Opinions and Beliefs as constraint system operators

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Abstract

The growing presence of digital distributed systems in social life is exemplified by many particular instances, including opinion forums, social networks, dating sites and photo sharing portals. The increased usage in the last decade of these systems brings various risks and behaviors, inherent from the social interaction therein. An epistemic aspect is singled out as a common feature shared between these systems and the behaviors carried within them. Designing, constructing and verifying formalisms to represent information that is epistemic in nature can help develop a sound theory to analyze the scenarios mentioned before and at the same time bridge the concepts involved to a logical and mathematical domain.

Regarding this, a specific concept of declarative and logic programming, that of a constraint system, deals with information represented by constraints (a constraint c could be a logical proposition partially describing a bigger system, e.g. $temperature > 20$). Constraint systems capable of incorporating the concept of spatiality such as user-spaces or message walls already exist (i.e. $[c]_i$, could read as "data/belief/constraint c belongs to agent i"). However, the movement of information between spaces is still not designed nor included in said constraint systems. Some process algebras do possess a concept of space mobility, notwithstanding, it is from an operational point of view, specifying only its behavior. Therefore it remains to mathematically define it along with all its properties.

The proposed project intends to provide constraint systems with an algebraic operator that correspond to moving information in-between spaces as to mimic the mobility of data of distributed systems such as posting opinions/lies to other spaces or publicly disclosing data (i.e. $\uparrow_i c$ reads as "extruding data/belief/constraint c from the space of agent i). Also, this extrusion operator should have a direct relationship with the spatiality operator, meaning that it should be modeled in constraint systems that also posses the concept of space (i.e. $[c \sqcup \uparrow_i d]_i = [c]_i \sqcup d$ reads "information d is extruded from the space of agent i", it can be alternatively interpreted as agent i posting an opinion d).

The authors developed a constraint system implementing the concepts of space and extrusion. The interaction between these conceptos account for mobility with no side effects, it is modeled as extrusion being the right inverse of space (i.e. $[\uparrow_i c]_i = c$ for any agent i). Additionally, given an already defined concept of space in a constraint system, the authors described different constructive ways of defining its extrusion and their mathematical properties. As a practical example, by means of a constraint system with space and extrusion, the authors gave semantic meaning to a logic with modalities of belief B_i and utterance U_i where $B_i U_i \phi \Leftrightarrow \phi$ for any formula ϕ of the logic.