

# Vision-Based Indoor Localization

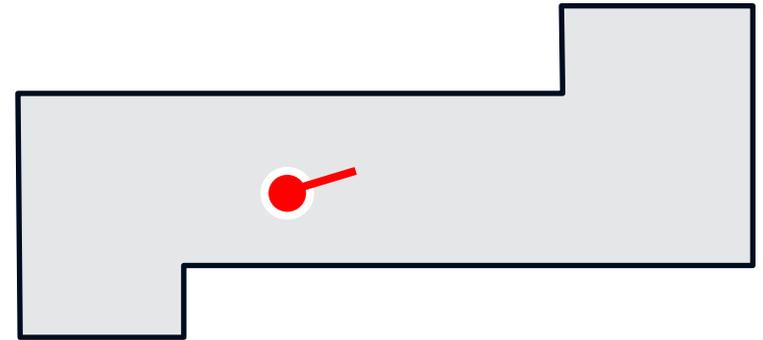
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AIT Austrian Institute of Technology

# Visual Localization



image



camera location



surveillance camera



wearable camera



mobile phone



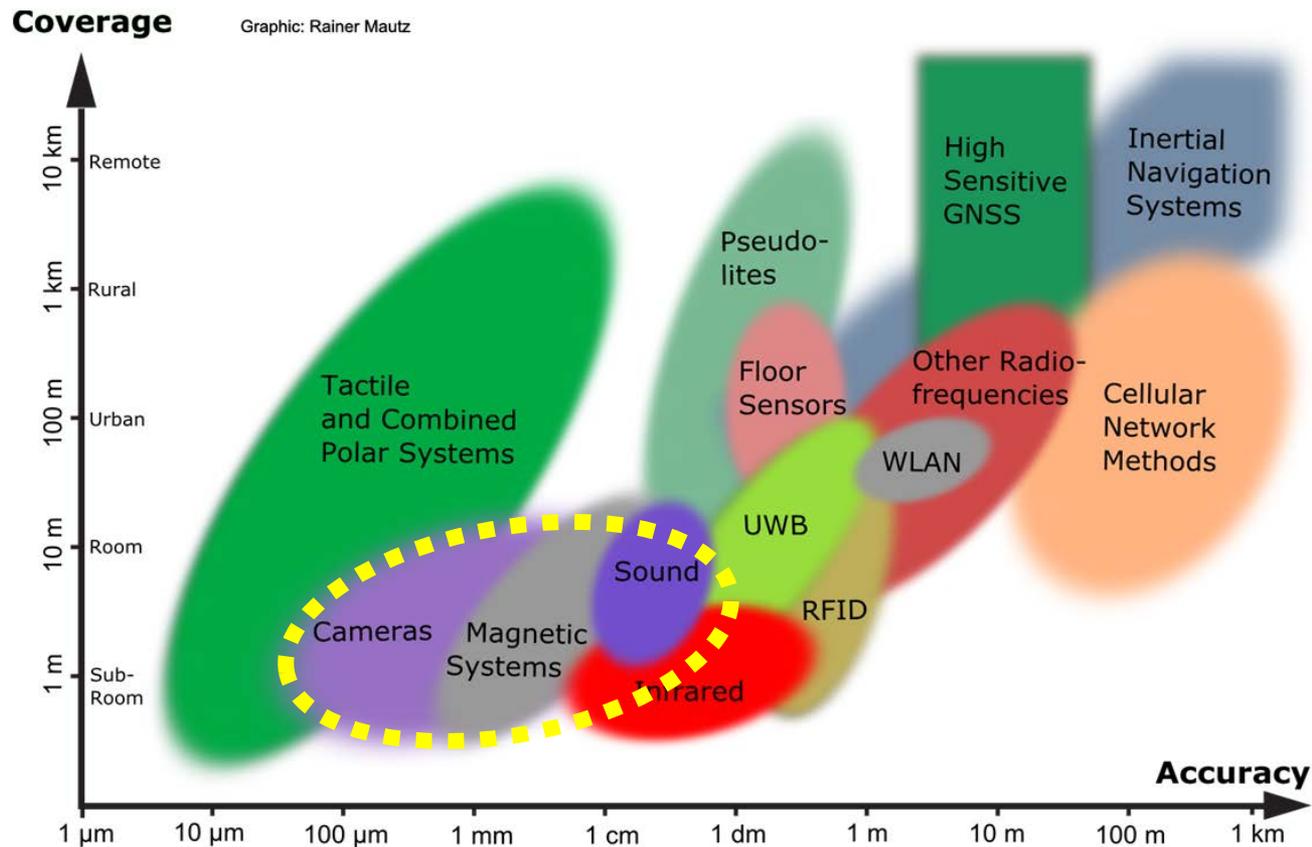
robot



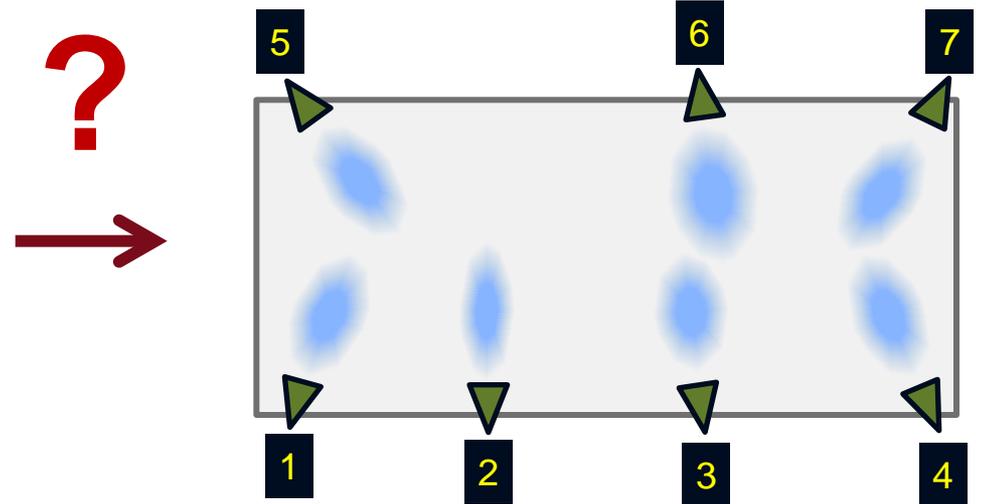
