COMP718: Ontologies and Knowledge Bases
Answers Lecture 7—bottom-up ontology development

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1 From conceptual data models to an ontology

1.1 Manual modelling

Consider Figure 1.

1. Represent the depicted knowledge in an OWL ontology.
   Answer: A sample formalisaiton is available at
   http://www.meteck.org/teaching/ontologies/phonepoints.owl.

2. Can you represent all knowledge? If not: what not?
   Answer: yes, all of it it can be represented.

3. Are there any problems with the original conceptual data model? If so, which one(s)?
   Answer: yes, there are problems. See Figure 5 for a graphical rendering that MobileCall and Cell are unsatisfiable; verify this with your version of the ontology. Observe that it also deduced that PhonePoint ≡ LandLine.

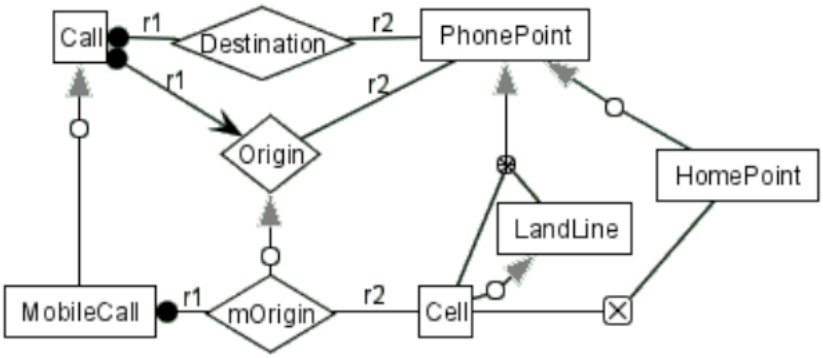

Figure 1: A small conceptual model in ICom; blob: mandatory, open arrow: functional; square with star: disjoint complete, square with cross: disjoint, closed arrow (grey triangle): subsumption.

1.2 Integration

Figure 3 shows a very simple conceptual data model in roughly UML class diagram notation: a partition [read: disjoint, complete] of employees between clerks and managers, plus two more subclasses of employee, namely rich employee and poor employee, that are disjoint from the clerk

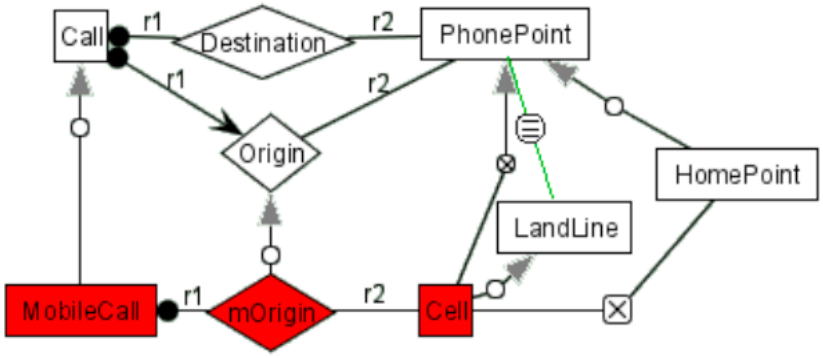

Figure 2: Answer to 1.1-3: red: inconsistent class, green: 'positive' deduction

and the manager classes, respectively (box with cross). All the subclasses have the salary attribute restricted to a string of length 8, except for the clerk entity that has the salary attribute restricted to be a string of length 5. Another conceptual data model, in ORM2 notation (which is a so-called attribute-free language), is depicted in Figure 4, which is roughly similar.

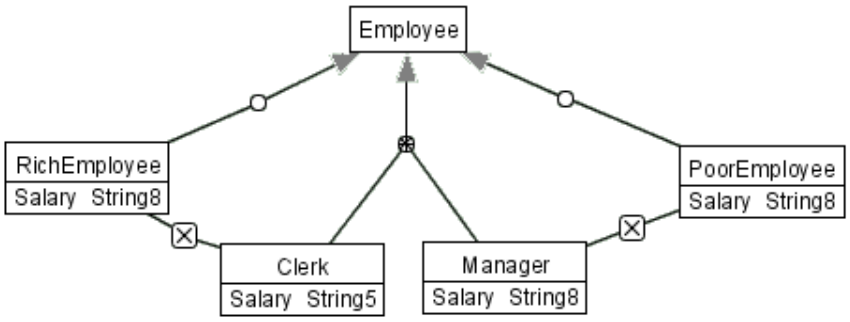

Figure 3: A small conceptual model in ICom.

