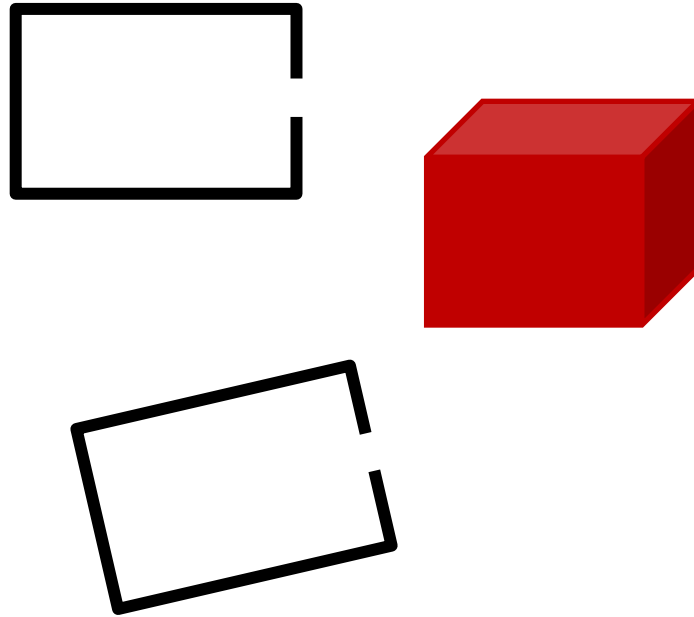
Rectifying cameras



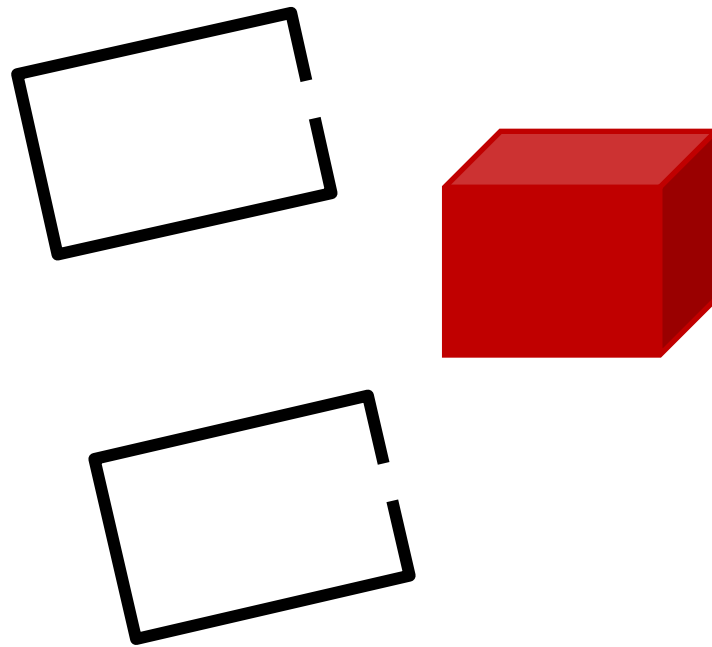
Rectifying cameras



Rectifying cameras



Rectifying cameras



Rotating cameras



Stereo Rectification

- (see whiteboard / lecture notes)
- Rectifying a stereo pair only requires rotating the cameras so they face a common projection plane.

Projective Geometry: Homogeneous Lines

- (see whiteboard/ lecture notes)

Projective Geometry: Homogeneous Lines

- (see whiteboard/ lecture notes)
- What are the homogeneous (projective) coordinates for the following lines:
 - $y = -x$