forklift

# Current Technologies

- Outdoor - GPS
- Indoor – **not a mature technology like GPS**

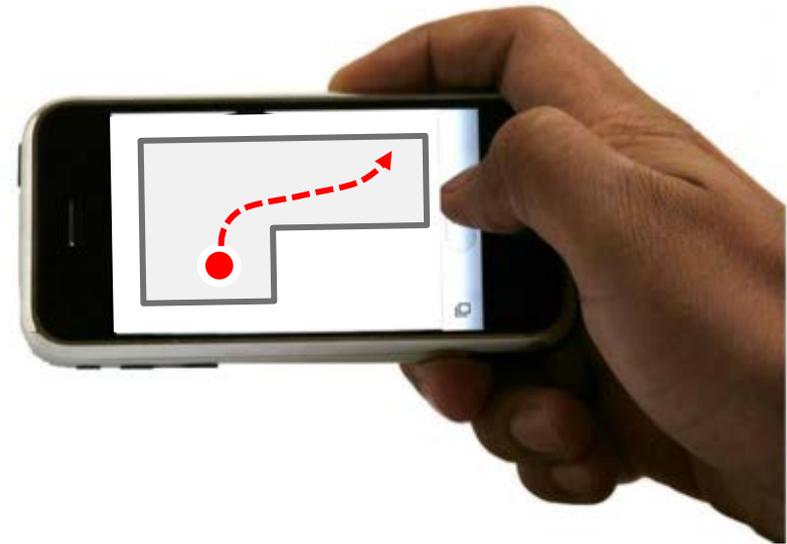


# Visual Localization - Surveillance



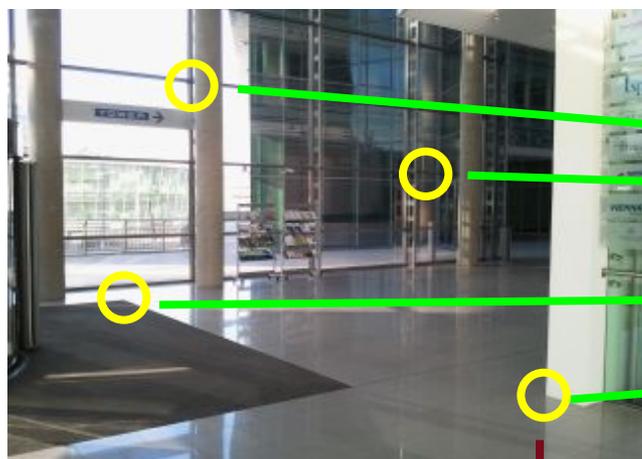
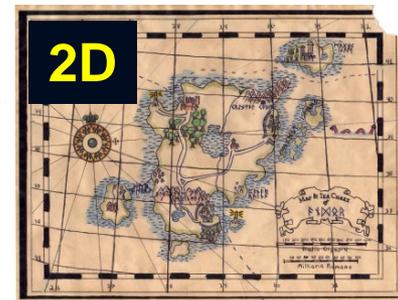
- Where are all these cameras?
- When only visual information available!

