On Formal Methodologies for Computer Supported Computer Ethics

Petros Stefaneas

Department of Mathematics
School of Applied Mathematical and Physical Sciences
National Technical University of Athens, Greece

Nowadays more than ever, computer ethics and information law are particularly conducive to everyday applications. Stemming from this reality computer supported computer ethics is a promising area for research. Still, the complexity of issues involved and the different problems addressed on each individual occasion make this task a hard one.

Formal methods is an area in computer science, which uses mathematics for the specification, design and verification of software and hardware systems. Usually, each formal method has its own semantics and depends on a particular logical system. Z, OBJ, VDM, CASL, B-Method, Petri Nets are few of the most well known formal methods. Most of the formal methods can be implemented in a computer. The advantage of using such methods is that they guarantee higher levels of correctness. In computer supported computer ethics, formal methods can be used to provide a report on where inconsistencies lie. For verification ([5]), the input may be a specification and a desired ethical property of a system, and the output may be either "Yes, the property is valid" or "The property is not valid". Formal methodologies based on deontic logic provide a description and informal analysis of the commonalities in ethical discourse. For example, the logic model (DEAL) makes use of recent research in deontic, epistemic and action logic, and indicate - drawing on recent research in computer implementations of modal logic - how information systems that implement the proposed formalization may be developed [4]. Another interesting example is [2] (and [1]) where mechanized multi-agent deontic logics are considered as the appropriate vehicle for engineering trustworthy robots. Mechanically checked proofs in such logics can serve to establish the permissibility (or obligatoriness) of agent actions, and such proofs, when translated into English, can also explain the rationale behind those actions. As formal method they use the theorem prover Athena in order to encode a natural deduction system for a deontic logic.

In our proposed paper, in addition to an overview, we will present a general framework for the formal methodologies of the computer supported computer ethics. This is based on the theory of institutions [3], an abstract model theoretic version of Tarki's theory of truth. Without going into mathematical details we will describe the basic methodological principles and its potential applications. We claim that our approach can be combined with other approaches, as [7], thus providing new light into the promising relation among formal methods and computer ethics.

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