

Computer Vision  
and Geometry Lab



# Computer Vision

## Exercise Session 7 – Structure from Motion

# Structure from Motion

- Arc3D **www.arc3d.be**
  - <http://www.youtube.com/watch?v=0tzW8dm71ec>
- Acute3D (123D Catch **www.123dapp.com/catch**)
  - <http://www.youtube.com/watch?v=UwBd1RbKljk>
- 2D3 boujou
  - <http://www.youtube.com/watch?v=qrszsSbStoQ>
- etc...

# Exercise 7

- 5 Images of a house on a turn table
- Background is static = at infinity



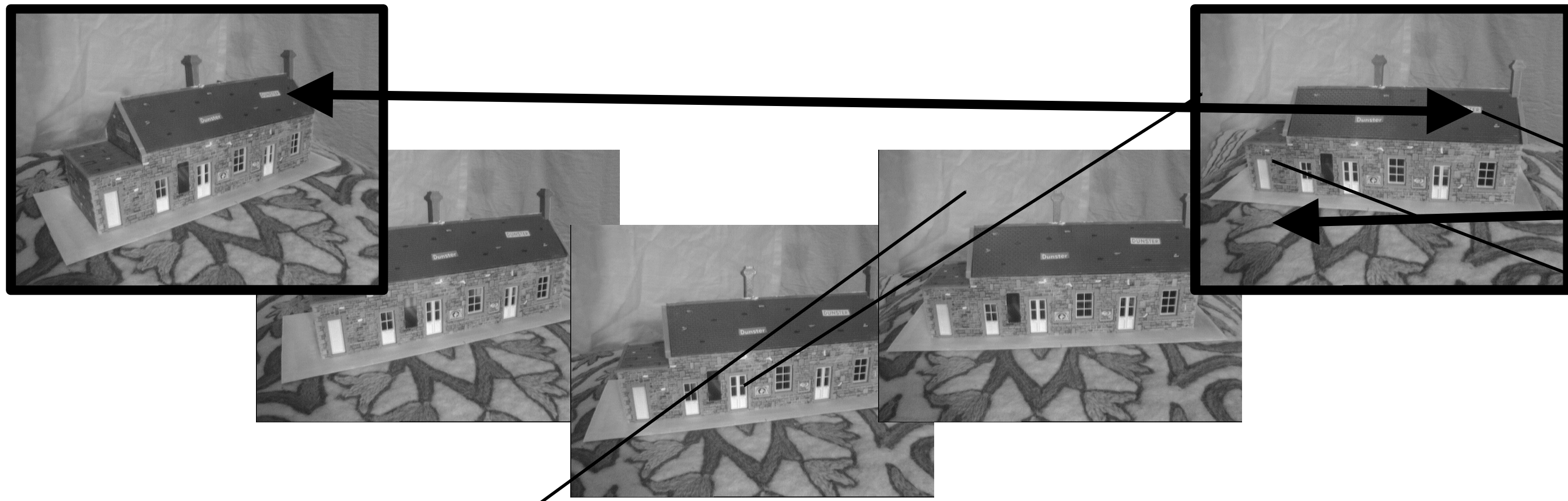
# Exercise 7

## ■ 4 Tasks:

- Initialization with epipolar geometry
  - Do 8-point RANSAC and triangulate
- Add more views
  - Do 6-point RANSAC and triangulate
- Plot everything
- Dense Reconstruction
  - Stereo matching and depth map plot

