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A Variable-Free Logic for Mass Terms

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Abstract This paper presents a logic appropriate for mass terms, that is, a logic that does not presuppose interpretation in discrete models. Models may range from atomistic to atomless. This logic is a generalization of the author's work on natural language reasoning. The following claims are made for this logic. First, absence of variables makes it simpler than more conventional formalizations based on predicate logic. Second, the capability to deal effectively with discrete terms, and in particular with singular terms, can be added to the logic, making it possible to reason about discrete entities and mass entities in a uniform manner. Third, this logic is similar to surface English in that the formal language and English are "well-translatable," making it particularly suitable for natural language applications. Fourth, deduction performed in this logic is similar to syllogistic and therefore captures an essential characteristic of human reasoning.

1 Introduction This paper presents a logic appropriate for mass terms, that is, a logic that does not presuppose interpretation in discrete models. Models may range from atomistic to atomless. This logic is a generalization of the logic for reasoning in natural language presented in Purdy [5]. It is also related, in its objectives, to the generalization of first order logic defined by Roeper [8].

Claims made for this logic are the following. First, the absence of variables makes it simpler than more conventional predicate logics such as [8]. Second, the capability to deal effectively with discrete terms, and in particular with singular terms, can be added to the logic, making it possible to reason about discrete entities and mass entities in a uniform manner. Third, this logic is similar to surface English, in that the formal language and English are "well-translatable" (see Čulík [3]), making it particularly suitable for natural language applications. Fourth, deduction performed in this logic is similar to syllogistic, and it therefore captures an essential characteristic of human reasoning.

The first claim is supported by the body of this paper. The definition of the language, its semantics, its axiomatization, and the proofs of soundness and com-

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