Recovering Ground Depth From Single Surveillance Video For Feature Scale Normalization

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Outline

- Motivation
- Approach Overview
- Camera Calibration Using Moving Objects
- Results and Demo

Motivation

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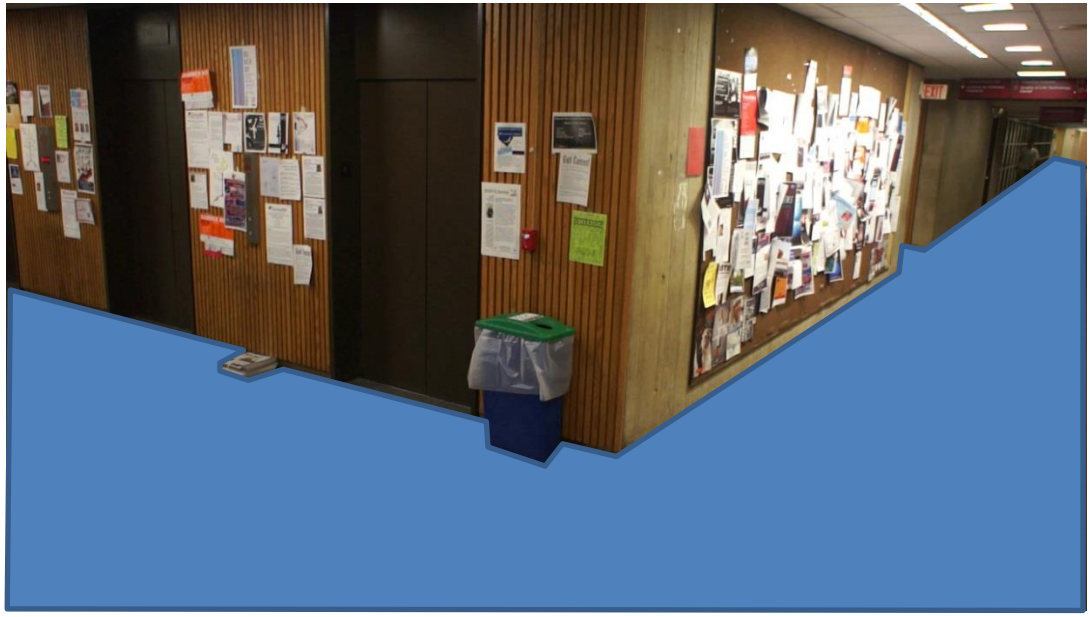
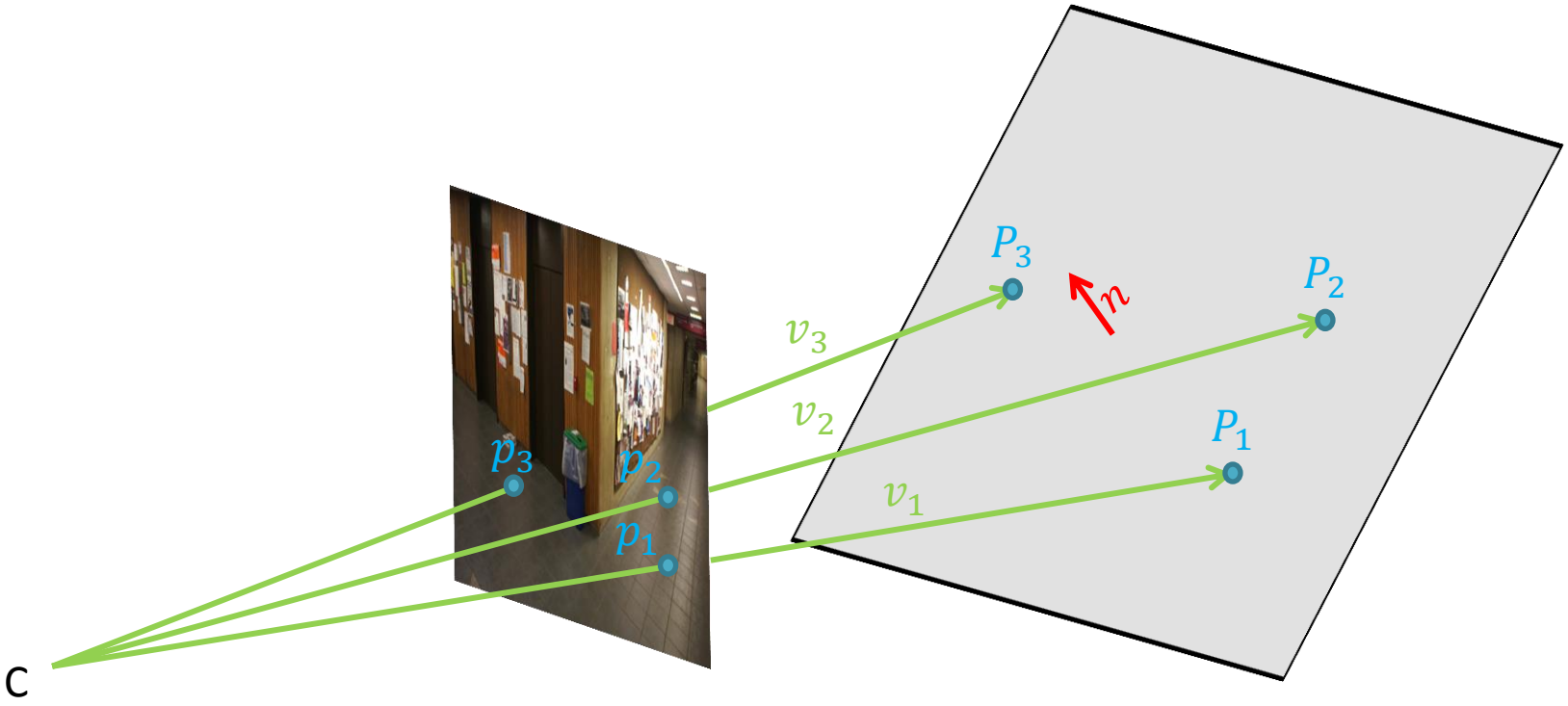
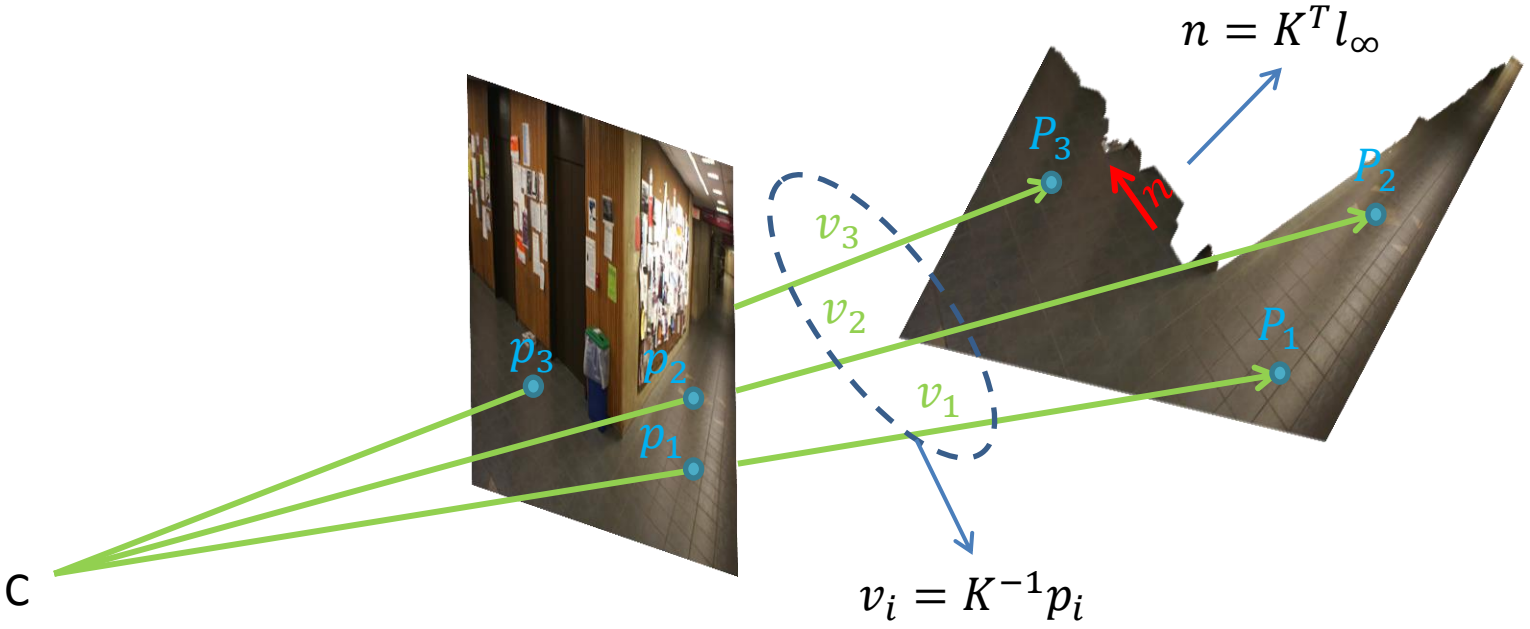


