UNIVERSITY OF SEOUL

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The Concepts of Level of Detail in 3D Indoor Models
-Focused on Application of IndoorLoD 2

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FIG Working Week 2016

CHRISTCHURCH, NEW ZEALAND 2–6 MAY 2016

Recovery

from disaster

Organised by
FIG
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Platinum Partners
Trimble.
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Land Information
New Zealand

Contents

1. Introduction

**Need to represent indoor space
for providing various indoor application**

Many Services based on indoor GIS applications have gained greater attention

Simulation

Virtual Tour

Facility Management

1. Introduction

Feature representation in Map scale

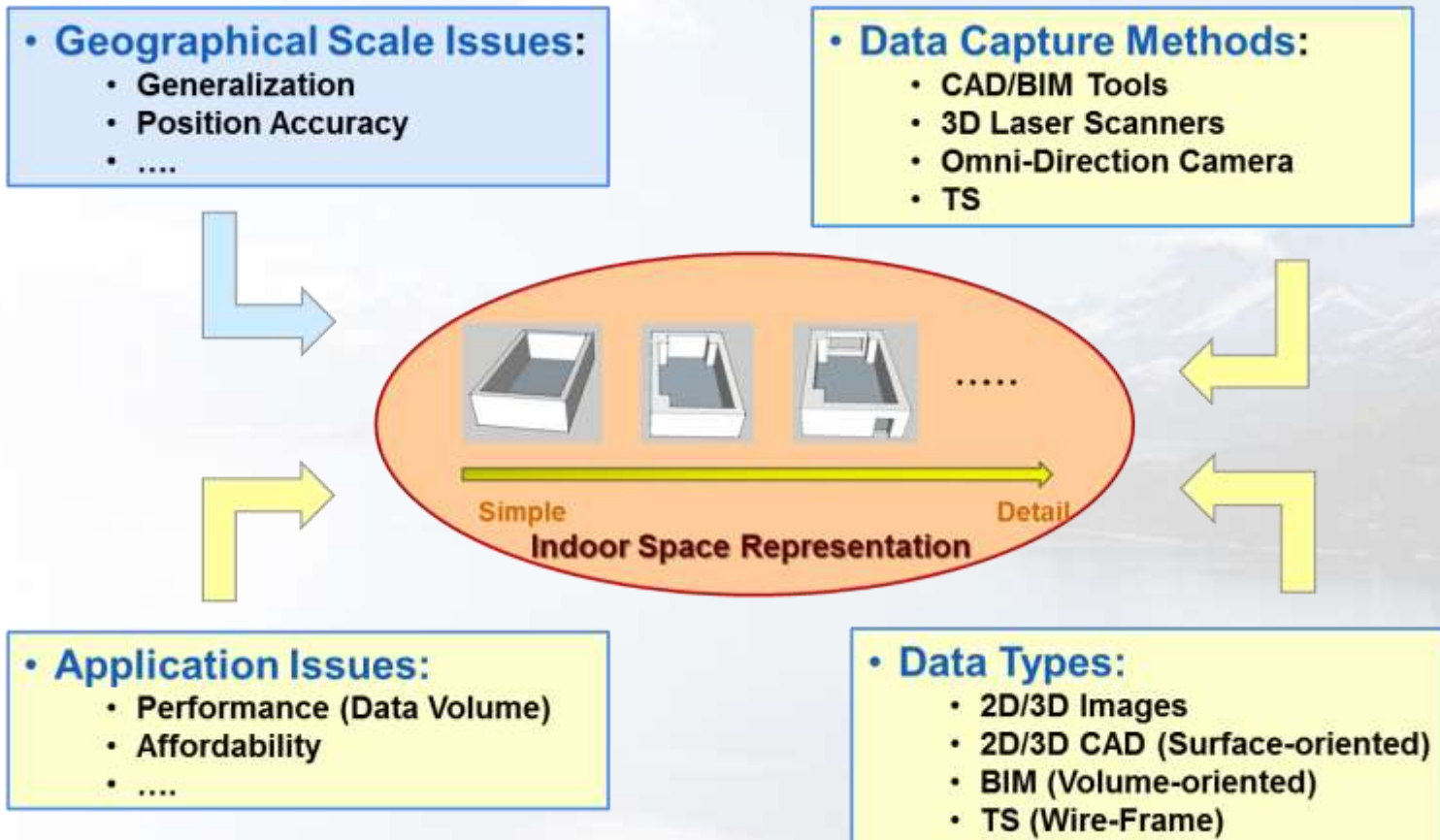**Cannot apply outdoor LoD**

Macro-scale

Micro-scale

Outdoor

Indoor

Propose concepts of LOD for indoor space based on indoor application services

2. Considerations in Indoor LoD Model
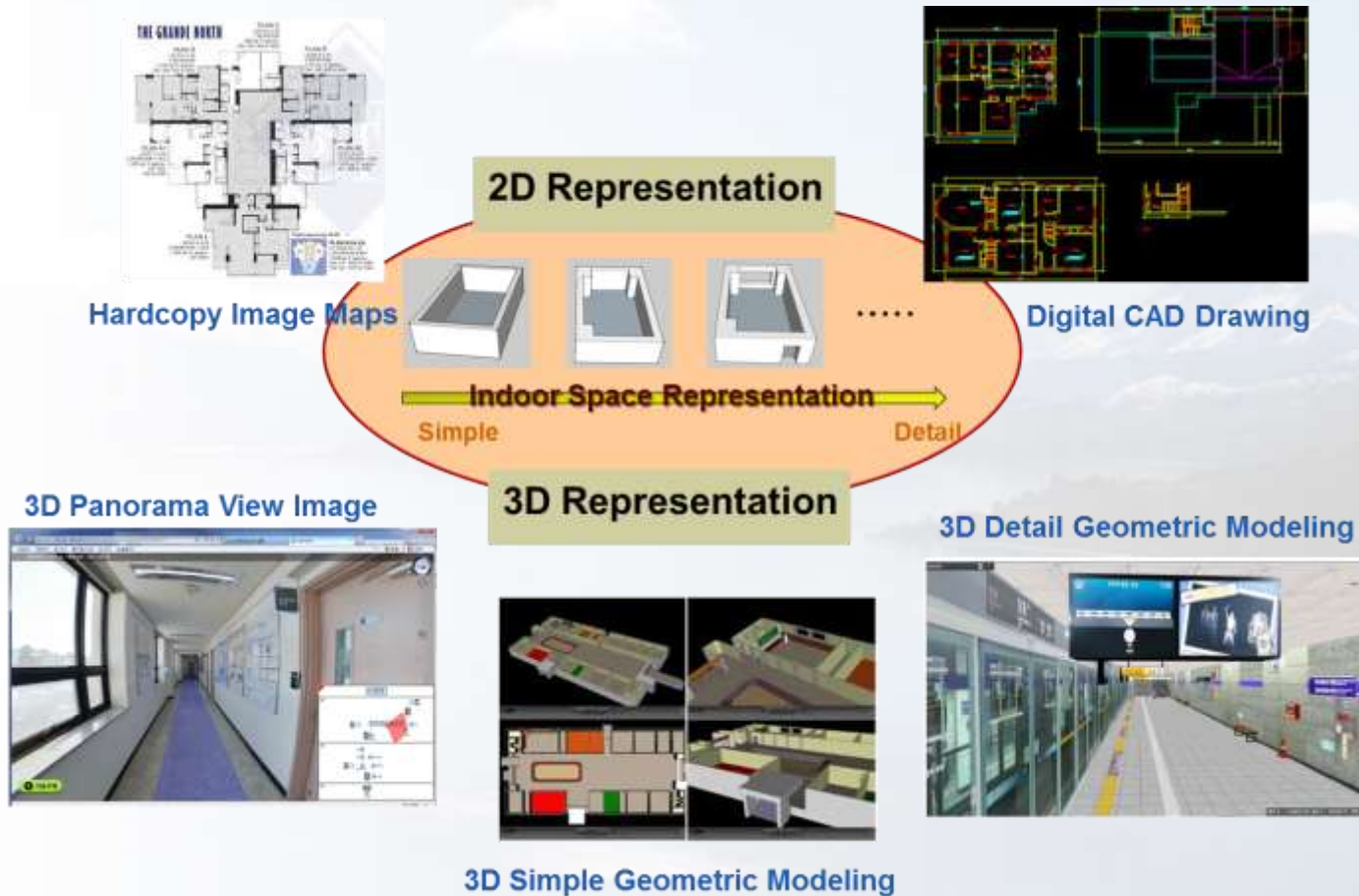
- **Geographical Scale Issues:**
  - Generalization
  - Position Accuracy
  - ....

- **Data Capture Methods:**
  - CAD/BIM Tools
  - 3D Laser Scanners
  - Omni-Direction Camera
  - TS

Simple .... Detail
Indoor Space Representation

- **Application Issues:**
  - Performance (Data Volume)
  - Affordability
  - ....

