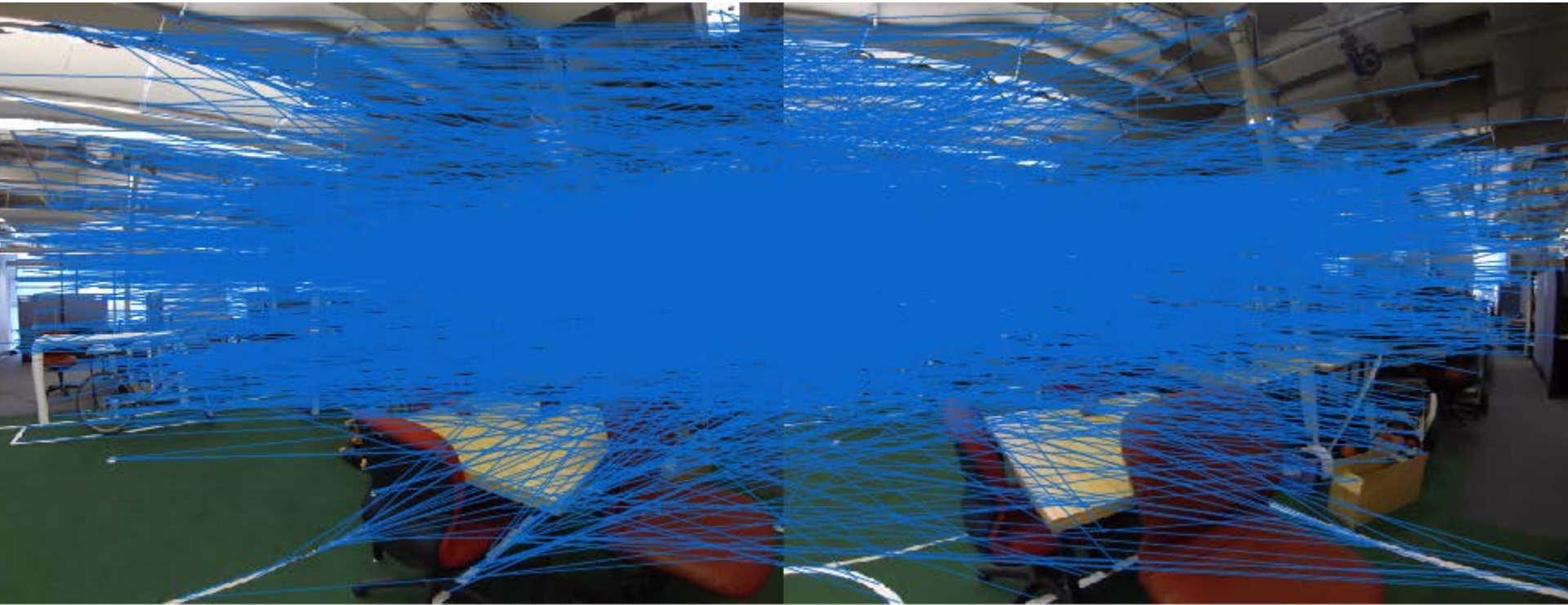# Feature Matching using Fundamental Matrix

Feature Matching using Fundamental Matrix

Nearest neighbor search between two images

Feature Matching using Fundamental Matrix

8 (bad) points to compute fundamental matrix

$$F =$$
$$\begin{matrix} 0.0000 & 0.0000 & -0.0159 \\ 0.0000 & -0.0000 & -0.0001 \\ 0.0102 & -0.0004 & 0.9998 \end{matrix}$$