# Visual Localization – Mobile Phone



# Visual Localization

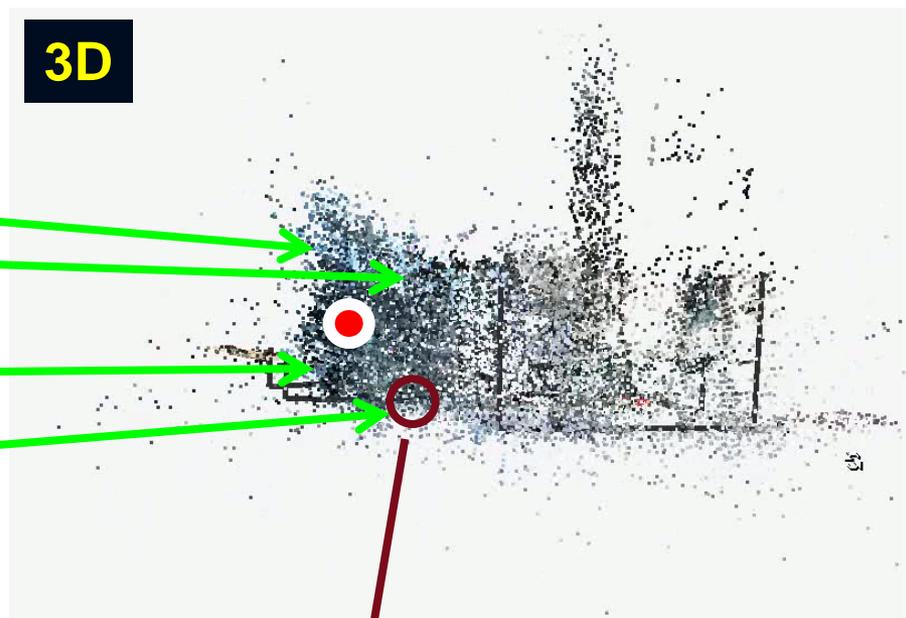
- Matching an image to learned landmarks



~ 100-1000 distinctive points



point attribute



~ 10k-100k landmarks

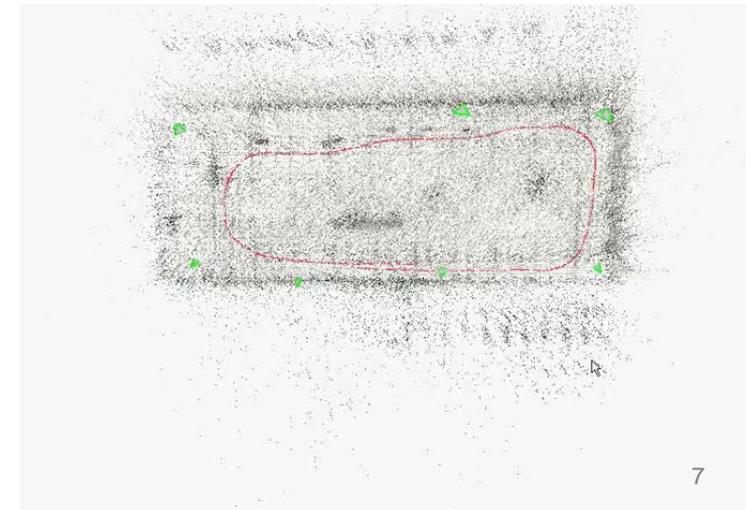
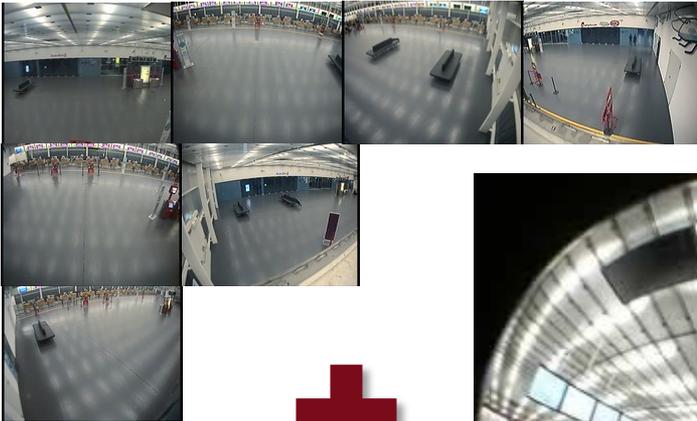