# Initialization

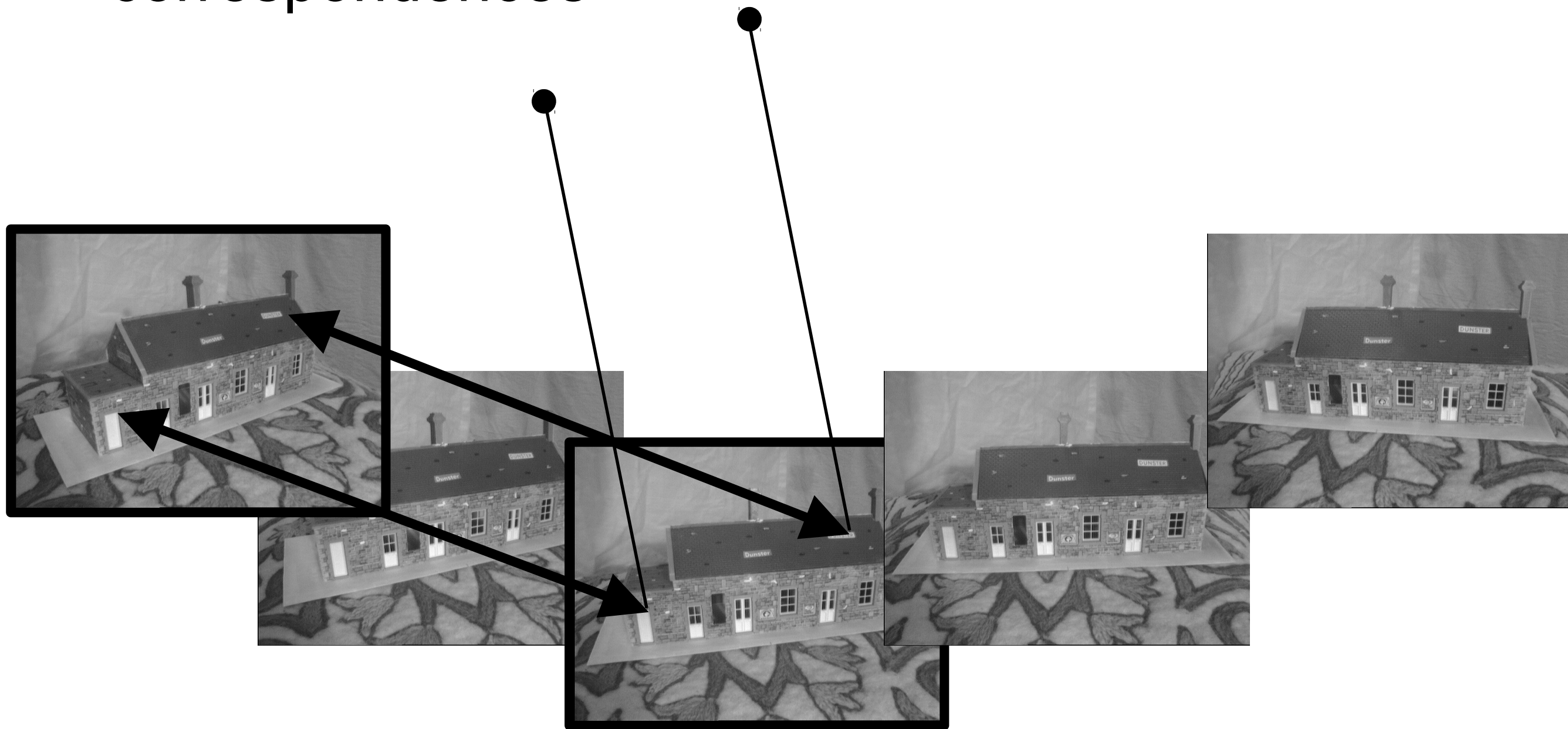
- Compute essential matrix, decompose into  $R$  and  $t$ , compute projection matrices





