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A method to generate traverse paths for eliciting missing requirements

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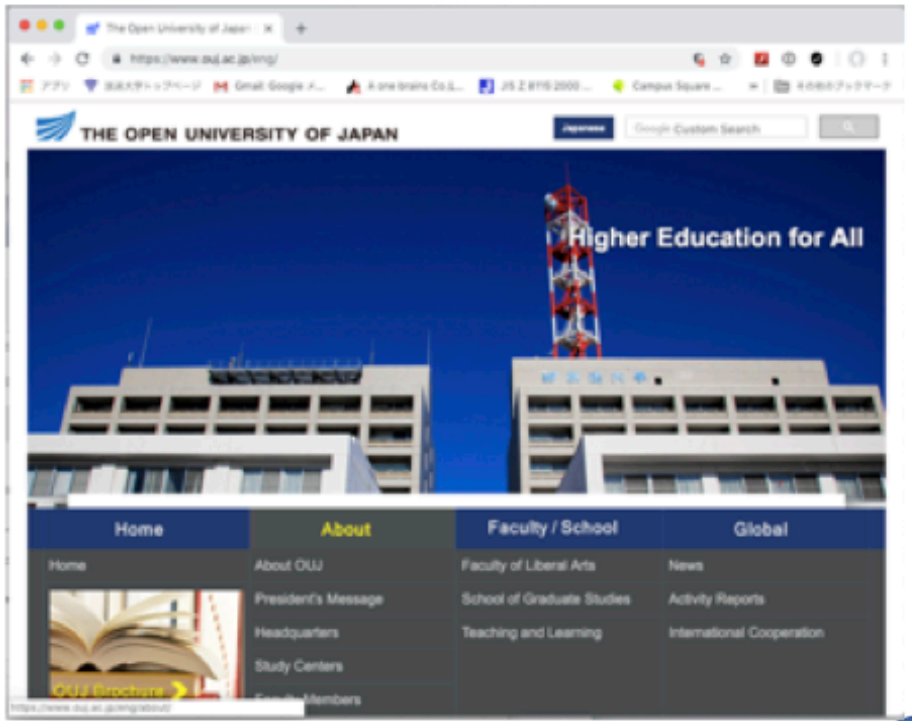
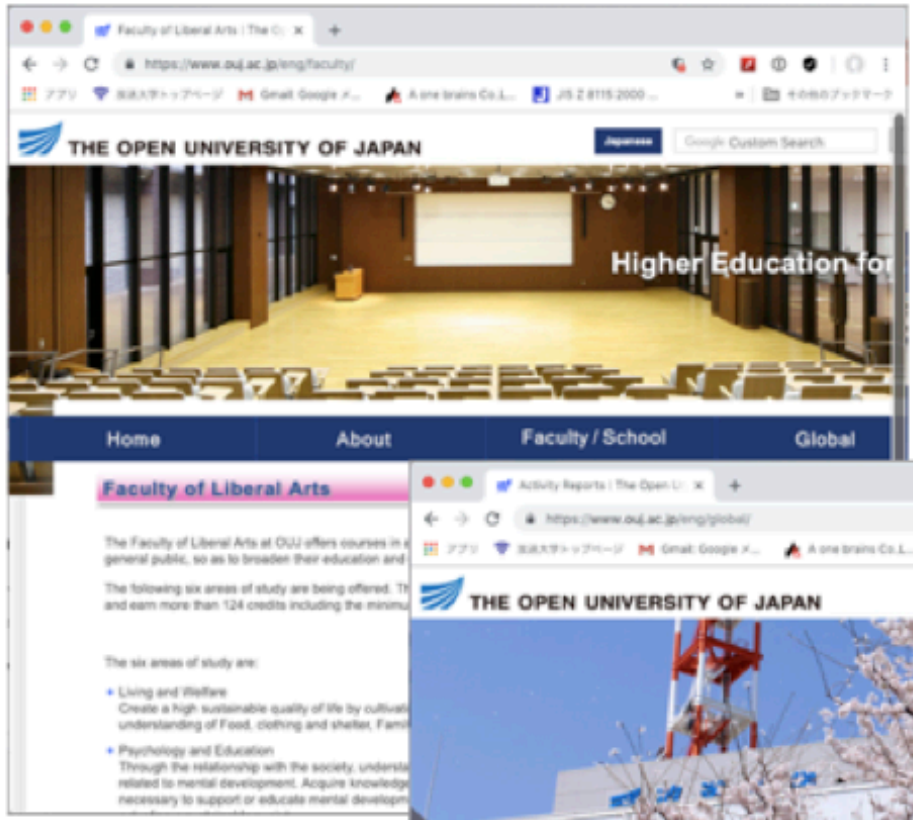
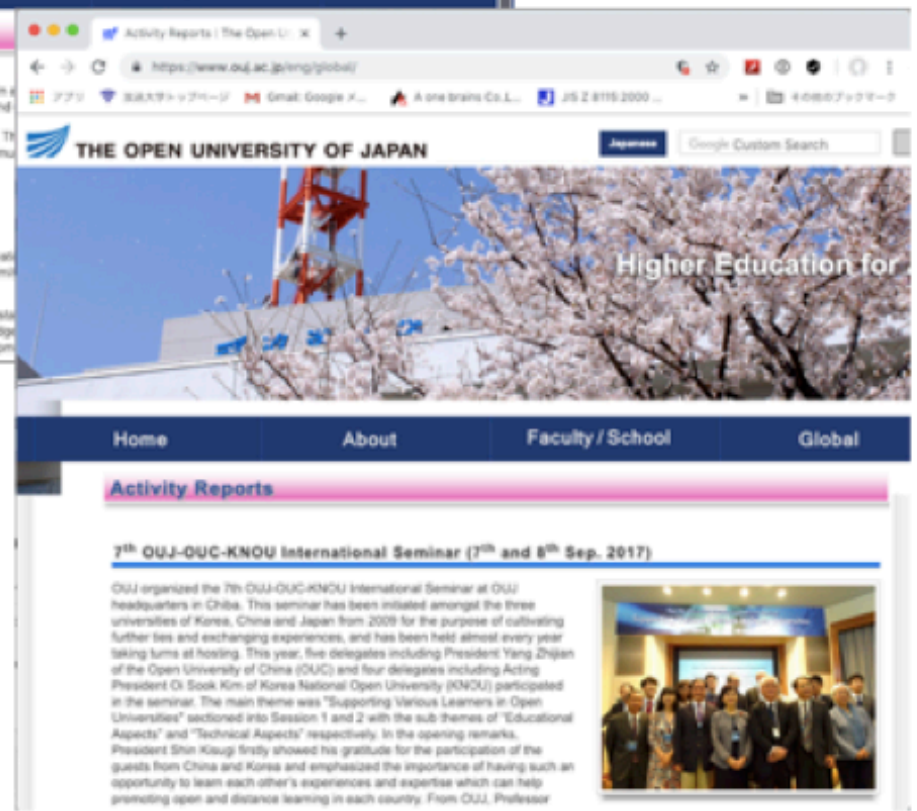
Agenda

