Social Logic Programs with Information Hiding Features

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Abstract. In a community often happens that mutual influence may occur among individuals so that individual's conclusions rely on other's ones. This results also in a form of reasoning where it may happen that a conclusion is supported by the community even though it is unfounded if interpreted as a conclusion of a single individual. Consider for example the case of voting coalition formation (like the election of the president of a committee). Typically a single individual does not decide autonomously to vote a given candidate, but it might happen that this decision depends on the decisions of other people. If we represent individual knowledge by means of traditional logic programs (under stable model semantics), and we construct the knowledge base of the community simply by merging individual programs, then the minimality of the semantics does not allow us to derive social-supported conclusions, since they technically correspond to unfounded sets of literals. Another important aspect of social interactions is that, in general, a given individual does not disclose to the community the whole knowledge base, so that information hiding mechanisms should be embedded in a language suitable to represent this form of reasoning. Consider for example the case of social-networks, where in a huge network of people each individual stores a lot of personal information exported to the network with different levels of visibility, dependent on the reliability of single contacts. In this context a number of examples of mutually influenced reasoning can be easily thought.

This work tries to meet all the above goals, by defining a language which extend a previously proposed one. First, the logic language here presented incorporates the capability of each individual to hide part of his conclusions and to reason about other's public information. The semantics of the language is based on the stable models semantics paradigm, but it gives to a collection of programs a different meaning of that given by stable model semantics applied to the same program collection viewed as a single program. In particular, the semantics is defined in such a way that the interdependent individuals' requirements result in a sort of guessing of agreed conclusions, that autonomously each individual cannot derive. The stability condition that in traditional programs (with negation) selects those models that can be re-generated by assuming false all external atoms, here operates by assuming true social conditions and by guaranteeing that this assumption allows us to re-generate the intended model. An interesting thing is that a polynomial translation exists able to map a social collection of programs in a single logic program such that the semantics of the original collection can be computed by determining the stable models of the single logic program.

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