landmark attribute



# Example: Surveillance in large camera networks

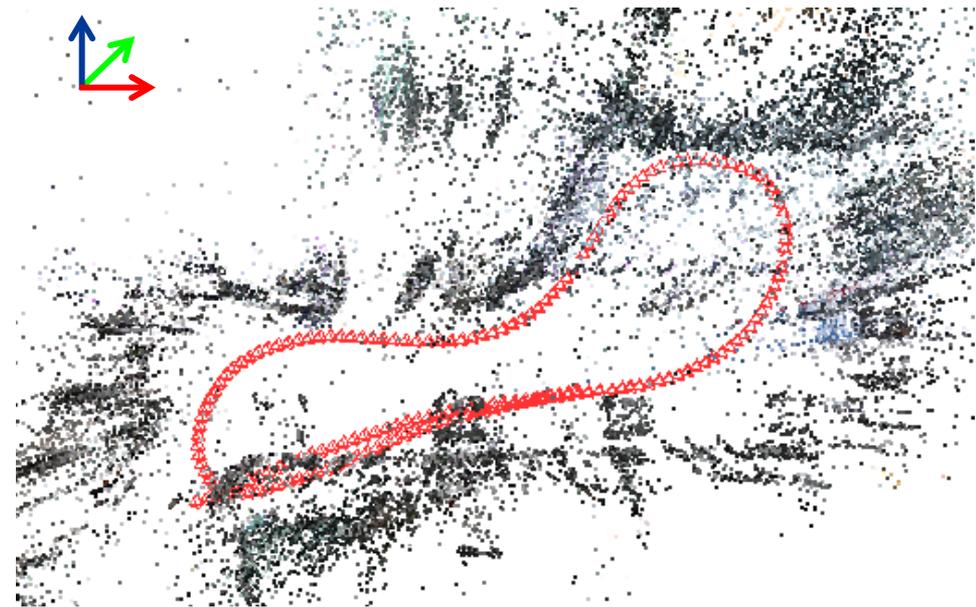
- 3D reconstruction of the building
- Automatic localization and calibration of cameras



Structure from Motion  
[ patent protected ]