- **Data Types:**
  - 2D/3D Images
  - 2D/3D CAD (Surface-oriented)
  - BIM (Volume-oriented)
  - TS (Wire-Frame)

2. Considerations in Indoor LoD Model

3. Concepts of Indoor LoD

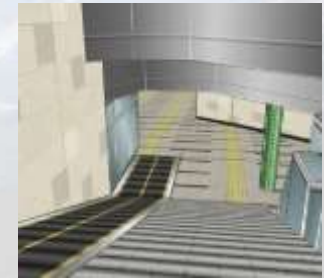| Image		Geometric Modeling		
Indoor LoD 1	**Indoor LoD 2**	**Indoor LoD 3**	**Indoor LoD 4**	**Indoor LoD 5**

2D Layout Image | Omni-directional Image | CAD Drawing | 3D Simple Geometry + Texture | 3D Detailed Geometry + Texture

3. Concepts of Indoor LoD

	Image Representation		Geometric Representation		
	Indoor LOD 1	Indoor LOD 2	Indoor LOD 3	Indoor LOD 4	Indoor LOD 5
Spatial Object Geometry Information	-	-	2D Curve	3D Solid (Representing vertical protrusion and sink of surface and slope)	3D Solid (Including sophisticated structures of surface)
Accuracy Classification (location(/height))	Low (1m)	Medium (1m)	Low	High (0.4/0.4m)	Very High (0.2/0.2m)
Visualization data	footprint	Panoramic Image	2D CAD Drawing	True Ortho Imagery	True Ortho Imagery
Application Field	Route Guidance	Store-view, Virtual Indoor Experience, Route Guidance	Route Guidance	Facility management, Virtual simulation, Disaster simulation	Facility management, Virtual simulation, Disaster simulation

4. Experimental Implementation

Topological Representation	Proposed Level of Detail	Application Domains

IndoorGML

- Indoor LoD 1 — Indoor navigation
- Indoor LoD 2 — Virtual Museum tour
- Indoor LoD 3 — Space Management
- Indoor LoD 4 — Indoor simulation in buildings
- Indoor LoD 5 — Indoor Facility Management
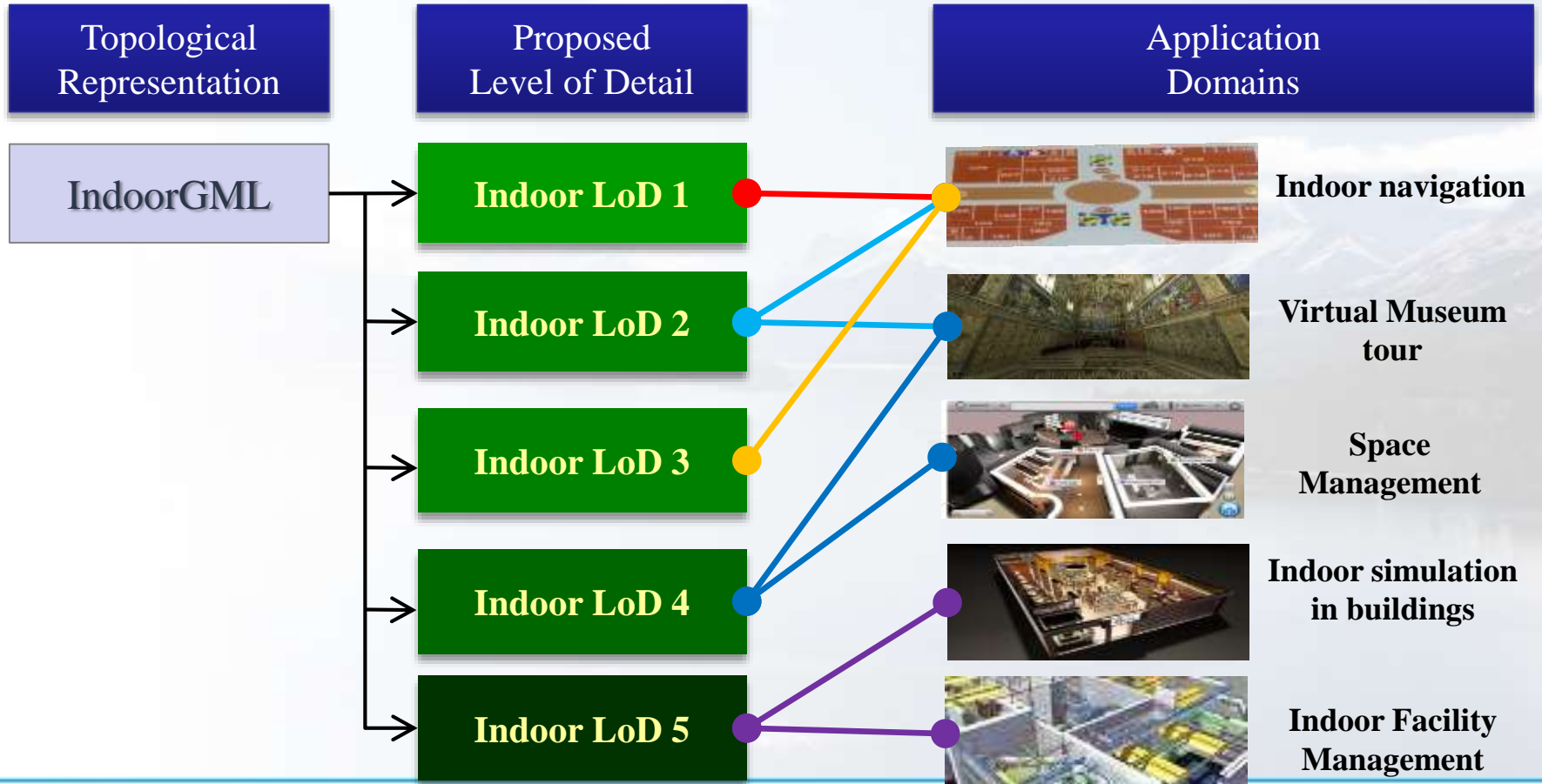
4. Experimental Implementation