Approach Overview



Approach Overview



Calibrate camera (K)

- The assumptions:
  - Zero skew
  - Square pixel

- The form of IAC (ω) under the assumptions:

$$\omega = K^{-T}K^{-1} = \begin{bmatrix} \omega_1 & 0 & \omega_2 \\ 0 & \omega_1 & \omega_3 \\ \omega_2 & \omega_3 & \omega_4 \end{bmatrix}$$

Calibrate camera (K)

- One standard approach:
  - Using three vanishing points corresponding to three orthogonal directions.

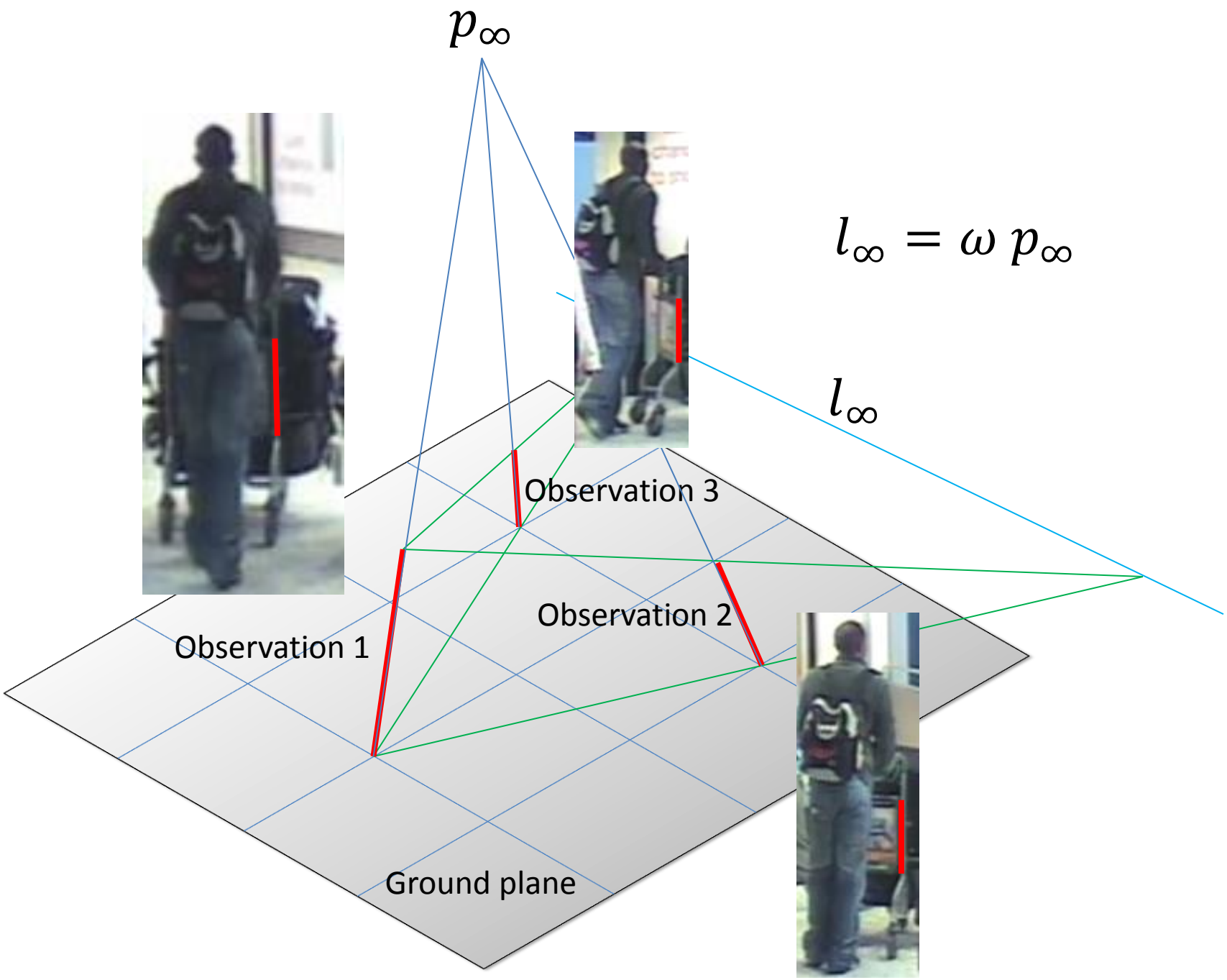
For each pair of orthogonal vanishing points v_i and v_j:

$$v_i^T \omega \, v_j = 0$$

Calibrate camera (K)

