Towards an Ontology of Procedures

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Abstract

Most of the current ontologies of procedures represent either informational entities (e.g. standard operating procedures) or processes directed by these informational entities (named here "executions"). As procedures are informational entities, they are dependent on languages. Even if two procedures have the same meaning, they can be formulated in different ways. For example, an apple pie recipe in a cookbook expressed in French and its translation in Esperanto both have the same meaning. However, they are expressed in two different languages. On the other hand, two executions may always differ, ever so slightly, even when the same procedure directs them. They may be realised at different times, by different people, with various tools. Consider the differences between Alice doing an apple pie on Sunday afternoon with a wooden spoon and Bob doing another apple pie, following the same recipe as Alice, on Wednesday morning with a plastic spoon.

To solve such issues, we may want to introduce an entity independent from all languages and slight variations called "canonical form". Our main general objective is to propose an ontology of canonical forms. Note that the canonical forms must admit several common features with procedures and executions. Such features encompass a mereological structure (decomposition of a procedure into sub-procedures and elementary instructions), a temporal structure (the instructions follow a temporal order) and the specification of participants.

I have already addressed mereological theories and participants representation. Concerning the mereology, we would like it to be possible for canonical forms to have the same part multiple times (e.g. a procedure with repeating instructions). Such a phenomenon is analysed in the literature on structural universals, in proposals such as Bennett's slot mereology [1] or Davis' occurrences [2]. I analysed Bennett's proposal and showed that this theory is not compatible with a counting criterion that would enable to count appropriately how many times a whole has a part [3]. Therefore, I proposed an extension to Bennett's theory to ensure the applicability of slot mereology to structural universals, which could be extended to canonical forms. Concerning the representation of participants, I have exploited the literature about semantic roles (which define various relations between processes and endurants). I have shown how PSL [4] can be

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reinterpreted as an ontology of informational entities (namely procedures) and how it can be extended with various semantic roles, such as agents and patients [5].

Even though some features of canonical forms have been identified, their ontological nature still needs to be investigated. Moreover, the temporal relations within the mereological structure also require investigation. For example, we need to account how an instruction and the parts of the next sub-procedure in the temporal order relate to each other. Finally, since canonical forms typically map to time intervals, the scientific literature on time intervals, such as Allen's theory [6], might be relevant.

The ontology will be written in first-order logic and implemented using OWL. Furthermore, this theory will be illustrated by multiple types of procedures, such as flight procedures, surgery procedures or cooking recipes.

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