Feature Matching using Fundamental Matrix

8 (bad) points to compute fundamental matrix

F =
  0.0000   0.0000   -0.0159
  0.0000   -0.0000   -0.0001
  0.0102   -0.0004   0.9998

# of inliers: 65

Feature Matching using Fundamental Matrix

8 (good) points to compute fundamental matrix

F =
      0.0000   -0.0000   0.0017
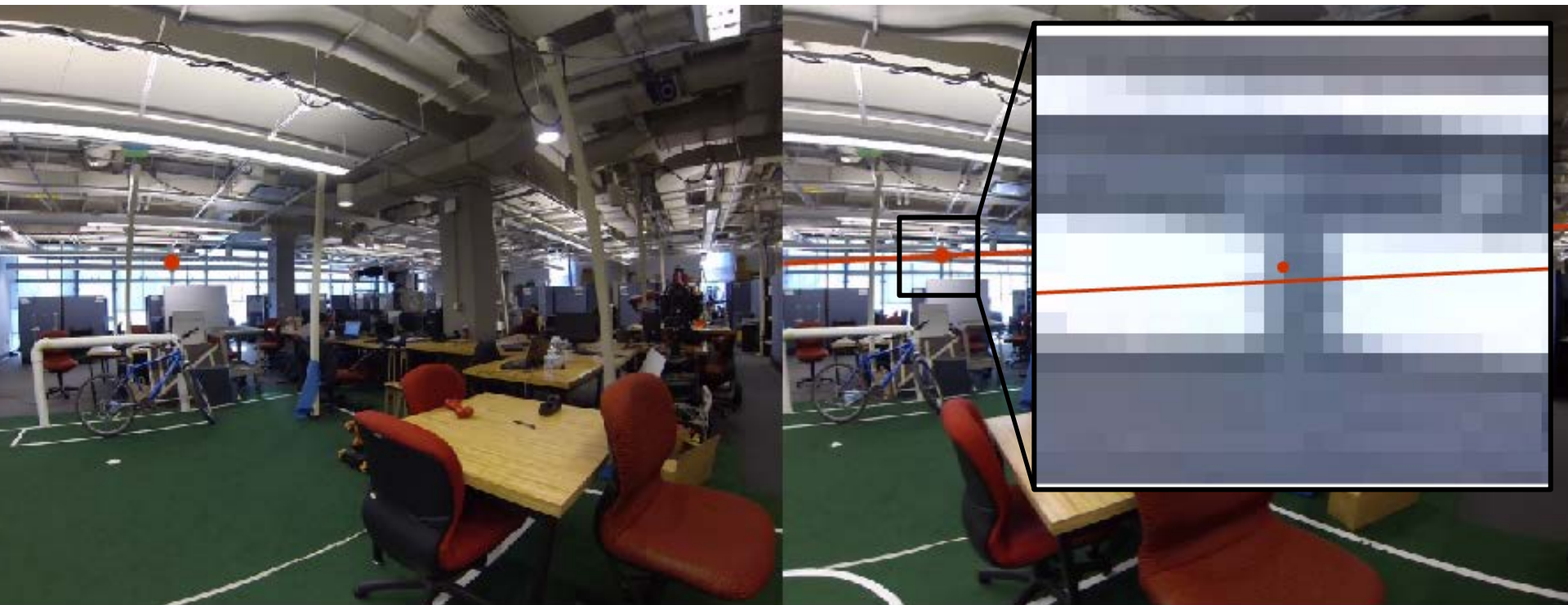   0.0000   -0.0000   -0.0169
     -0.0033   0.0148   0.9997

Feature Matching using Fundamental Matrix

8 (good) points to compute fundamental matrix

F =
  $\begin{array}{ccc} 0.0000 & -0.0000 & 0.0017 \\ 0.0000 & -0.0000 & -0.0169 \\ -0.0033 & 0.0148 & 0.9997 \end{array}$