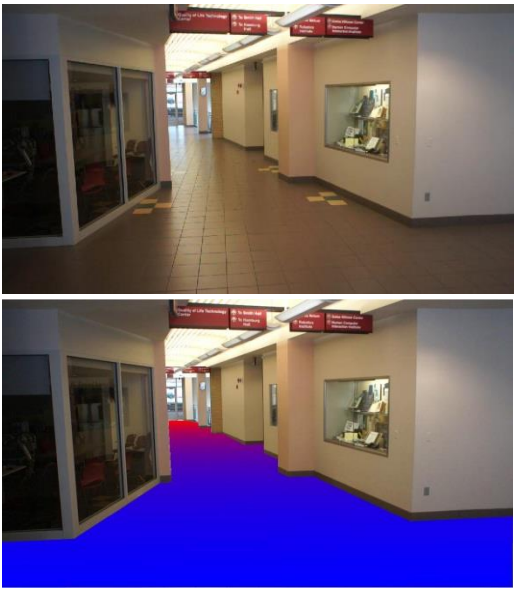
- Using moving objects:

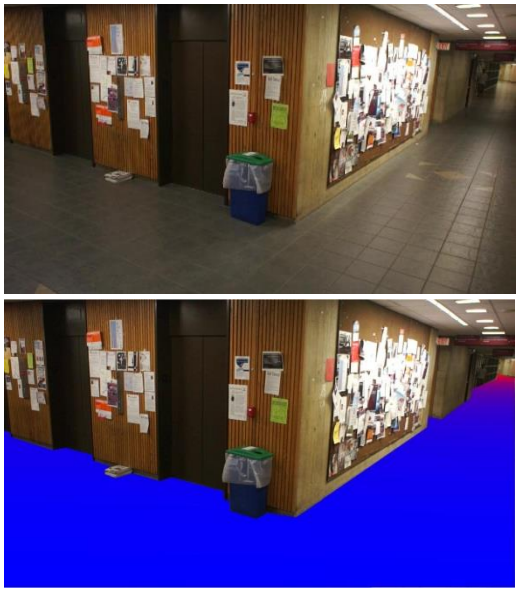
•••

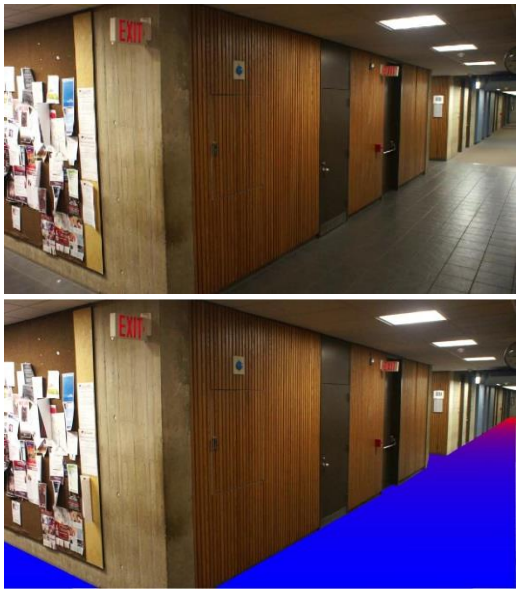

p_∞
$l_\infty = \omega\, p_\infty$
l_∞
Observation 3
Observation 2
Observation 1
Ground plane

Results and Demo

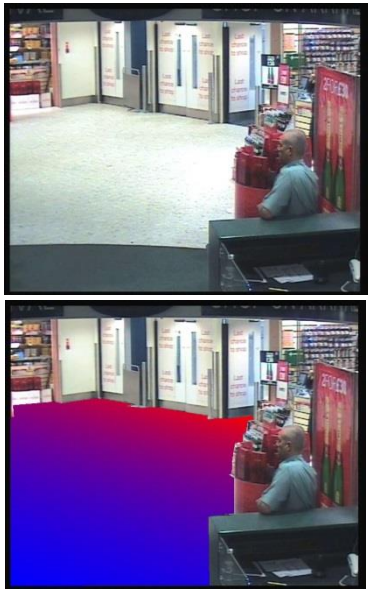
- Ground plane depth visualizations:


NSH


Wean Hall 1



Wean Hall 2


London Gatwick Airport

Results and Demo

- Demo: InsertMe!

Thanks!