# Mapping stage

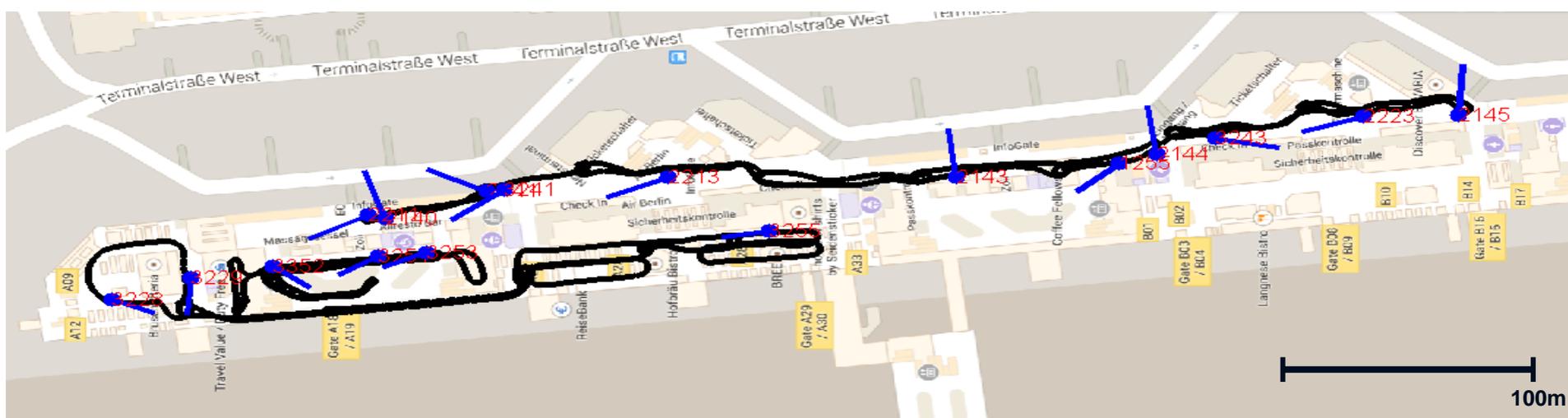
## - sequential Structure from Motion



sequence of calibrated images

trajectory and 3D points

# Airport, Large-Scale Experiment

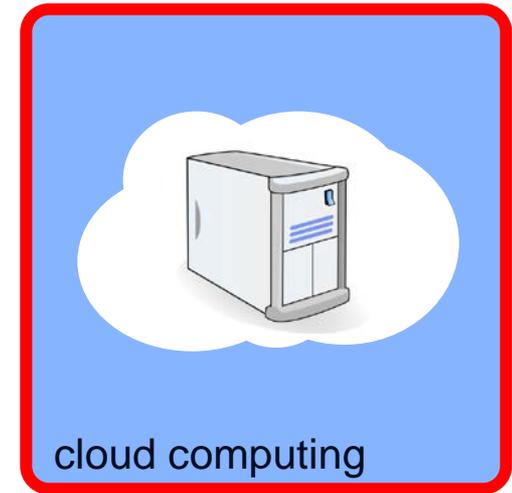


Points : 452329  
 Lines : 37168

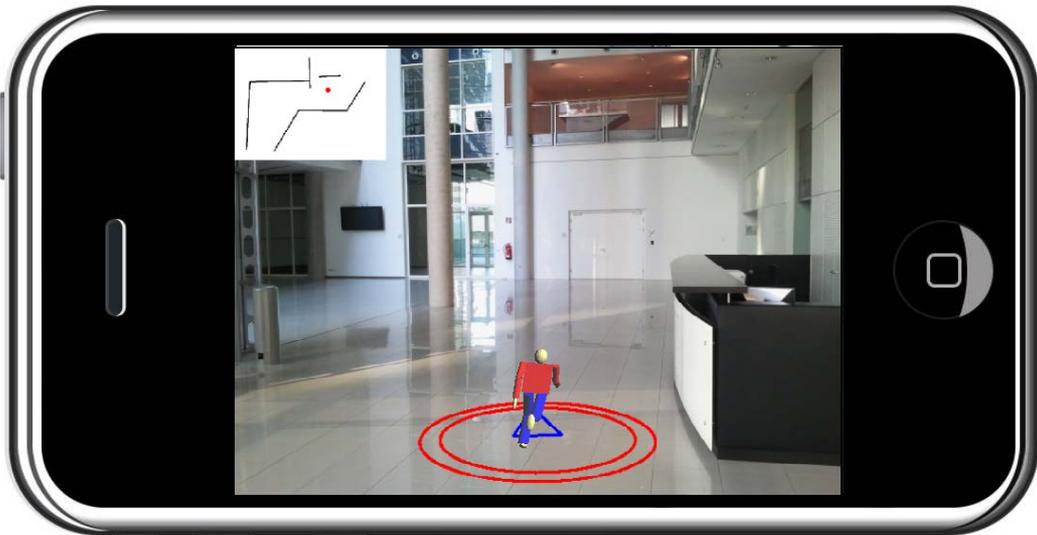
# Localization of Mobile Cameras



image



cloud computing