Exercises

1. When you reason over the conceptual data model in Figure 3, you will find it has an inconsistent class and one new subsumption relation. Which class is inconsistent and what subsumes what (that is not already explicitly declared)? Try to find out manually, and check your answer by representing the diagram in an OWL ontology and run the reasoner to find out.
   Answer: See Figure 5

2. Develop a proper ontology that can handle both conceptual data models. Consider the issue of how deal with attributes and add the information that clerks work for at most 3 projects and managers manage at least one project.
   Answer: Multiple answers are possible due to various design decisions. E.g.,:
   - Did you represent Salary as a class and invented a new object property to relate it to the employees, or used it as a name for an OWL data property (preferably the former)? And when a data property, did you use different data types (preferably not)?
   - Did you add RichEmployee, or, better, Employee that has some property of being rich?
   - Did you use a foundational ontology, or at least make a distinction between the role and its bearer (Employee and Person, respectively)?

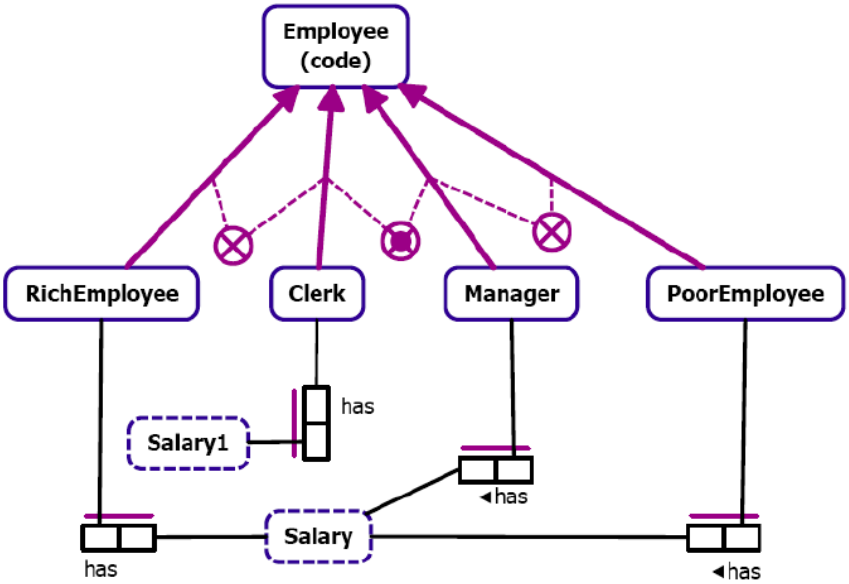

Figure 4: A small conceptual model in ORM2, similar to that in Figure 3.

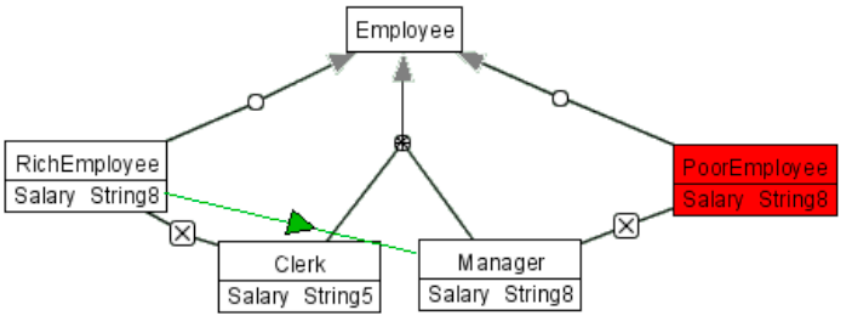

Figure 5: Answer to 1.2-1

2 Thesauri

Given the small section of the Educational Resources Information Center thesaurus, below.

1. In which W3C-standardised (Semantic Web) language would you represent it, and why?
   Answer: Language: SKOS or OWL 2 EL. Why:
   - SKOS: was the purpose of it, to have a simple, but formal, language for 'smooth transition' and tagging along with the SW
   - OWL 2 EL: intended for large, simple, type-level ontologies, and then still some reasoning possible

2. Are all BT/NT assertions subsumption relations?
   Answer: Regarding mass media, films and news media: not necessarily, but to be certain, check yourself what the definition of `Mass Media` is, when something can be called `News Media`, and then assess the differences in their properties.
   `Propaganda` has as broader term `Information Dissemination`, but a characteristic of propaganda is dissemination of *mis*information.

```
Popular Culture
     BT Culture
```

NT n/a
RT Globalization
RT Literature
RT Mass Media
RT Media Literacy
RT Films
UF Mass Culture (2004)

Mass Media
BT n/a
NT Films
NT News Media
NT Radio
RT Advertising
RT Propaganda
RT Publications;
UF Multichannel Programing (1966 1980) (2004)

Propaganda
BT Communication (Thought Transfer)
BT Information Dissemination
NT n/a
RT Advertising
RT Deception
RT Mass Media
UF n/a