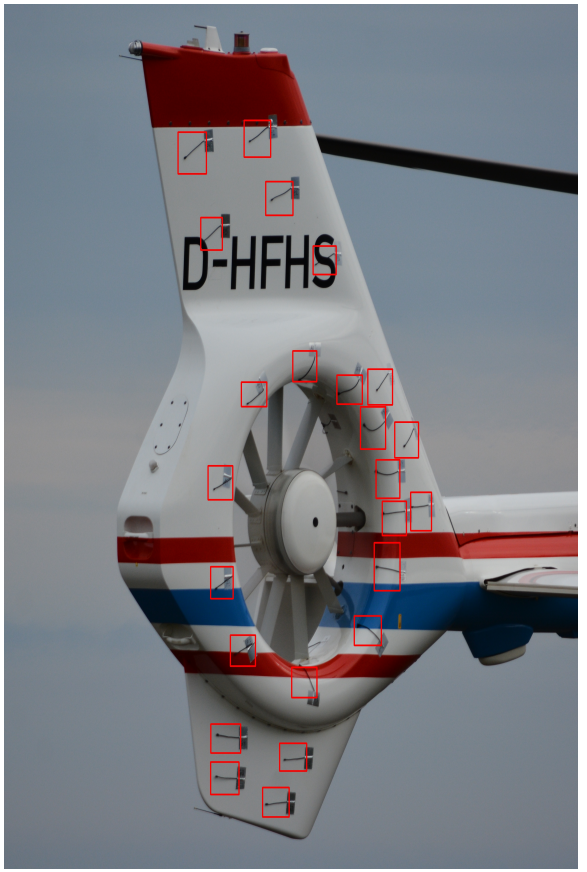
Label mapping

Given an image with coordinates and labels, find the corresponding labels in a different image (different perspective, scale, rotation...)

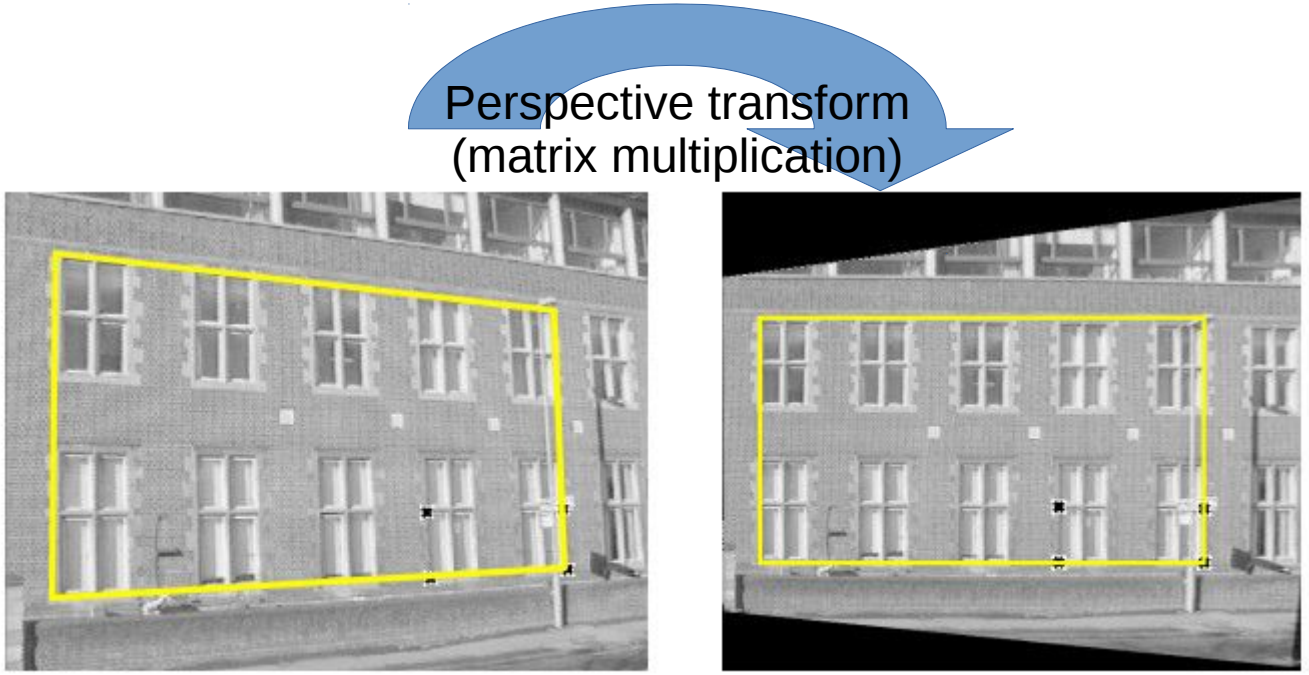
Known coordinates and known labels (manual input)



Known coordinates (from object detection, red boxes), which box has which label?