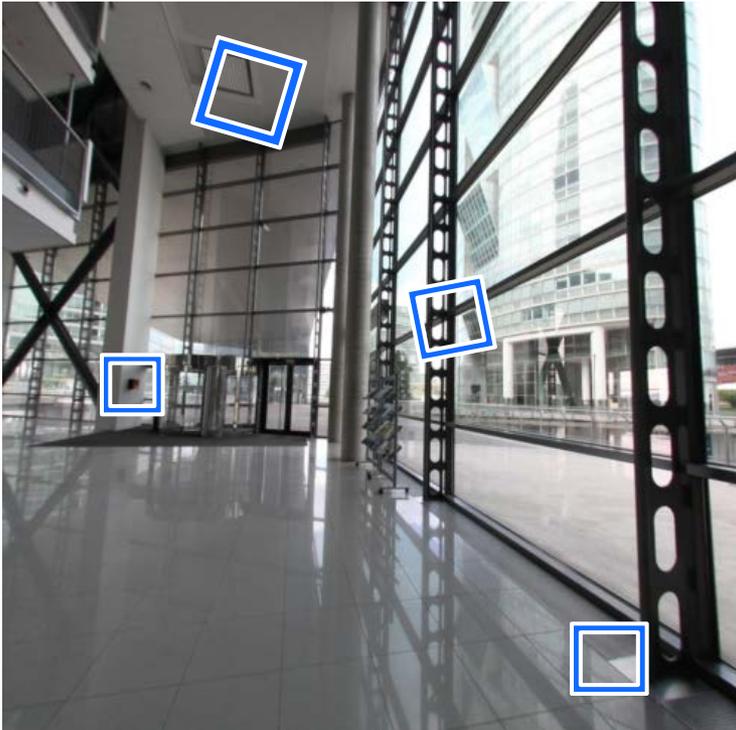


location



navigation

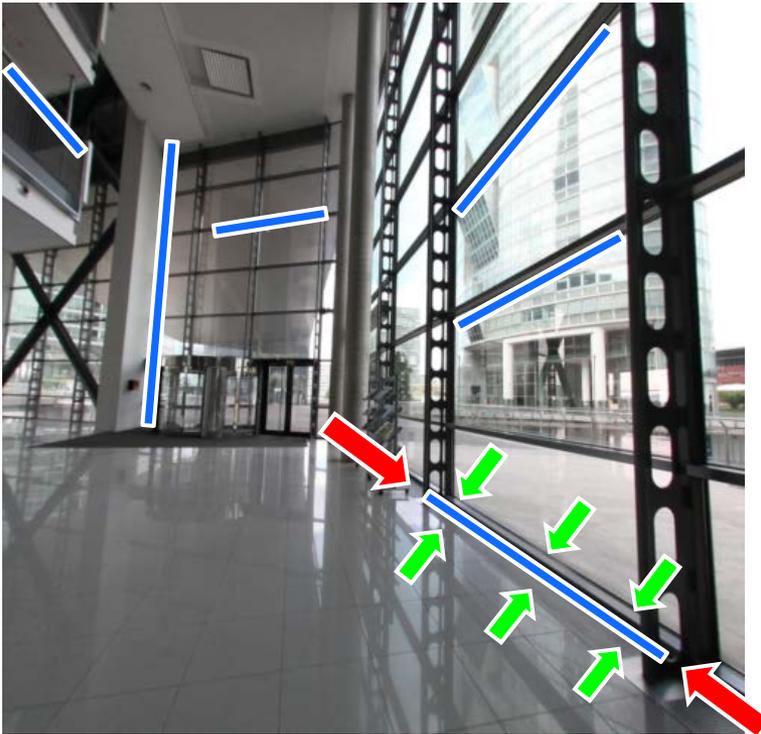
# Indoors with Point Features



- wiry structures
- lack of texture
- repetitions

→ inaccurate or no structure and motion estimate

# Indoors with Line Segments



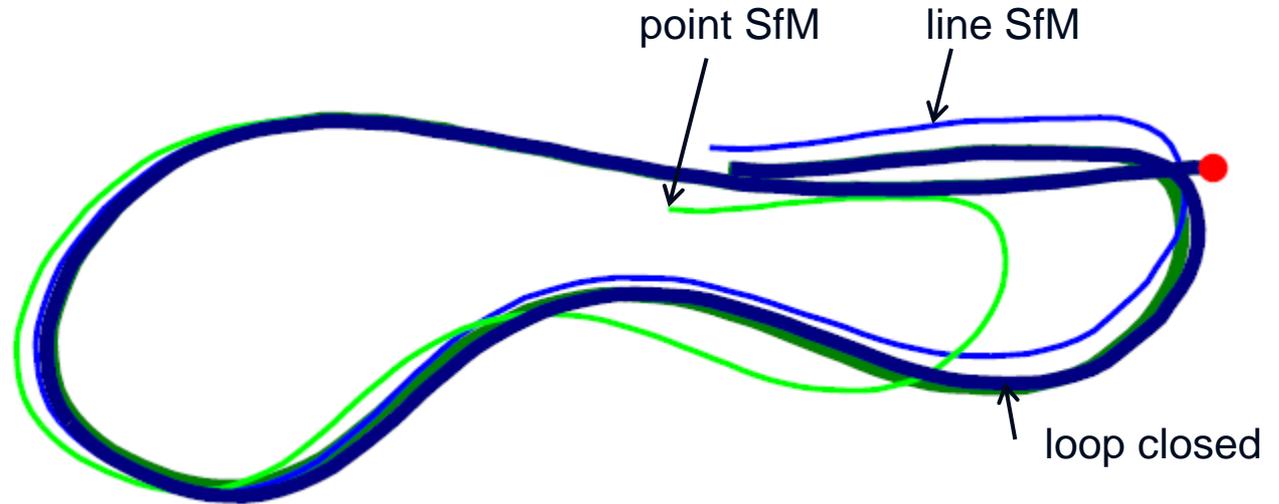
- prevalent indoors
- higher detection accuracy
- semantically richer information

