

# Indoor Location Ontology

Report by : Yuhana

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The report describes about indoor location ontology for CSIE (Computer Science and Information Engineering) building, one of building in National Taiwan University (NTU), Taiwan. This ontology will be used for path finding based on context on indoor location.

## Description about CSIE building

CSIE building has 5 floors and one basement. Each floor has many rooms, passage, ladder sand lifts. There are several types of rooms:

1. Laboratory. These rooms are provided for students to explore and practice their knowledge, do research, assignment from teacher or supervisor, or the project. Each laboratory has name, room number, door way, spread on 5 floors, and supervised by teacher as supervisor.
2. Seminar room. Seminar rooms are provided for students and teacher to discuss their field, project, or discuss the paper.
3. Classroom. Classrooms are provided to support academic activity such teaching process.
4. Rest room. Each floor has rest room as service room for people.
5. Staff's office. Staff's office is office for teacher or CSIE staff.

There are 2 type passages: corridor and door way. Corridor connect one room with another room or another place, door way connect room is way out from room.

Ladders and lifts connected one floor with another. There are 3 ladders in CSIE building, 2 ladders in east side (ladder in south east building and ladder in north east building) and one ladder in west side. Also there are 2 lifts in east side, lift in south east building and lift in north east building.



Figure 3. Map for 3<sup>rd</sup> floor in CSIE Building

The tables below will describe about room in each floor for 1<sup>st</sup> floor to 3<sup>rd</sup> floor.

Table 3. List of The Rooms at 3<sup>rd</sup> floor

Number	Name	Category
336	Intelligent Space Laboratory	Laboratory
332-334	Parralel & Distributed Processing Laboratory	Laboratory
328-330	Digital camera & computer vision laboratory	Laboratory
324-326	Seminar Room	Seminar Room
322	Chih-Wen Hsueh's office	Office Room
320	Shih-Hao Hung's office	Office Room
318	Hsu, Jane Yung-Jen's office	Office Room
316	Kao Young Cheng's office	Office Room
314	Empty room	-
312	Empty room	-
310	Seminar Room	Seminar Room
308	Intelligent Space Laboratory / Embedded Computing	Laboratory
306	Intelligent Space Laboratory / Image Processing & Pattern Recognition	Laboratory
304	NSC PPAEU laboratory	Laboratory
302	Machine Discovery & Social Network Mining Lab	Laboratory
301	Natural language processing lab	Laboratory
303	Digital Archive & Automated Reasoning Lab	Laboratory
305	Office Automation Network Lab	Laboratory
307	System on a chip lab	Laboratory
311	Chen, Hsin-His's office	Office Room
313	Yan, Wen-Ming's office	Office Room
315	Kuo, Tei-Wei's office	Office Room
317	Lee, Tzao-Lin's office	Office Room
319-321	Seminar Room	Seminar Room
323	Pu-Jen Cheng's office	Office Room
341	Honorary & Retired Faculty office	Office Room
325	Honorary & Retired Faculty office	Office Room
339	Faculty club	Office Room
331	Ruey-Feng Chang's office	Office Room
333	Shou-De-Lin's office	Office Room
335	Kitchen	Service room
337	Bathroom	Service room
346	Low Power VLSI Laboratory	Laboratory
344	Neural Networks Lab	Laboratory
342	Intelligent Space Laboratory / Intelligent robotics & automation	Laboratory
340	Seminar Room	Seminar Room

### CSIE Location Ontology

Based on above CSIE building description, we design an ontology for indoor location for CSIE building.

We follow these steps :

1. Determine scope
2. Consider reuse
3. Enumerate Terms
4. Define Taxonomy
5. Define Properties
6. Define Facets
7. Define Instances
8. Check for Anomalies

I. Determine scope

Our ontology will cover indoor location based on CSIE building. This ontology will be used for finding path / way from one place to another place. Ontology should provide information about all the places in CSIE building, room name, room number, staff office, professor laboratory. This ontology will be used by CSIE building visitor include students, staffs / lecturers, couriers, or guests.

II. Consider Reuse

Since there is no ontology for indoor location, we develop new ontology for this purpose.