1. Background and a goal
2. Related work
3. Approach
4. Overview of the proposing method
5. Experiment
6. Discussion
7. Conclusion

1. Background







Goal

- To save people from getting lost in a web, we develop a method to create an ”adequate/useful” web site based on a conceptual model.
- The mission of the method
  - Define elements of a conceptual model to achieve the goal.
  - Define a process to find requirements that are not satisfied in the current system.
  - Generate actors’ traverse paths within the system.
    - Ex. of a traverse path) Actor *A* accesses *X*, *Y* from *X*, and *Z* from *Y*.
  - Generate inverse requirements.
    - Ex.) Actor *A* cannot access *P* from *X*.

2. Related work

- Use case as a requirements definition method.
  - We need to represent processes of users' total activities/behaiviours in the developing web system.
- Ontology as a requirements elicitation method.
  - We focus on relations among objects with accessing permissions of each user.
- Persona analysis as a requirements engineering method to derive typical user's requirements.
  - We need more general model. -> A conceptual model.

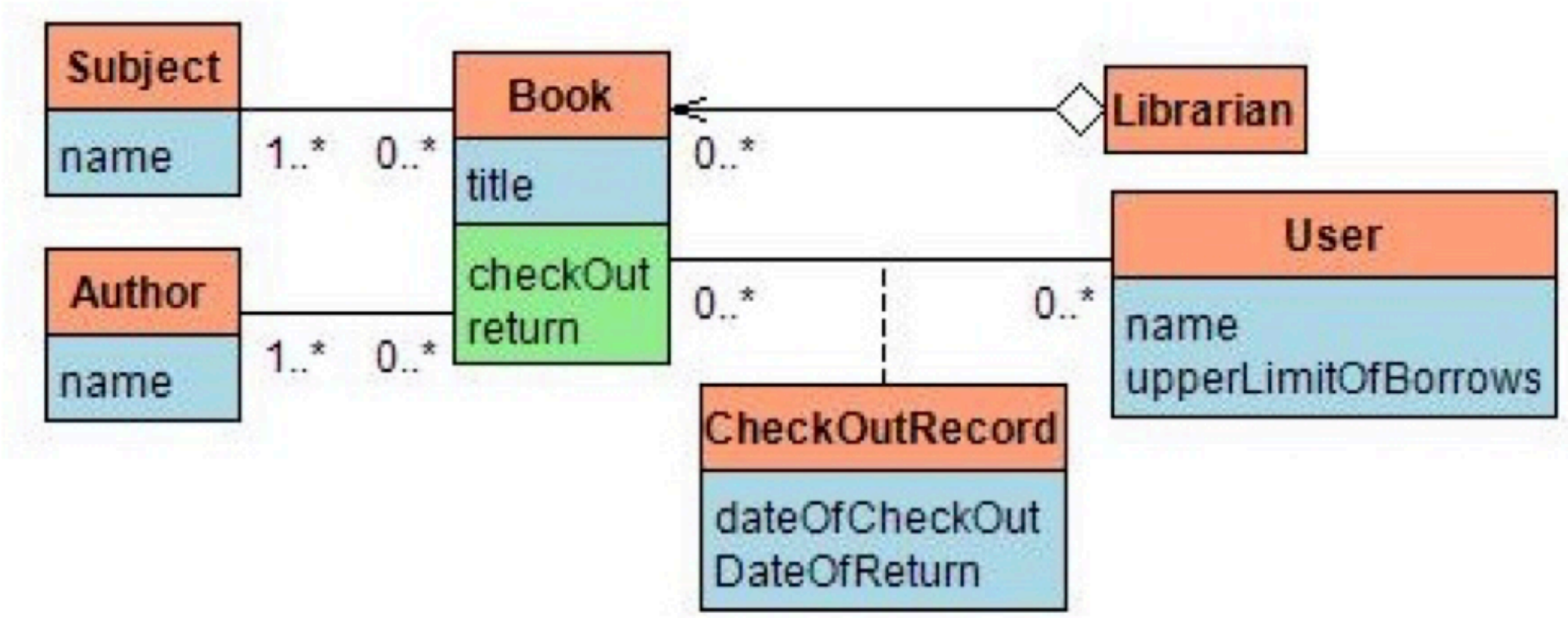
3. Approach

We extend
UML class diagram.

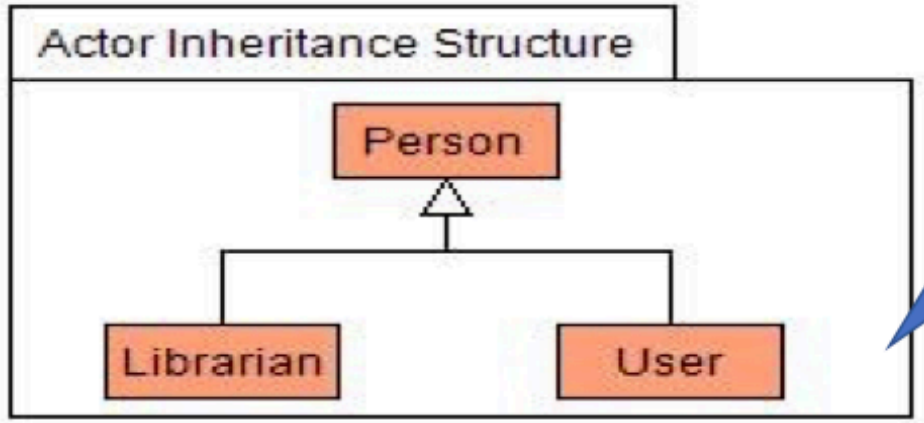
- Defining elements of a conceptual model
  - Object / Class / Inheritance
  - Association / Aggregation / Association class
  - Actor
  - Permission (actor + access permissions (create/read/update/delete))
- Defining rules for generating traverse paths
  - depending on the structure of the conceptual model.
- Applying the method and tool for an example to evaluate the method.

Overview: How does our method work?