→ better structure and motion estimate

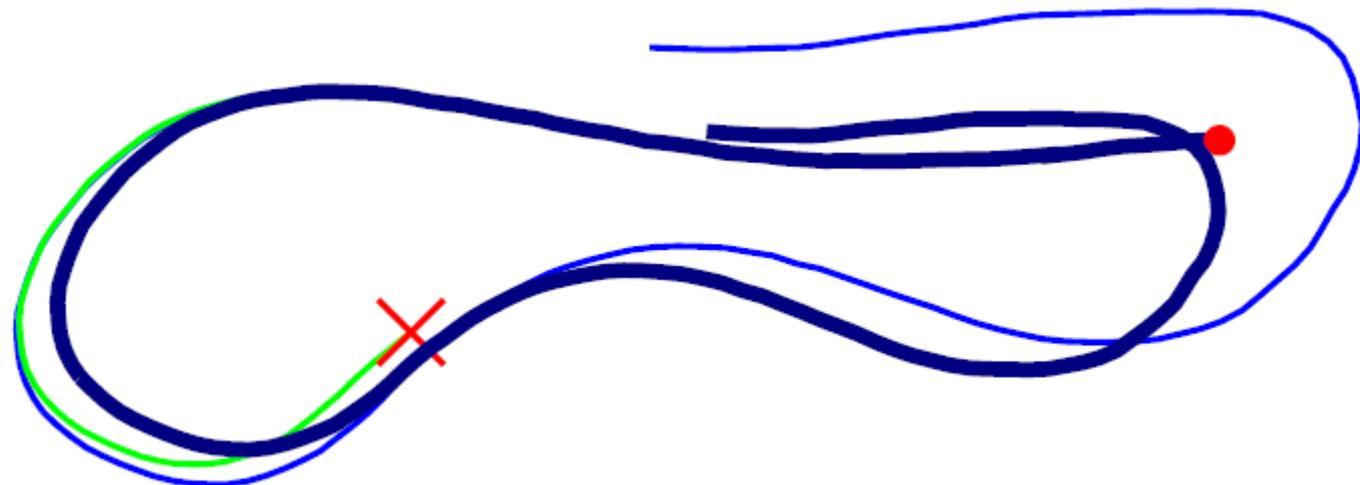
# Results – Trajectory Estimate



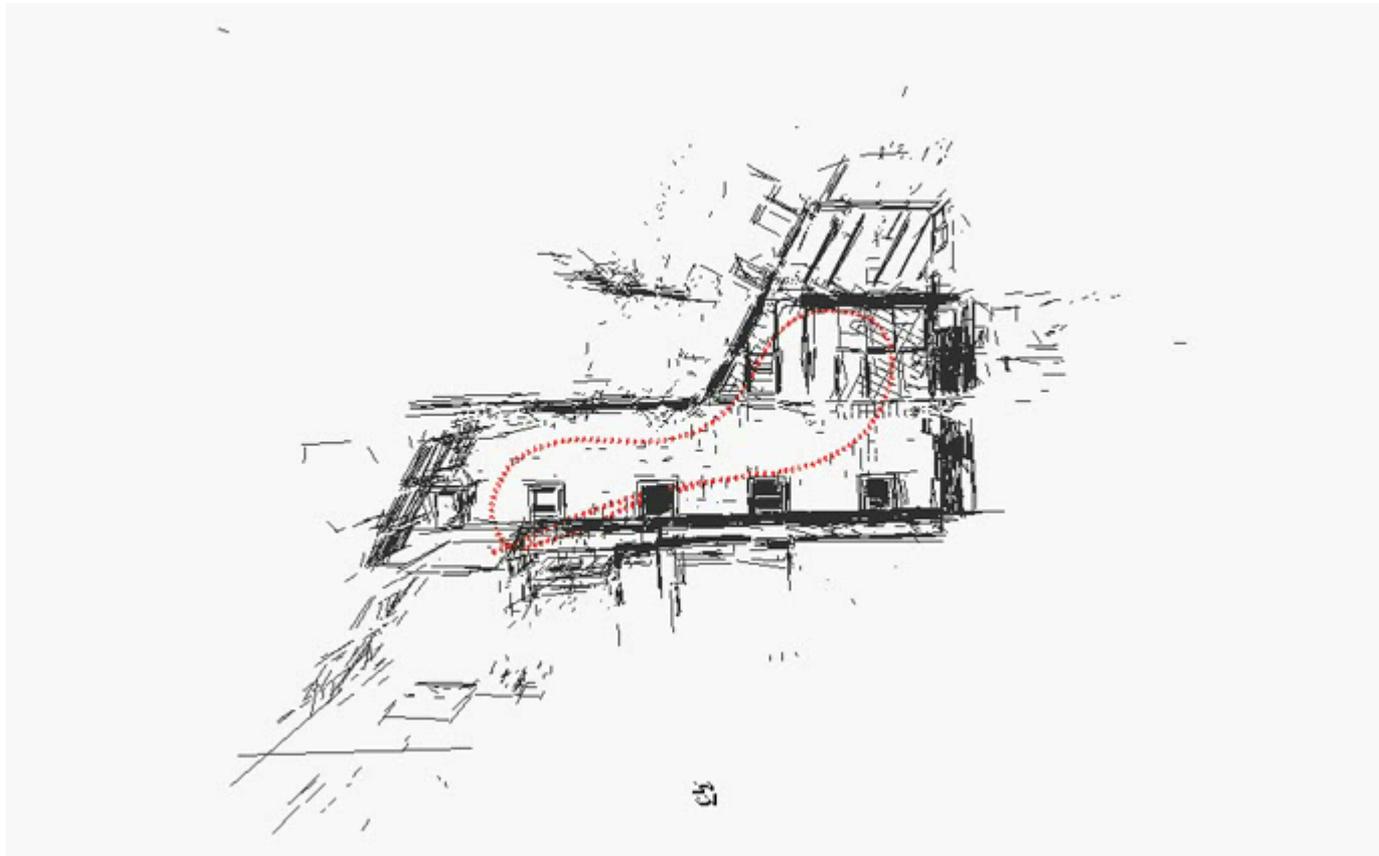
180° FOV



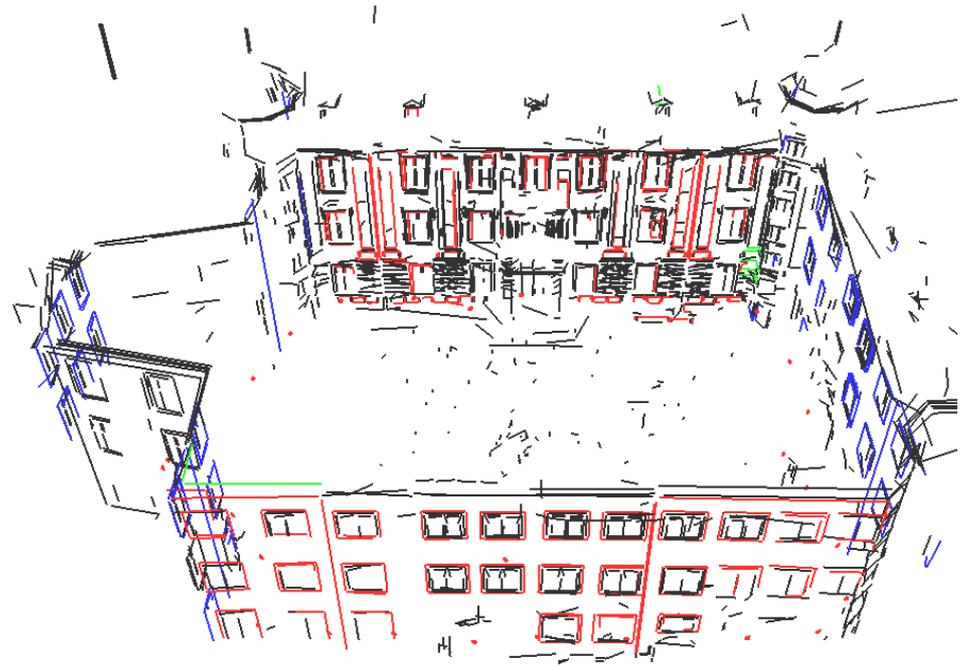