# Adding more views

- Feature matches define 3D-2D point correspondences

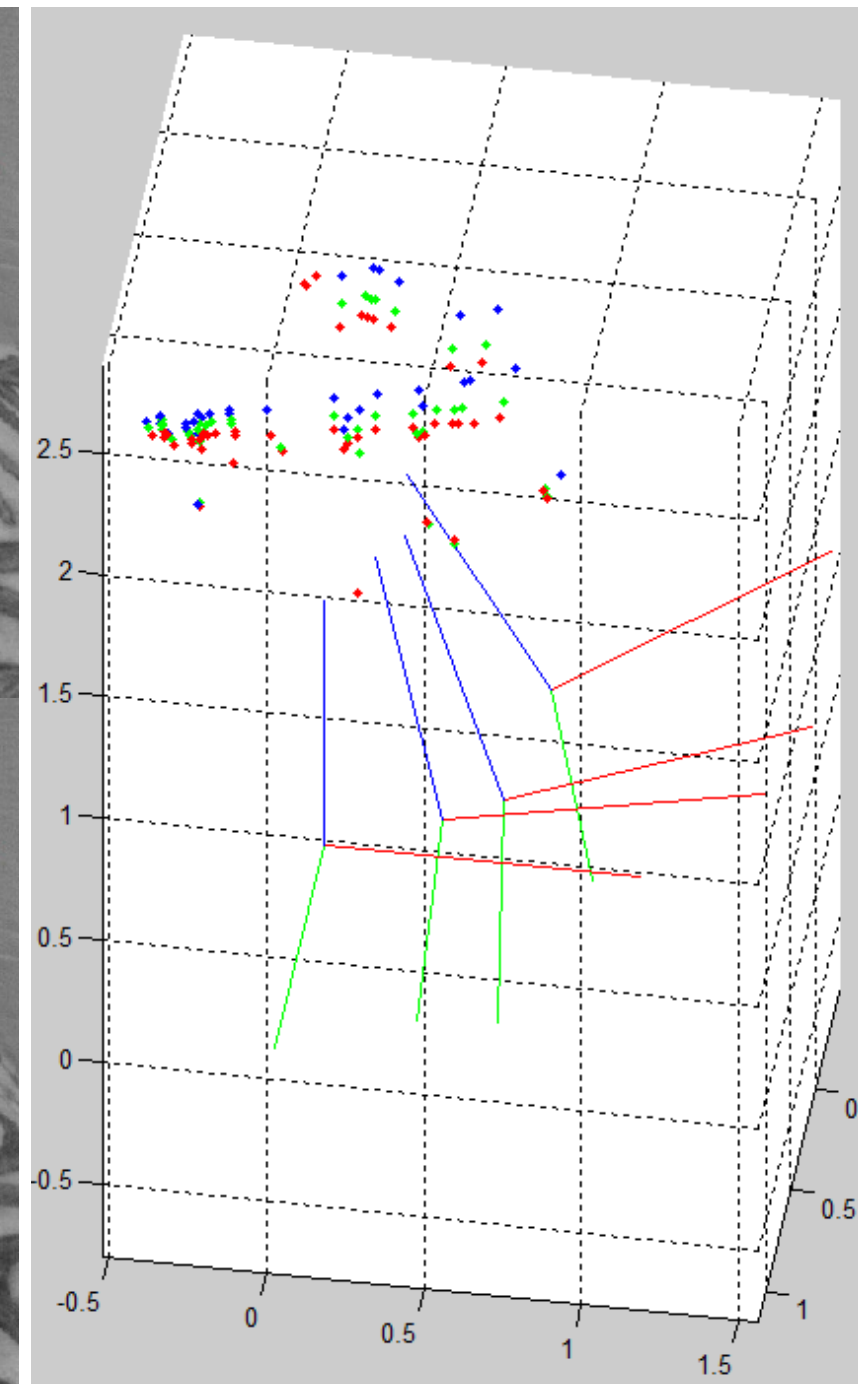
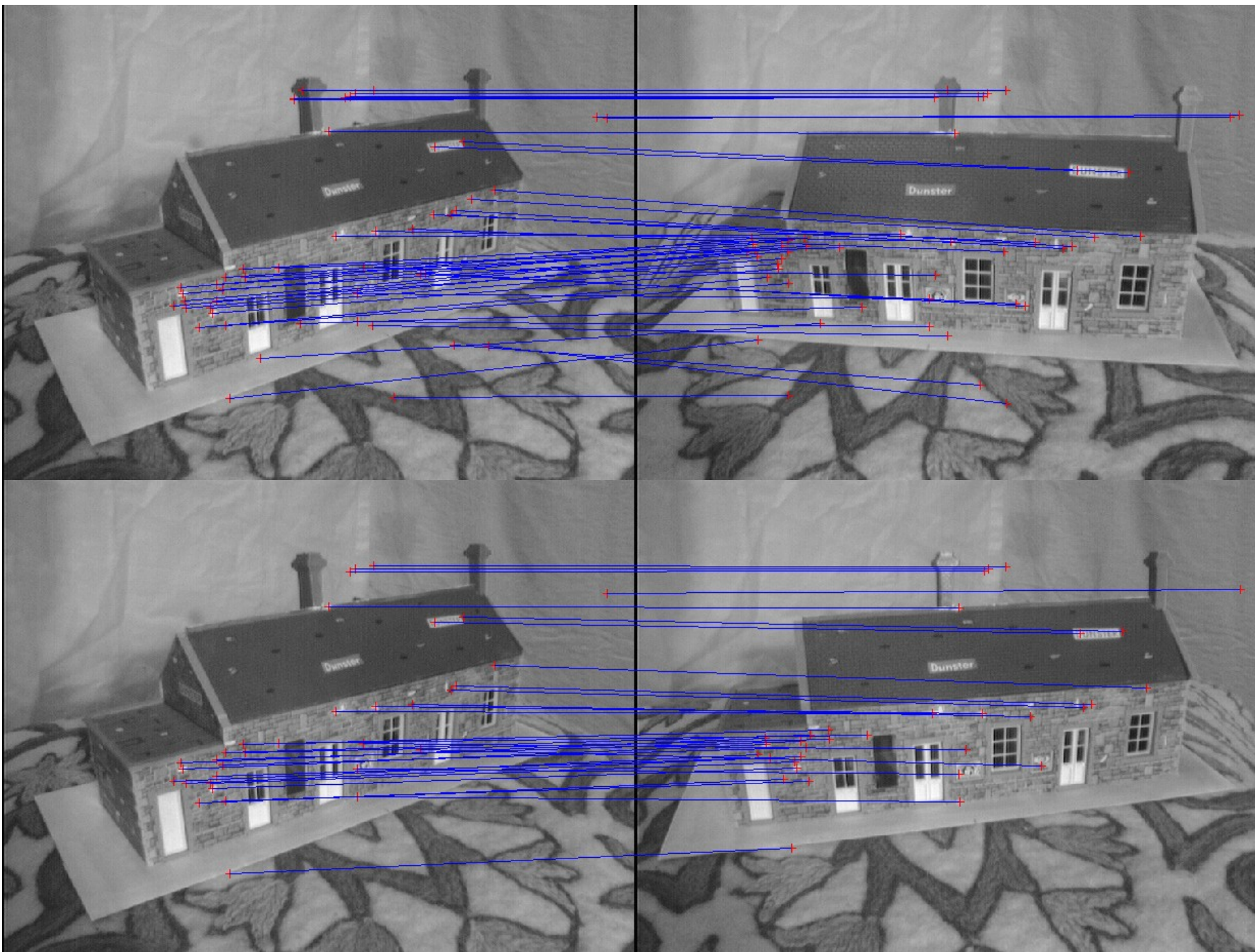