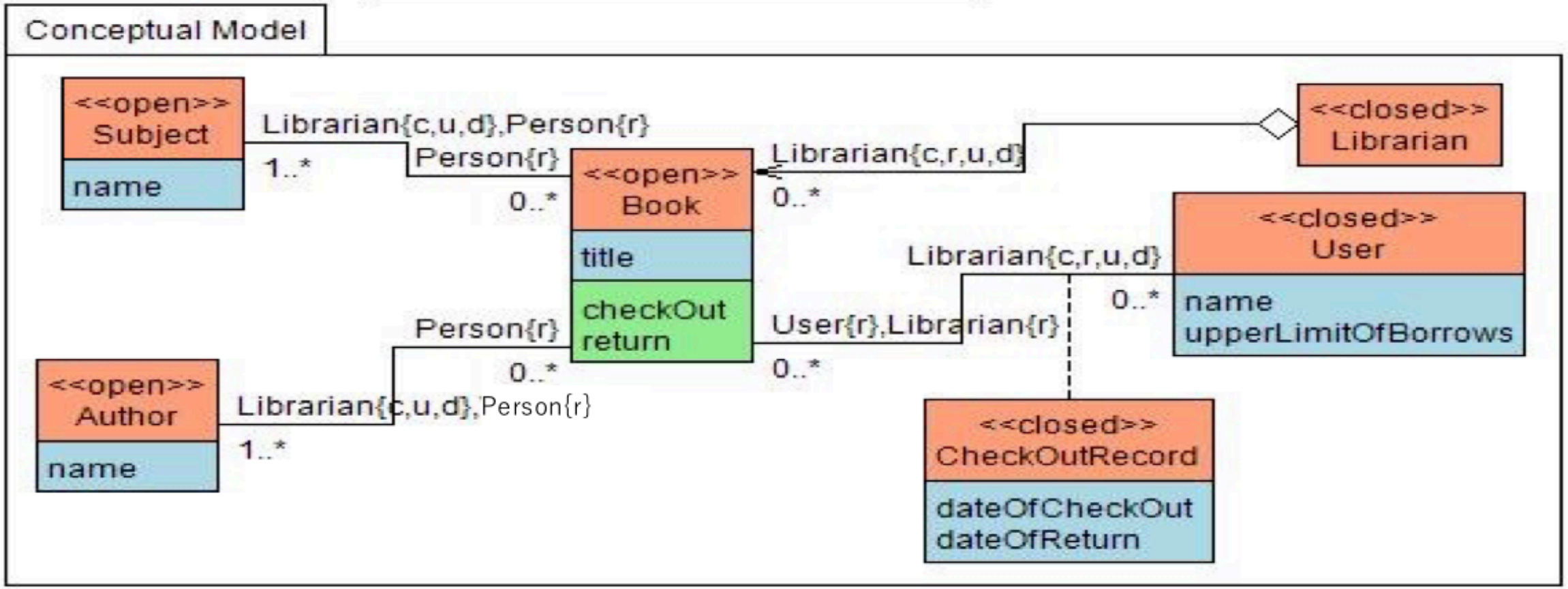
- A general class diagram does not work.



It works!