Approach based on classical computer vision

- A plane can be transformed to another plane by a homography (perspective transform)
- Needed: 4 point in source image and 4 corresponding point in the image to transform (this can be a problem!)
- Only works for a plane, our tufts are on a curve surface, so we may run into trouble… (especially for tufts that a inside the duct)



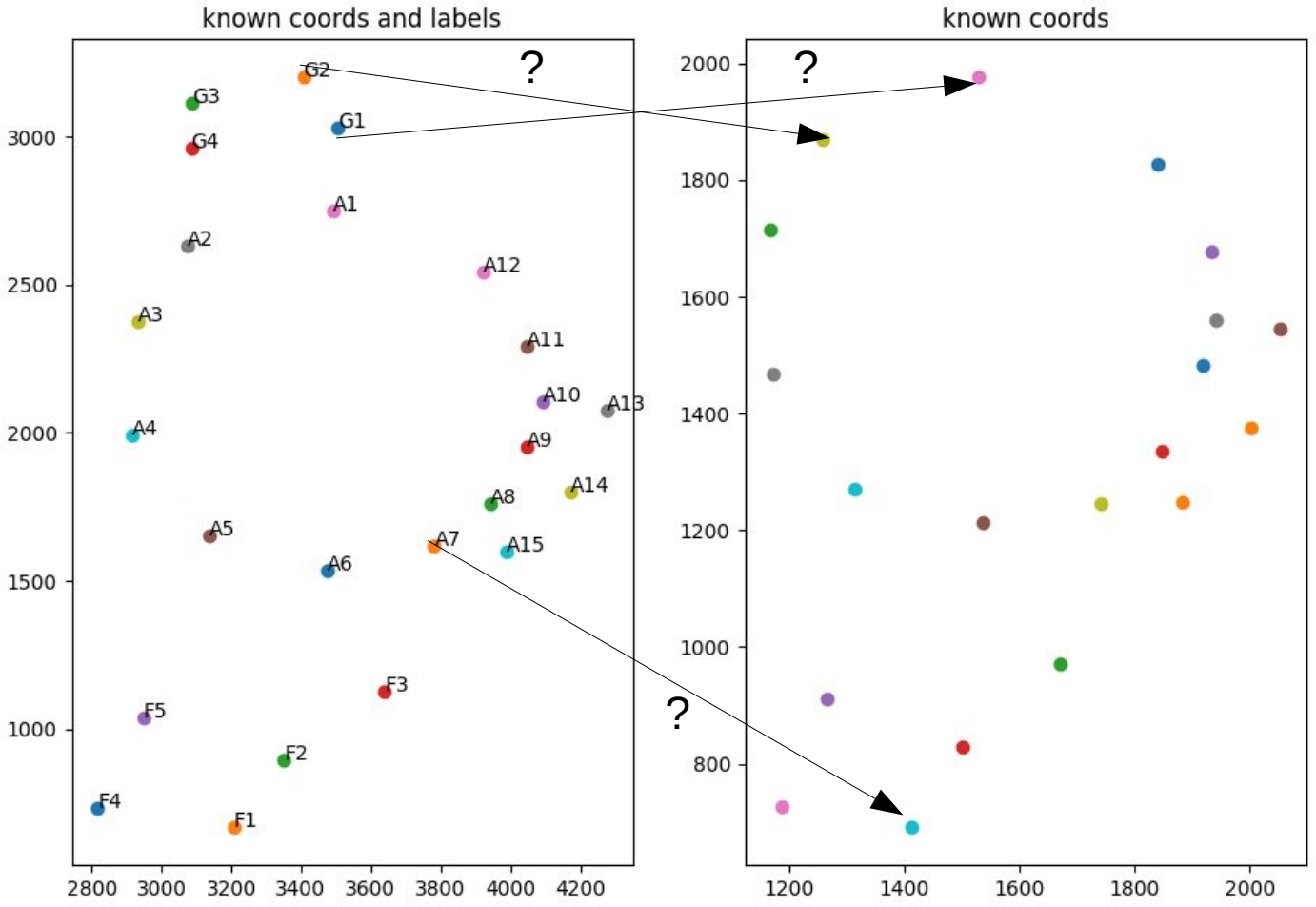