\# of inliers: 118

Feature Matching using Fundamental Matrix
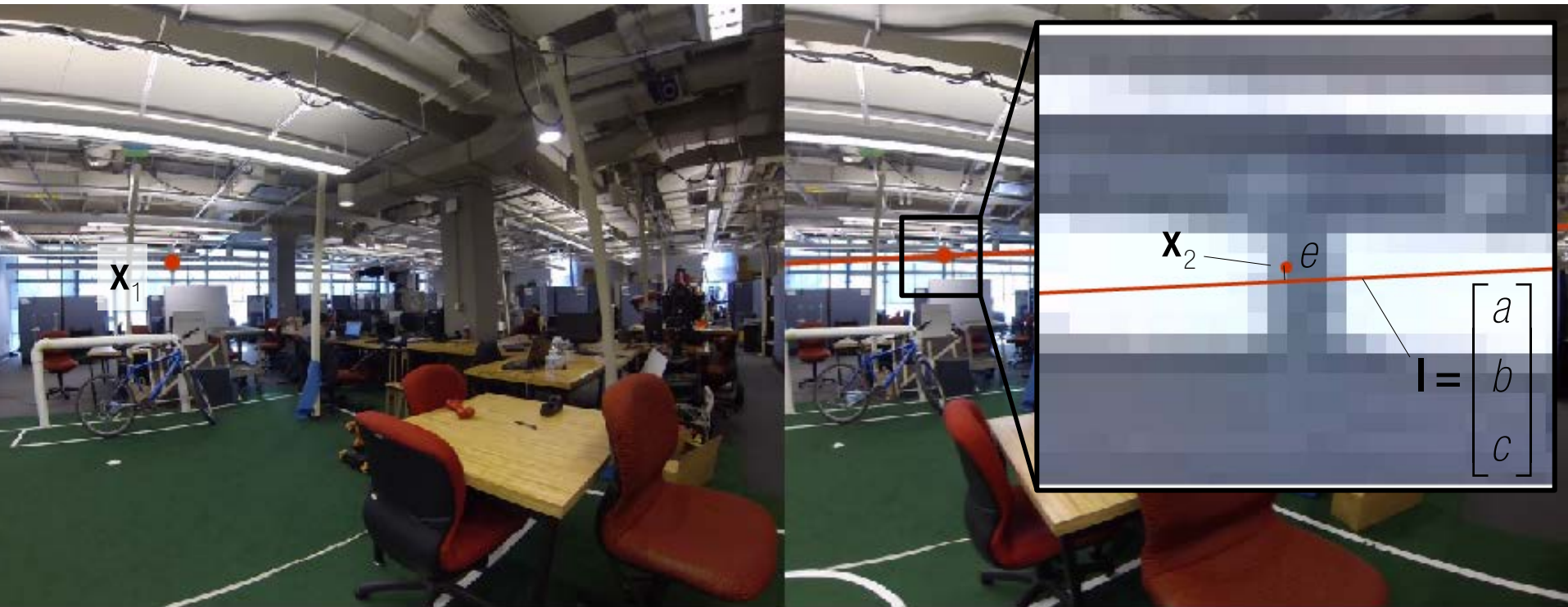

Epipolar line

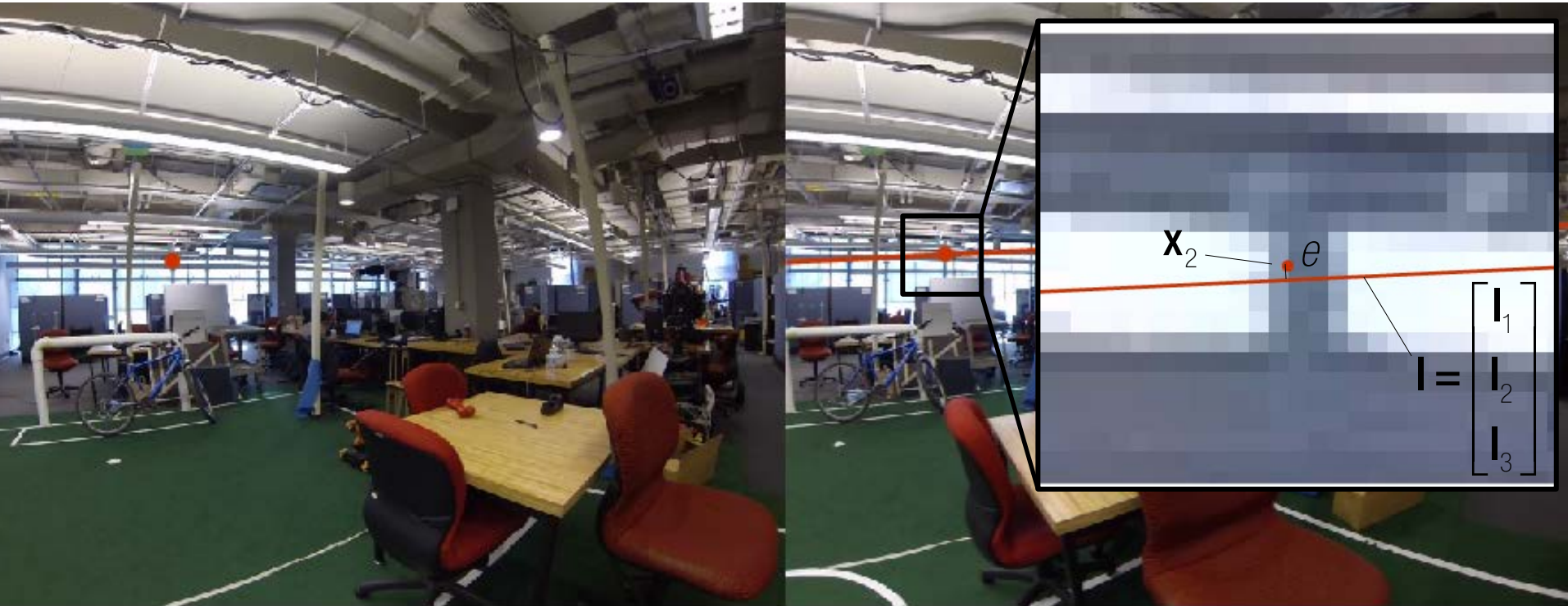# Feature Matching using Fundamental Matrix