■ Example (Based on Indoor LoD 2)

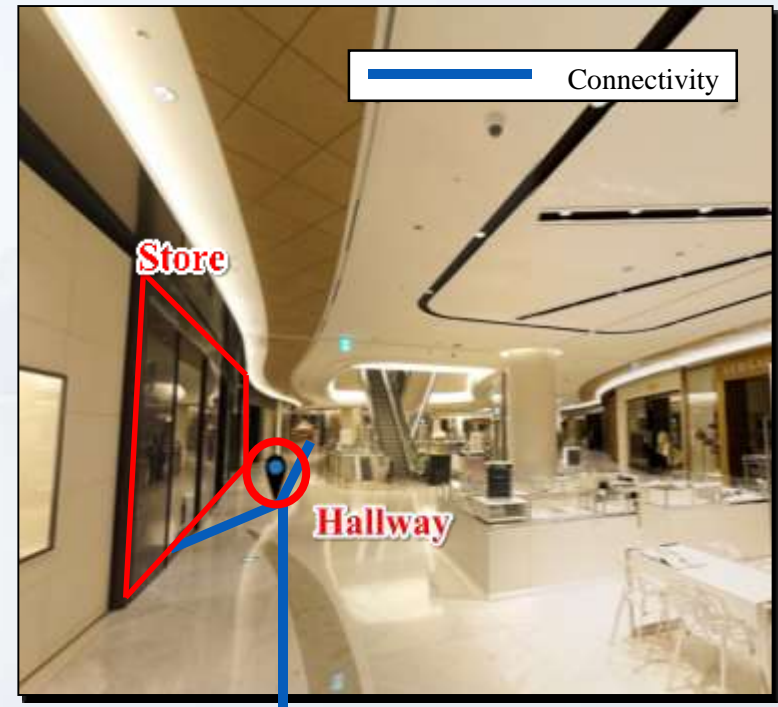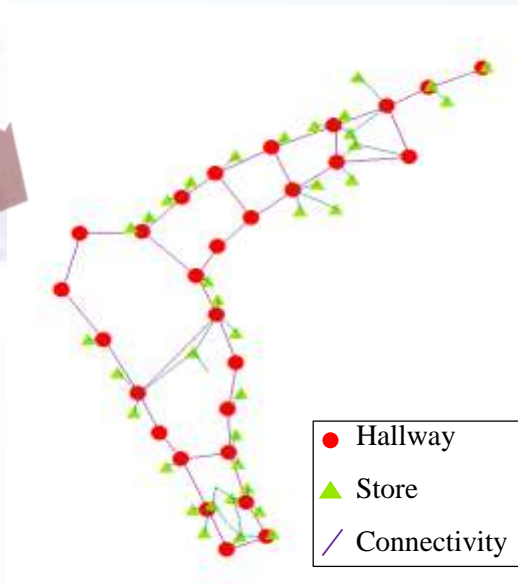
To provide more complicated service like facility management or disaster simulation in

Indoor LoD 2, relation between space and topology have to be defined

4. Experimental Implementation

■ Example (Based on Indoor LoD 2)

Legend:
- ● Hallway
- ▲ Store
- ╱ Connectivity

Connectivity

Store

Hallway

- Hallway, Store(Space) → Node

- Space's connectivity → Edge

5. Conclusion

- This study focused on indoor LoD model for representing indoor space based on indoor applications

    – Consider issues of indoor representation

    – Apply proposed indoor LoD 2 to specific case

- **Future Work**

    – Specify proposed indoor LOD model

    – Implement experiment for connecting with topological data