III. Enumerate Terms

Enumerate terms can be done by following these steps :

1. Identify relevant terms
2. Write down in an unstructured list all the relevant terms

Terms with noun phrase indicate class names and verbs indicate property names

Based on above description about CSIE building, we identify and list the terms in CSIE building. Here are terms in CSIE building : Room, Corridor, Classroom, Door way, Floor, Passage, Ladder / Stair, Lift, Laboratory, Restroom, Office, Seminar room, Kitchen, connect with, room name, room number, passage at floor, room at floor, consist of room, room has door, ladder at floor, lift at floor, in region, floor number, laboratory name, has room number, lab supervised by, office own by.

Based on these terms we separate in 2 parts:

1. Classes : Room, Corridor, Classroom, Door way, Floor, Passage, Ladder, Lift, Laboratory, Restroom, Office, Seminar room, Kitchen.

- Properties: connect with, room name, room number, passage at floor, room at floor, consist of room, room has door, ladder at floor, lift at floor, in region, floor number, laboratory name, has room number, lab supervised by, office own by.

- passage\_at\_floor
- room\_at\_floor ↔ consist\_of\_room
- consist\_of\_room ↔ room\_at\_floor
- room\_has\_door
- ladder\_at\_floor
- lift\_at\_floor
- facesPlace
- inRegion
- under\_of ↔ above\_of
- above\_of ↔ under\_of
- connectWith ↔ connectWith

- floor\_number
- lab\_name
- room\_name
- has\_roomNumber
- lab\_supervisedby
- office\_ownby

Figure 2

Figure 3.

#### IV. Define Taxonomy / class hierarchy

Class hierarchy for indoor location ontology :

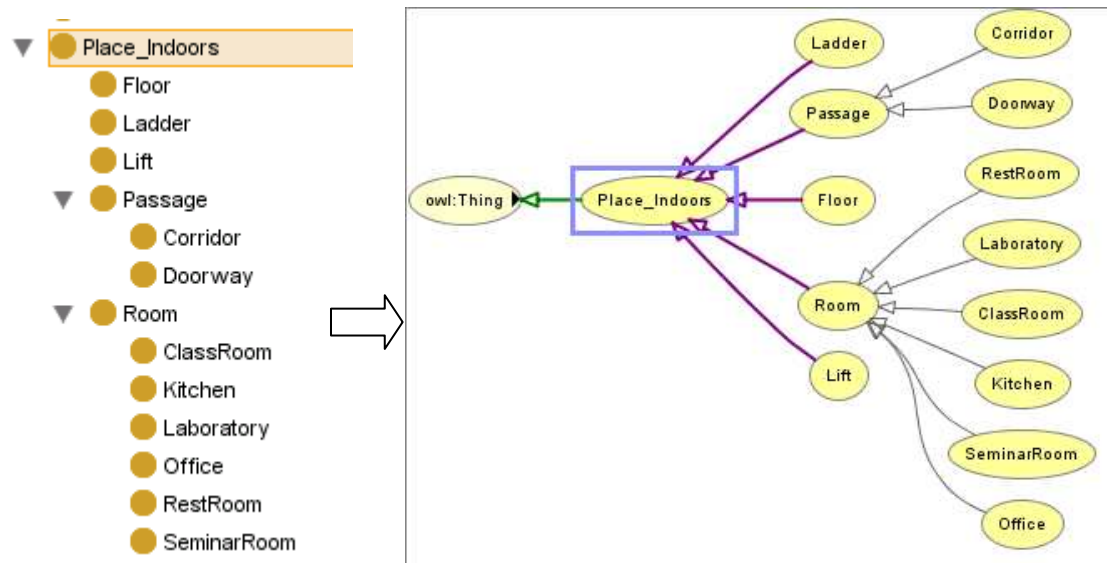


Figure 4. Class hierarchy for Indoor Location Ontology

#### V. Define Instances

Instances for indoor ontology building :

- 6 instances for Floor
- 20 Instances for ladder / stair

3. 12 instances for lift
4. Instances in 3<sup>rd</sup> floor :
  - a. 56 instances corridor
  - b. 52 instances doorway
  - c. 1 kitchen
  - d. 17 laboratory
  - e. 18 office room
  - f. 7 seminar room