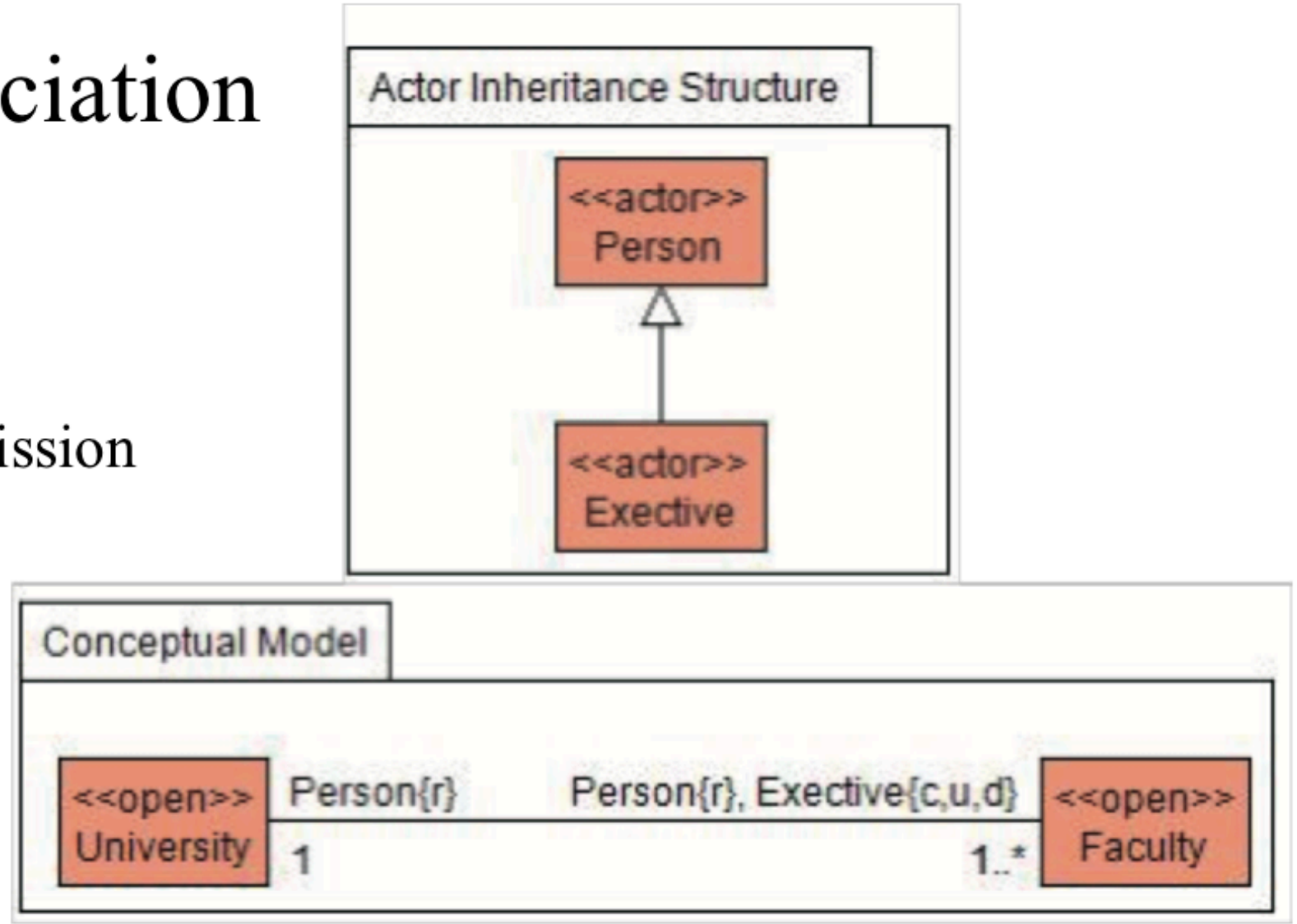


Proposed class diagrams with access permissions.