from Hartley & Zisserman

Homography vs Affinetranform

- Homography needs 4 corresponding point, parallel line may not stay parallel under transform.
- Affine transform: needs 3 corresponding points, less degrees of freedom than homography, parallel line stay parallel under transform.

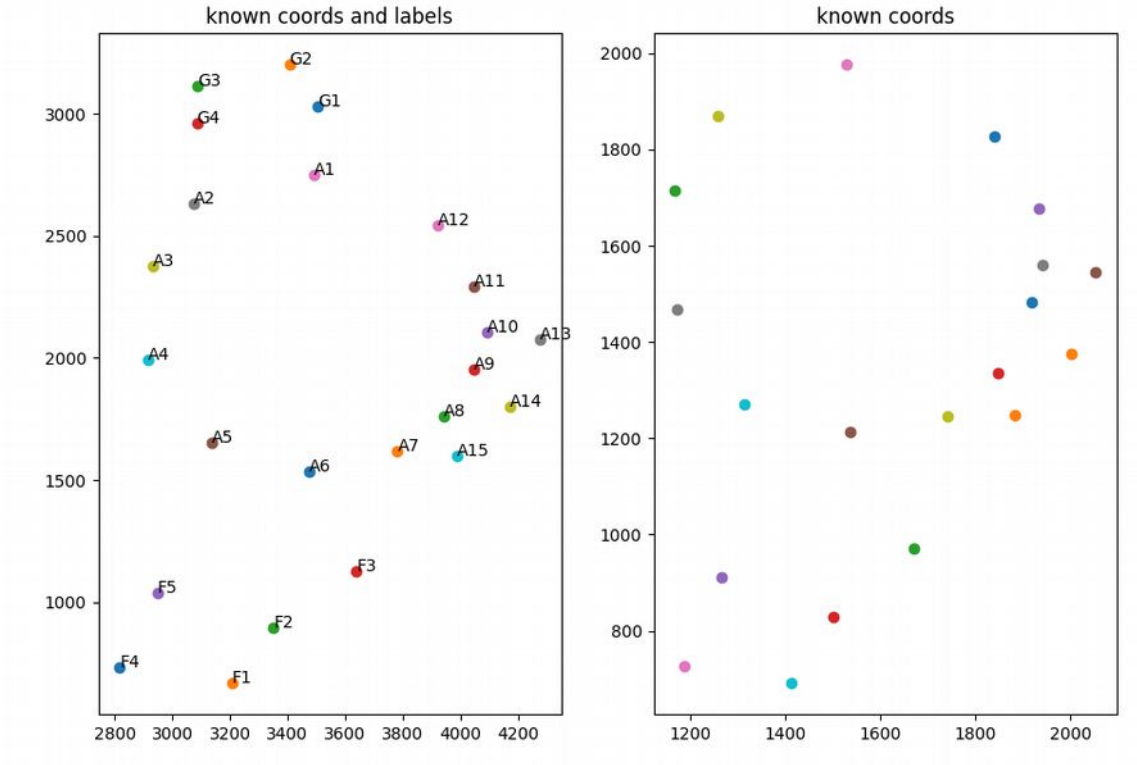
Affine transform

- Affine transform found to be more robust than homography
- Key: find 3 corresponding points!

