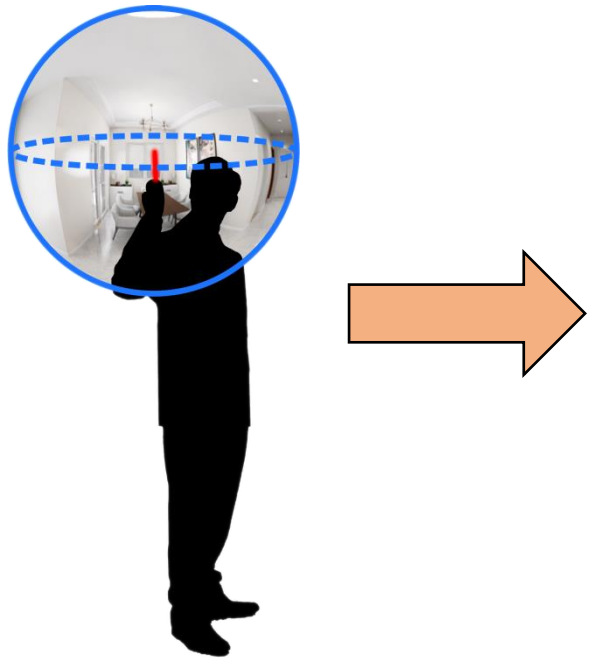
SESSION 6: CLOSING + Q&A

Today's focus: indoor modeling and exploration from panoramic imaging

Why focusing on panoramic imaging?



1) **MANY ACQUISITION SOLUTIONS AVAILABLE** (commodity and professional devices, stitching, …)

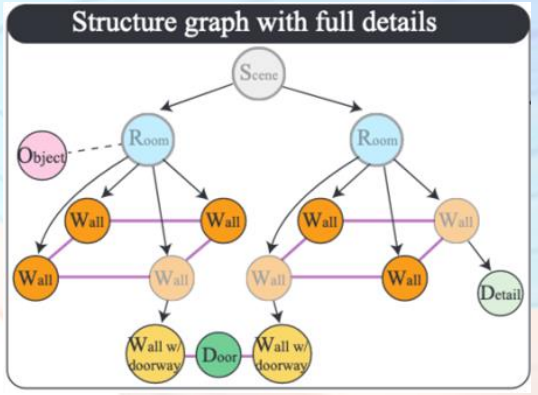
2) **EASY AND FAST ACQUISITION** (single shot takes few seconds and covers all scene around the viewer)

3) **GLOBAL/WIDE CONTEXT FACILITATES ANALYSIS** (no clipping of objects/areas, possibility to look at scene regularities, …)

4) **EXPLORATION OF SINGLE IMAGE IS DYNAMIC/IMMERSIVE** (fundamentally different than standard 2D counterparts)

Why specialized solutions for interiors?

- **Strong need for structured indoor models**
  - High-level representation of main elements and their relations
  - Optimized to meet requirements of specific fields of application
    - Building Information Models (AEC domain): bare architectural structure
    - Emergency management, location awareness, routing: also interior clutter
  - Standard surface reconstruction does not guarantee this



Ikehata et al. ICCV2015

- **Deal with specific challenges of input data**
  - Technological limitations of acquisition devices
  - Artifacts caused by properties of real-world interiors
    - Clutter, unreachable areas
    - Transparent/reflective + textureless surfaces

Reconstruction of models from noisy, partial, imperfect data

- All methods use some **architectural priors** in addition to other surface reconstruction ones
- Historically, priors were exploited in **geometry-reasoning** solutions, that combined them with specific processes to extract models
  - E.g. extract edges and corners, filter according Manhattan direction, build model through connection/fusion, …
- Nowadays, more and more solutions exploit **data driven priors**, i.e., common characteristics extracted from large sets of examples
  - Esp. deep-learning solutions
- The most common approach is a combination of both

Major directions

- Room modeling
  - Bounding surfaces, exploiting priors, deep learning solutions
- Integrated indoor model computation
  - Multi-rooms; Ensuring consistency; Finding and modeling connections
- Visual representation generation and exploration
  - Beyond geometric reconstruction; Appearance; panoramic exploration

Supporting material (1/2)

- **Course web site**
  - https://www.crs4.it/vic/sigasia2024-course-pano/
  - Updated in coming weeks with slides
- **Course notes**
  - G. Pintore, M. Agus, E. Gobbetti, Automatic 3D modeling and exploration of indoor structures from panoramic imagery. Proc. SIGGRAPH Asia 2024.

Supporting material (2/2)

- **Additional material**
  - G. Pintore, C. Mura, F. Ganovelli, L. Fuentes-Perez, R. Pajarola, and E. Gobbetti. State-of-the-art in Automatic 3D Reconstruction of Structured Indoor Environments. Computer Graphics Forum, 39(2): 667-699, 2020. DOI: 10.1111/cgf.14021
    - Established STAR, good intro to the overall field – see also related ACM SIGGRAPH Course (2020)
  - Automatic 3D modeling of indoor structures from panoramic imagery. CVPR 2023 Tutorial - https://www.crs4.it/vic/cvpr2023-tutorial-pano/
    - Previous version of this course, more oriented towards computer vision

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NOW: Q&A

Conference | 3–6 December 2024
Exhibition | 4–6 December 2024
Venue | Tokyo International Forum, Japan

THE END – THANKS FOR YOUR ATTENTION

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