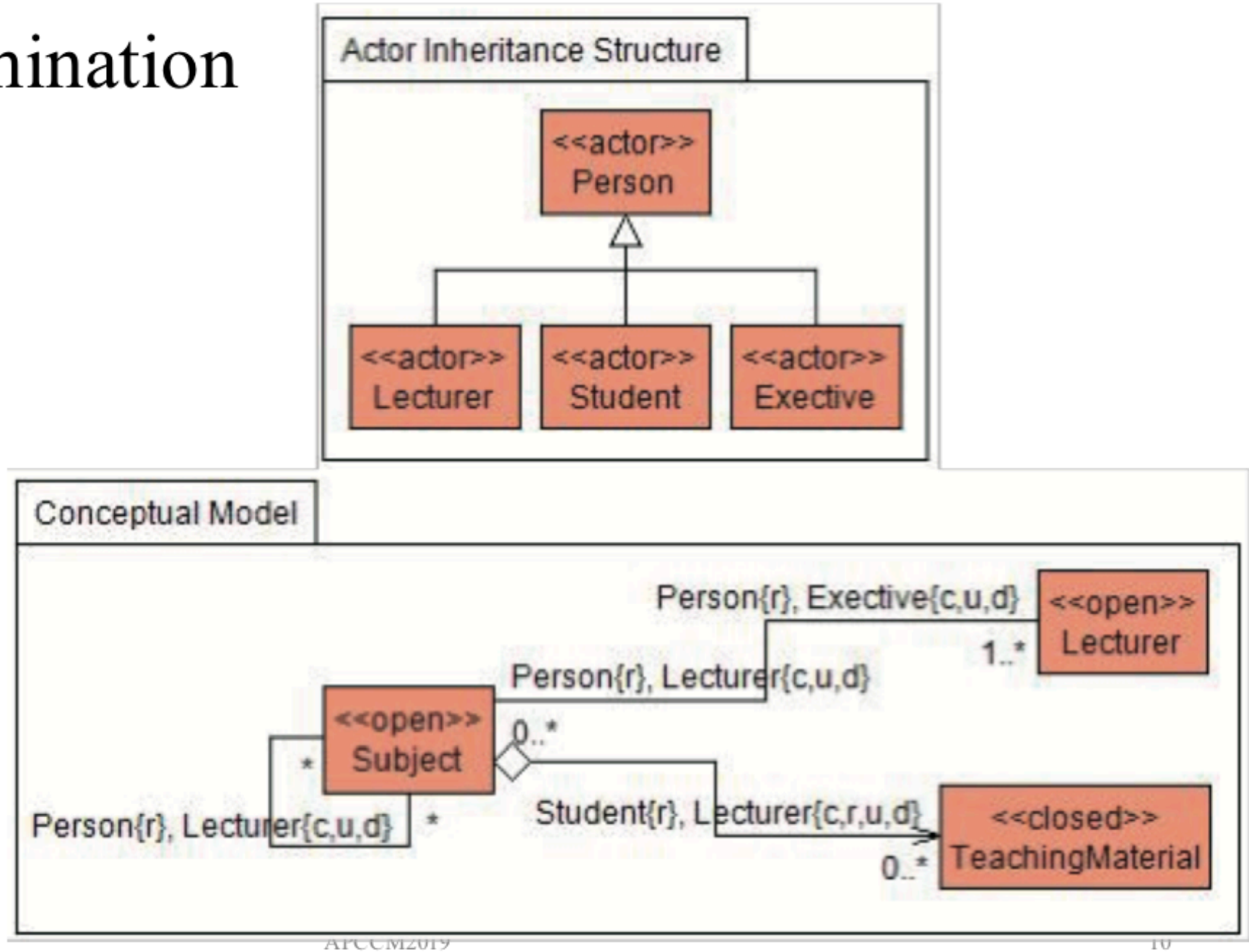
Rules for association

- <<open>>
- <<closed>>
- roles -> access permission



The tool is available from http://www.s-lagoon.co.jp/Traverser

Rules of termination of traverses



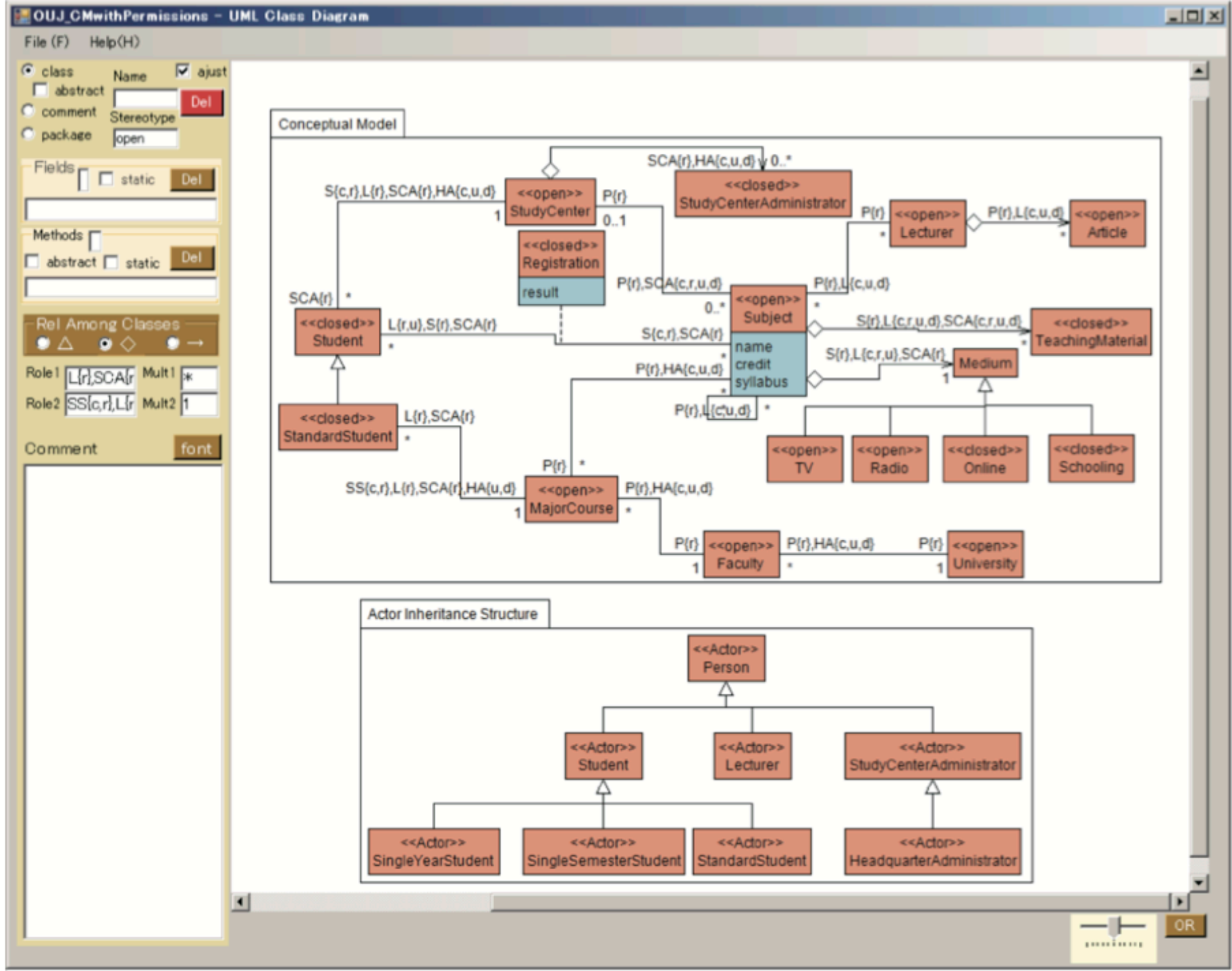
A process of the method