# 6-Point Algorithm

- The 6-point algorithm that was used for the camera calibration can be used to compute the projection matrix relative to the scene
- Do RANSAC to filter out wrong matches
- It does not work well on planar scenes – make sure you have 3D points distributed all around



# Plotting

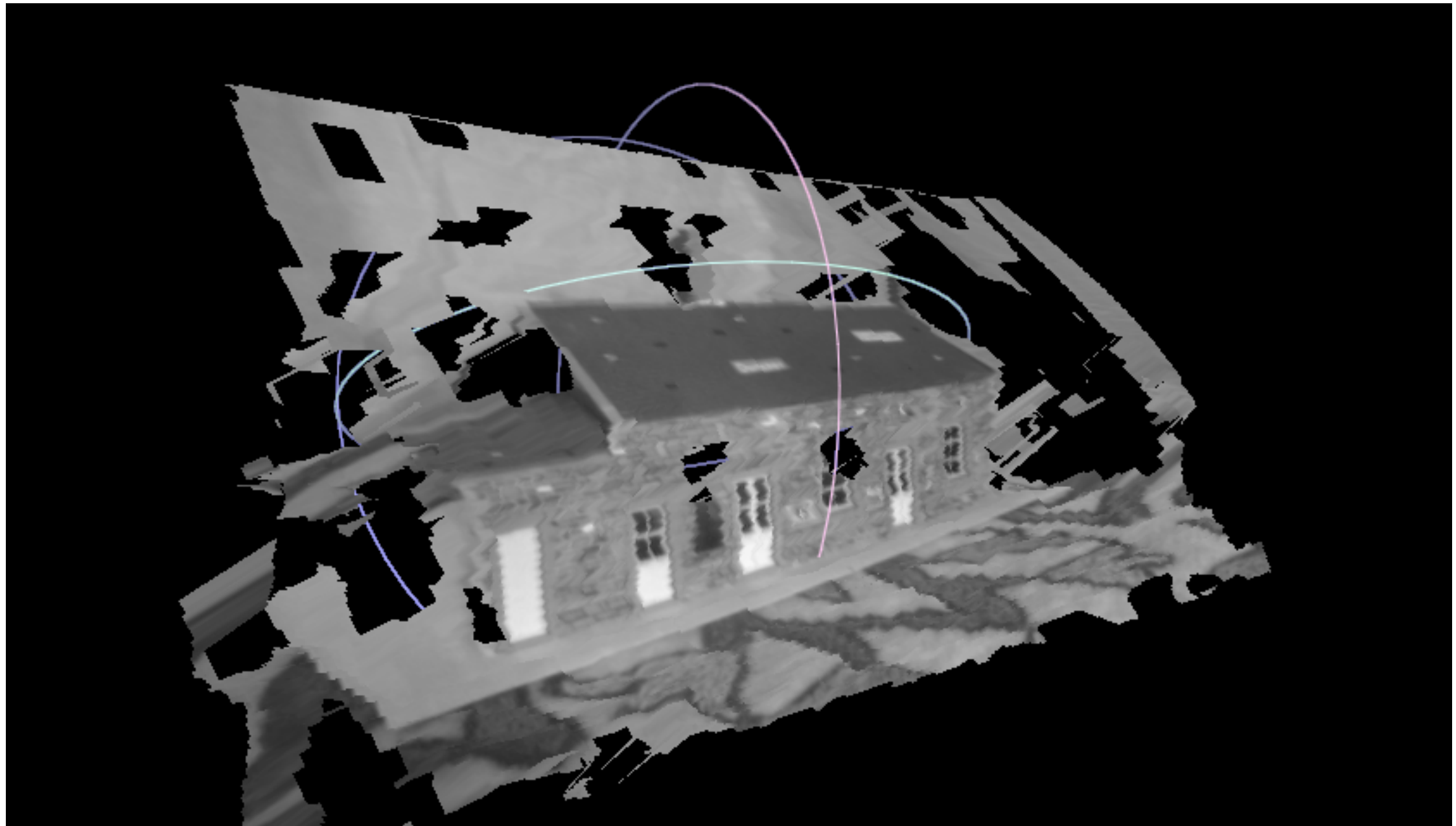




# Hand-in

- Report should include:
  - Images with visualized inlier and outlier matches
  - Epipolar geometry of the initialization images
  - Sparse reconstruction with inlier 3D-points and cameras
- Source code

# Bonus: Dense Reconstruction



# Hand-in

**By 11:59pm on Thursday 21<sup>st</sup> November 2019**  
**On Moodle**