Epipolar line

Feature Matching using Fundamental Matrix

Epipolar line

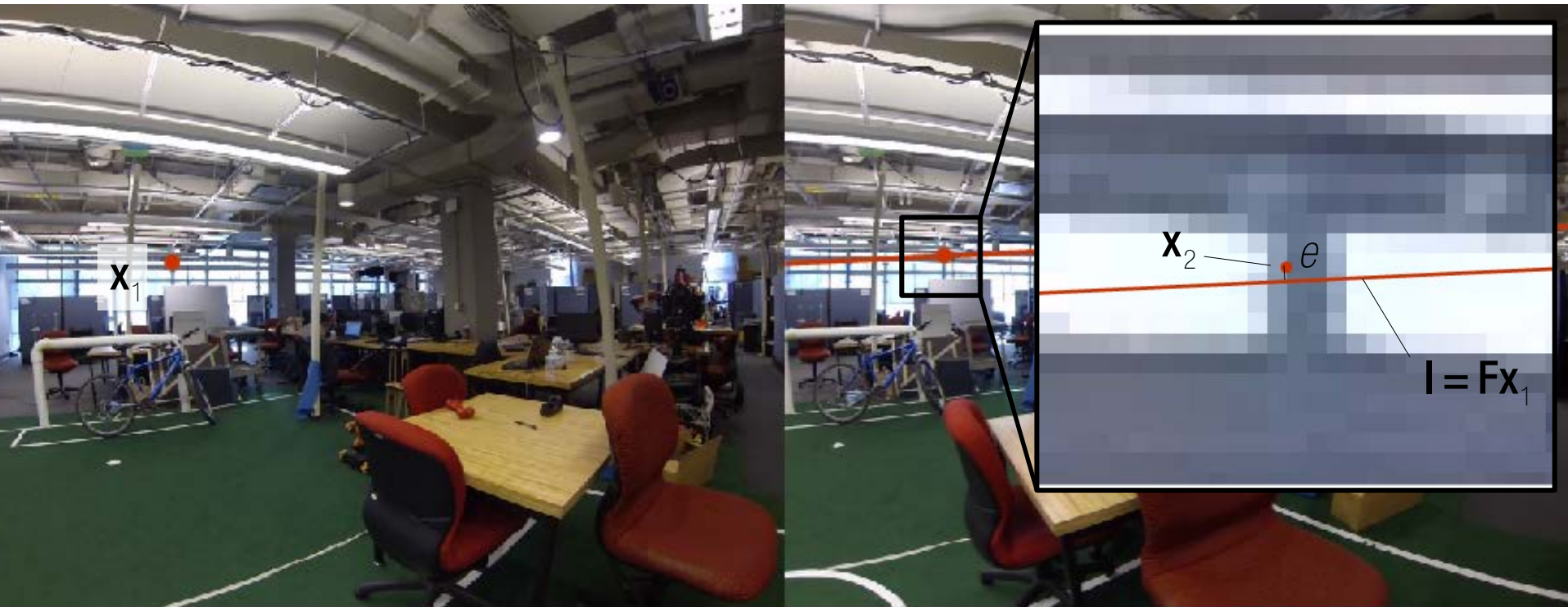$$e = \frac{|ax + by + c|}{\sqrt{a^2 + b^2}}$$

