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AE4M33RZN, Fuzzy logic: Assignment

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Scenario

It is the year 2030, in which Facebook has severed a devastating drain of users to its competitors. In a desperate attempt to save its existence, the once largest social network decided to exploit its massive database of sensitive data in order to offer its users "the world's best dating site".

You have been hired by Facebook as a knowledge engineer, who shall design the core engine of the new service. You chose the already-well-established formalism of fuzzy description logic to do your job.

Task description

- You can assume that the service works as follows: A user (let's call him Bob) clicks the "Find a match" button, which starts the dating system. Your system imports a subset of Facebook's database, which is related to the particular user: The list of friends, list of friends of friends, some rather distant people unreachable via the friend relation, personal details, user's history...

- You can start by using the following relations:

  - friendOf(x, y) (abstract, symmetric relation): relates two friends x, y.
  - Like(x) (concept): set of items (URLs, images, ...) Bob "likes".
  - likes(x, y) (abstract relation): the person x likes the item y.
  - ageDiff(x, y) (concrete feature): age difference between Bob and the person x.
  - lastContact(x, y) (concrete feature): person x was contacted by Bob (sent a message, wrote on the wall, ...) y time units ago.
  - PastSchool(x) (concept): Bob studied at the school x in the past.
  - studiedAt(x, y) (abstract relation): the person x studied at the school y in the past.

  Think about other types information that might discover a good soul-mates! You can negotiate with your boss about the type and amount of imported data.

- Be creative! The assignment asks you to use your own imagination.

- Be polite! Respect ethical conventions and avoid offensive statements.

Assignment goals

Your overall task is to create *a demonstration prototype* and *design proposal* of the match-making system. You are asked to supply a document describing, how you plan to implement the system, supported by a *fuzzyDL* file to illustrate of your statements.

$3p$. Decide what type information Bob will enter (match preferences) before the engine starts.

Ask your boss to use at least one more type of information from the company database (create an additional concept or a relation not listed on the previous page)

Create an $\mathscr{ABox}$ with examples to illustrate the database.

$4p$. Design a fuzzy concept GoodMatch whose membership function selects the "best potential candidates". You can use helper concepts and axioms by enriching your $\mathscr{TBox}$.

Explain your design and justify the choice of particular fuzzy connectives.

Illustrate the reasoning on your $\mathscr{ABox}$ from the previous point.

$1p$. Use both the *Łukasiewicz* and *standard* operation at least once.

$2p$. Make the $depth(\text{GoodMatch}) > 2$, where the depth is defined as:

$$depth(x \in \{\top, \bot\} \cup A) = 0$$
$$depth(\forall\, \mathsf{R} \cdot \mathsf{C}) = 1 + depth(\mathsf{C})$$
$$depth(\exists\, \mathsf{R} \cdot \mathsf{C}) = 1 + depth(\mathsf{C})$$
$$depth(\square\mathsf{C}) = depth(\mathsf{C})$$
$$depth(\mathsf{C}\square\mathsf{D}) = \max(depth(\mathsf{C}), depth(\mathsf{D}))$$

for all unary and binary concept constructors $\square$.

Tip: It is not sensible to search for mates among friends, because Bob knows them already quite well. But searching among friends of friends should be better: Bob does not know these people, but they are still likely to share commond world-views, hobbies, etc.

$5p$. Simulate the reasoning engine by hand. Firstly, reduce your $\mathscr{ABox}$ and $\mathscr{TBox}$ (or even the definition of GoodMatch) *reasonably* (!), and derive the membership value of a chosen individual.

E.g. Derive $\sup(\alpha)$ in $\mathcal{K} \vDash \langle John : \text{GoodMatch} \,|\, \alpha \rangle$.

$(+2p.)$ Make your document visually appealing, easy to understand, well structured, and persuasive!

Submission

You are asked to submit one PDF document (min. 1 standard page of text), which will be used to illustrate your work and a TXT file with your ontology.

The deadline is 2/1/2013. Upload your work in the upload system: `http://cw.felk.cvut.cz/upload`

The individual tasks sum up to 17 points out of 15 (thanks to the last, bonus task). Therefore your score will be chopped at 15.

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