## Logics and categories for software engineering and artificial intelligence

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# Exercise Sheet 4

**Due: May 19, 2009**

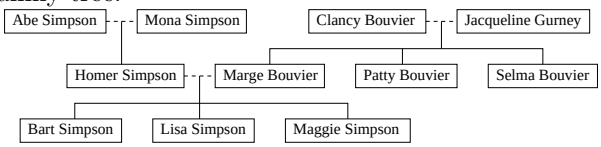
**Exercise 4.1** (Family ontology)

Download the family ontology from the lecture website[1].

(a) Define roles *hasParent*, *siblingOf*, *relativeOf*, and *ancestorOf*.
(b) Define cousin relations (cf. `http://en.wikipedia.org/wiki/Cousin`) up to second degree cousins and two removes.
(c) Where applicable, state role hierarchies, reflexivity and transitivity of roles, inverse roles, and role compositions.

**Exercise 4.2** (Reasoning with Protégé and Pellet)

(a) Extend the family ontology from Exercise 4.1 with the individual and role assertions (only marriage and parent-child relations) depicted in the following family tree.




(b) Additionally, state some implied facts (persons being grandparents, implied relations, etc.) and mark them with `%implies`.
(c) Use Hets (latest build) to prove the implied facts. It is also possible to translate the Hets input file into an OWL file that can be parsed by Protégé by running `hets -o owl Family.het`.

**Exercise 4.3** (Cyclic TBoxes)

Specify the following statements, possibly using cyclic TBoxes. If you use a cyclic TBox, be careful to correctly choose least or greatest fixpoint semantics, according to what is needed in the examples.

(a) A chess fanatic is a chess player all of whose friends are chess fanatics.
(b) A Gmail user has been invited by some Gmail user.
(c) A folder is an inode that contains inodes, all of which are files, folders or devices.

The exercise sheets may and should be worked on in groups of two (2) students. Please write both names on your solution.

[1] `http://www.informatik.uni-bremen.de/agbkb/lehre/ss09/logcat/family.het` (note that the ontology differs from the one mentioned on the last exercise sheet)