1. Develop a conceptual model agreed on by domain experts.
2. Define actors' groups in an inheritance structure.
   - The structure implies access permissions of actors.
3. Define permissions for every actors' category to access relations.
4. Traverse classes by tracing associations/aggregations via classes for each permitted actor and construct possible traverses for each actors' category.
5. Validate specified requirements with derived traverses.

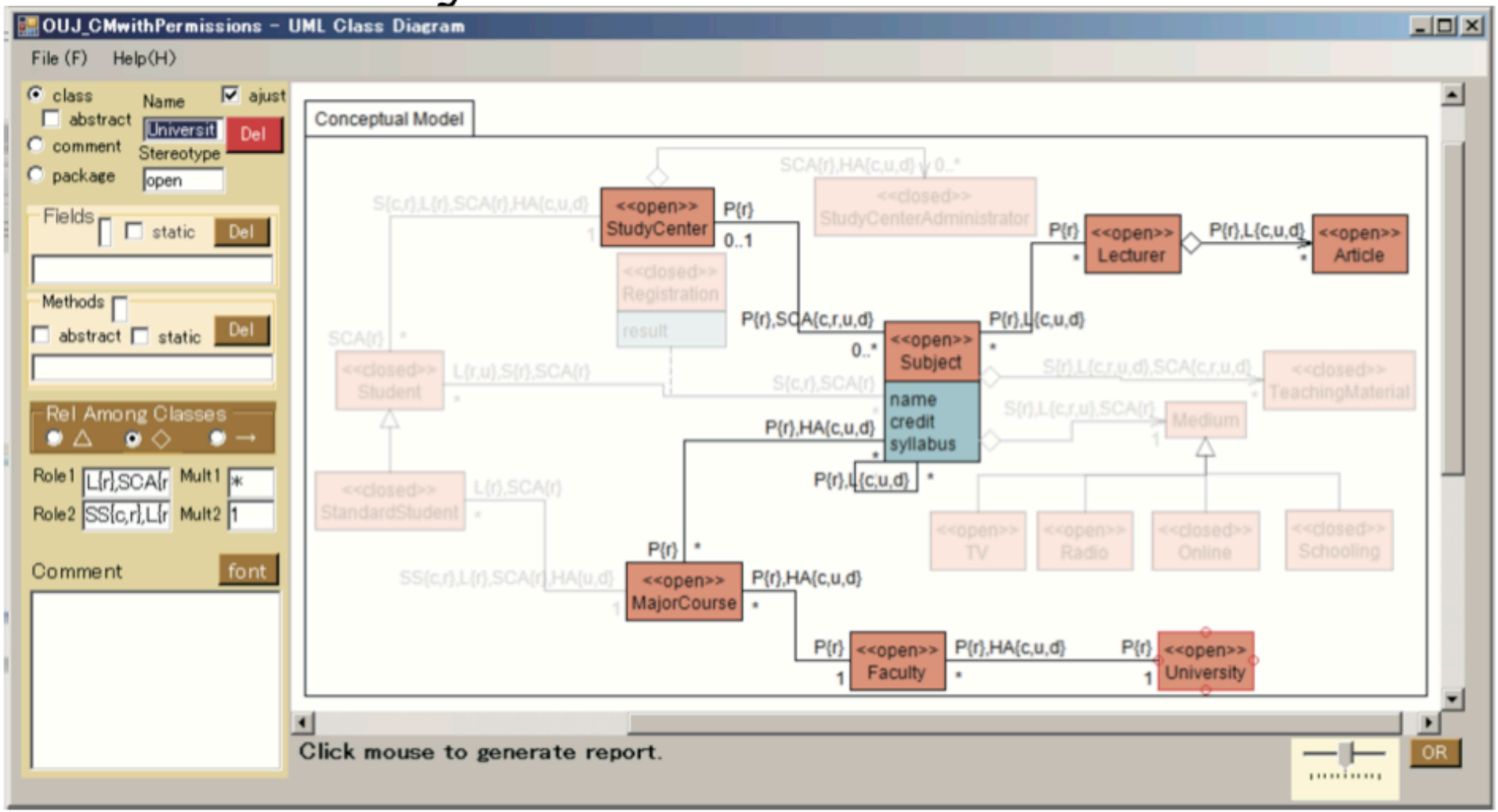
Experiment: System WAKABA for academic affairs of the Open University of Japan.