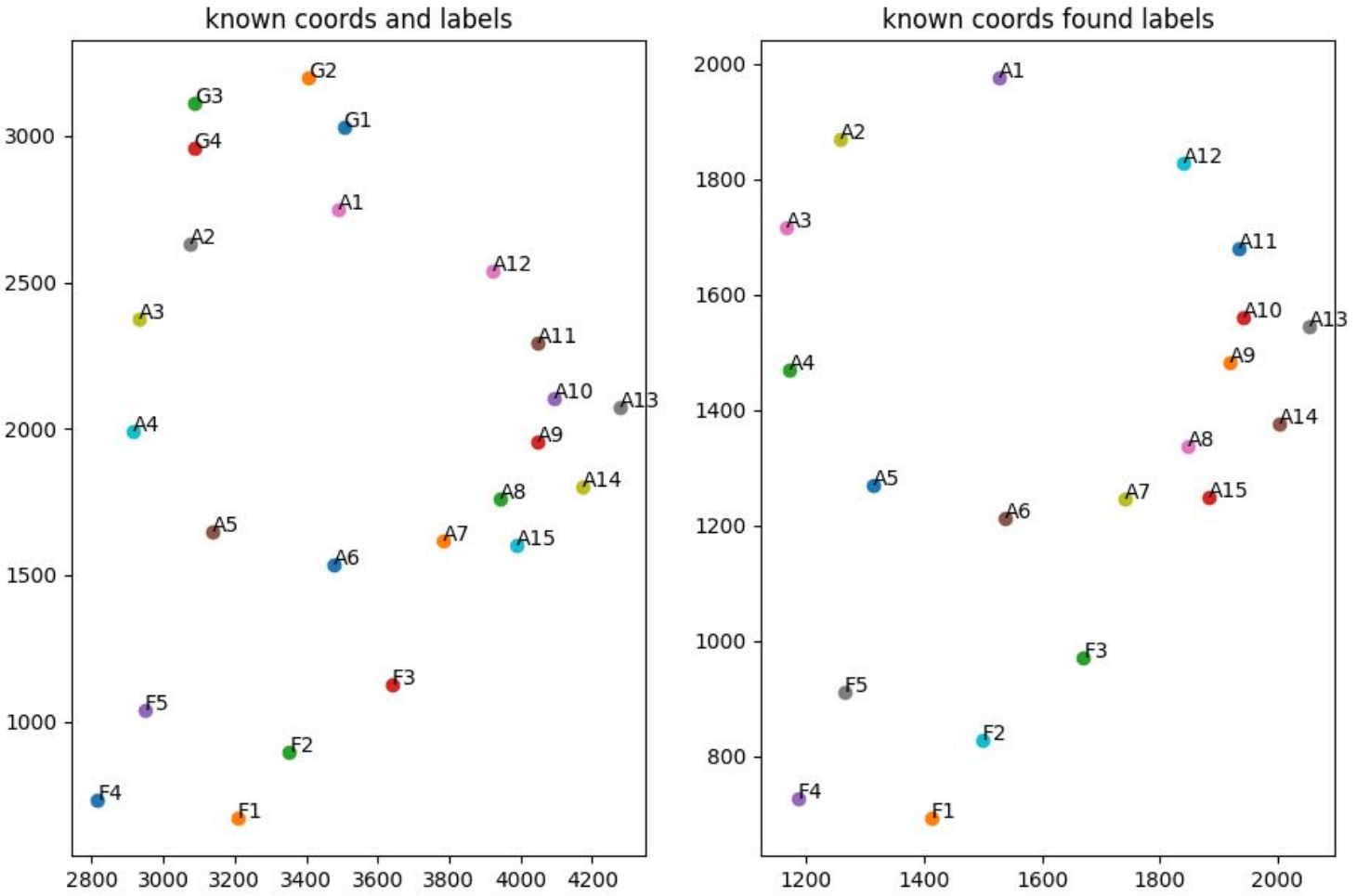


Corresponding points

- Brute force try all possible combinations
- How many are there? Pick 3 out of 24 positions: 24!/21! = 12144
- Can be further reduced to ~6000 (can be solved <1s)
- Evaluate transform based on distance between found coordinates and the given coordinates.



Results


known coords and labels
G2
G3
G1
G4
A1
A2
A12
A3
A11
A10
A13
A4
A9
A14
A8
A5
A7
A15
A6
F3
F5
F2
F4
F1
3000
2500
2000
1500
1000
2800
3000
3200
3400
3600
3800
4000
4200
known coords found labels
A1
A2
A12
A3
A11
A10
A13
A4
A9
A14
A8
A5
A7
A15
A6
F3
F5
F2
F4
F1
2000
1800
1600
1400
1200
1000
800
1200
1400
1600
1800
2000