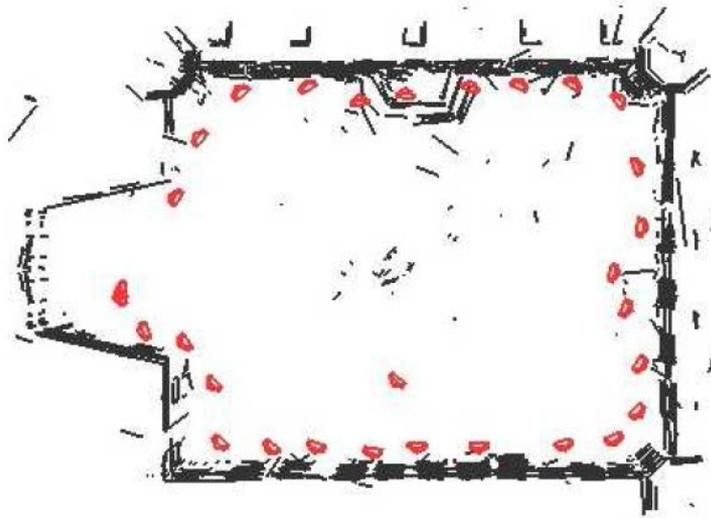
100° FOV



## Results – Structure Estimate



# Results on Strecha's Castle-P30





# AIT Austrian Institute of Technology

your ingenious partner