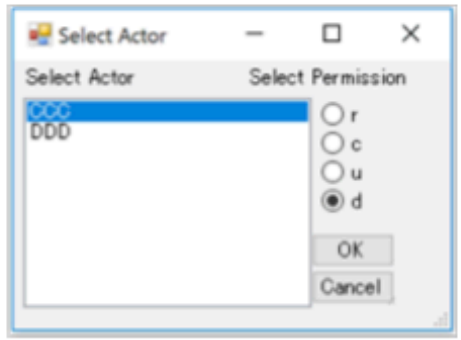
- It was newly released in March/2018.
- Users:
  - Students: approximately 90,000 (from 15 year-old to 100 or more? year-old)
  - Lectures, officers, and administrators: hundreds,
  - Expected visitors: All of Japanese 120,000,000
- We built a conceptual model with the scope of the system WAKABA.
  - Assumption: The model is correct, or at least adequate.

The conceptual model of OUJ



The visualized scope of Person's traverse from University





An example of a dialog to generate traverse paths. The paths are reported visually and also in a text file.

Unimplemented functional requirements

- MissReq1:
  - S/he cannot access the multimedia teaching materials from the syllabus.
- MissReq2:
  - S/he cannot access lecturers' information from the syllabus. Every syllabus is provided by a PDF file without any links.
- MissReq3:
  - In genera, a standard student who logs in to the system, s/he is not allowed to access open information.

Traverser could define.....

- An actor *StandardStudent* who accesses a/an *Subject* object can access(read) the *Medium* object or the *TV* object or the *Radio* object or the *Schooling* object or the *Online* object from the *Subject* object.
- An actor *Lecturer* who accesses a *Subject* object, can access the *Student* objects from the *Subject* object, and the *Registration* object of the *Subject* object for each *Student* object.
- An actor *Student* who accesses the *Student* object can access the *Subject* objects from the *Student* object, as well as the *Registration* object of each *Subject* object.
- An actor *Student* who accesses the *Student* object can access the *Subject* objects from the *Student* object, as well as the *Student* objects from each *Subject* object.

Discussion

- The threats of internal validity
  - The conceptual model of WAKABA might be built for traverse generation, only?
- The threats of external validity
  - Can every engineer use the method?
  - The undefined requirements that the Traverser generated were known to the stakeholders of WAKABA, but were deleted because of their priority policy.
  - If the size of the conceptual model becomes too large, the number of traverses will explode.
  - The undefined requirements in WAKABA are OUJ specific requirements.

Limitations of the method

- Since the conceptual model is a static model, we cannot generate traverses that imply temporal information. The tool can generate only possible traverses.
- The access control is imperfect, because the method only mentions permissions on associations/aggregations.

Future work

- Apply the method and tool to other domains and evaluate the effectiveness more widely.
- Validate the practicability of our approach with practitioners.

References

- Requirements Engineering literatures are available.
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- Takako Nakatani and Toshihiko Tsumaki. 2014. Predicting Requirements Changes by Focusing on the Social Relations. In Proc. of the 10th Asia-Pacific Conference on Conceptual Modeling. Australian Computer Society, 65–70.