Feature Matching using Fundamental Matrix

Epipolar line

$$e = \frac{\left| ax + by + c \right|}{\sqrt{a^2 + b^2}} = \frac{\left| \mathbf{x}_2^\top \mathbf{l} \right|}{\sqrt{\mathbf{l}_1^2 + \mathbf{l}_2^2}}$$

Feature Matching using Fundamental Matrix

Epipolar line

$$e = \frac{\left|ax + by + c\right|}{\sqrt{a^2 + b^2}} = \frac{\left|\mathbf{x}_2^\top \mathbf{l}\right|}{\sqrt{\mathbf{l}_1^2 + \mathbf{l}_2^2}} = \frac{\left|\mathbf{x}_2^\top \mathbf{F}\mathbf{x}_1\right|}{\sqrt{\left(\mathbf{F}_1\mathbf{x}_1\right)^2 + \left(\mathbf{F}_2\mathbf{x}_1\right)^2}}$$
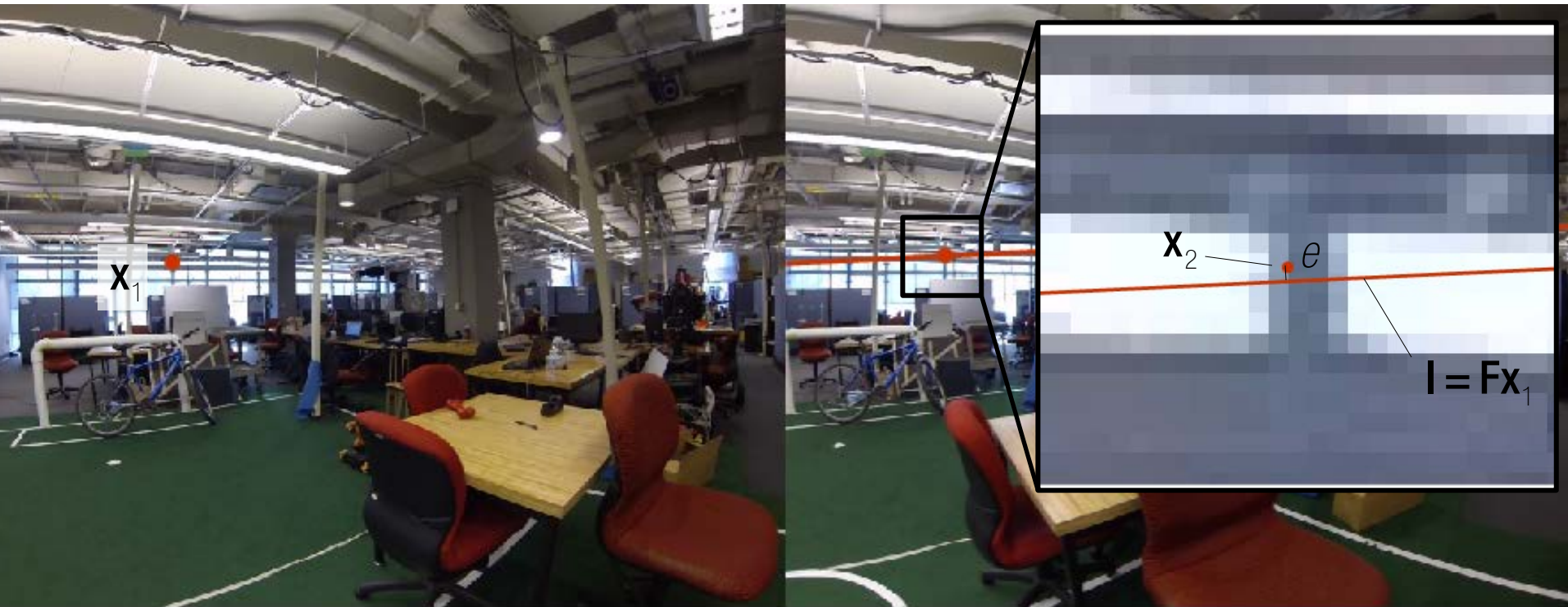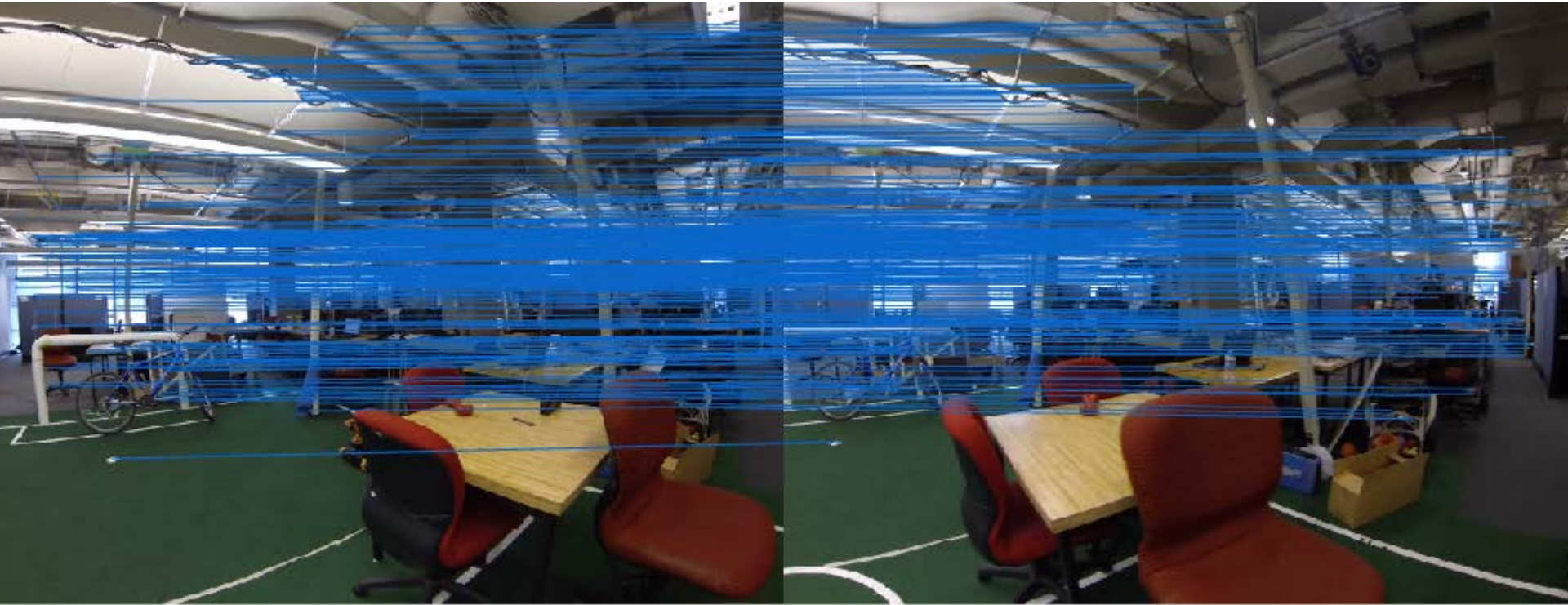
Feature Matching using Fundamental Matrix

Epipolar line

$$e = \frac{|ax + by + c|}{\sqrt{a^2 + b^2}} = \frac{\left|\mathbf{x}_2^\top \mathbf{l}\right|}{\sqrt{\mathbf{l}_1^2 + \mathbf{l}_2^2}} = \frac{\left|\mathbf{x}_2^\top \mathbf{F} \mathbf{x}_1\right|}{\sqrt{\left(\mathbf{F}_1 \mathbf{x}_1\right)^2 + \left(\mathbf{F}_2 \mathbf{x}_1\right)^2}}$$

Epipolar error: 0.7089 pixel error

Feature Matching using Fundamental Matrix

Final inliers using RANSAC

F =
```
   0.0000    0.0000   -0.0031
  -0.0000   -0.0000    0.0283
   0.0017   -0.0294    1.0000
```

# of inliers: 443