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Nominal Tense Logic

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Abstract This paper considers the logical consequences of making Priorean tense logic referential by sorting its atomic symbols. A second sort of atomic symbol, the *nominal*, is introduced and these are constrained to be true at exactly one point in any model. The resulting gain in expressive power is examined, and a number of logics are axiomatized and shown to be decidable. The relevance of the extension to the semantics of natural language is briefly noted.

This paper investigates a simple method of incorporating temporal reference into Priorean tense logic. A new sort of atomic symbol—the *nominal*—is introduced to languages of tense logic. These new symbols, distinguishable from the ordinary propositional variables, combine with other symbols in the usual way to form wffs. There are no other syntactic changes. The enriched languages are interpreted on frames in the usual way, except that we stipulate that nominals must take the value 'true' at precisely one point in any frame. Nominals are thus 'instantaneous propositions', and the instant at which a nominal is true is the instant it names. We can think of nominals as a mechanism which enables the views of Reichenbach [22] and Prior [20] on tense in natural language to be incorporated in single framework. Although this idea is briefly elaborated on in the concluding remarks, the main aim of the present paper is to discuss the logical properties of Nominal Tense Logic. It turns out that this simple sorting mechanism has a considerable effect on tensed languages: many classes of frames not standardly definable—for example the partial orders, the strict total orders, and the integers—become definable and give rise to richer tense logics.

This paper is structured as follows. After presenting the basic concepts, we turn to model theory and examine the increased expressive capabilities. Next we turn to axiomatics and axiomatize both the minimal nominal tense logic and the minimal nominal modal logic. In the following section we prove completeness results for some rather more 'time-like' classes of frames; this is done using Segerberg's [25] cluster manipulation techniques. We also define an algebraic seman-

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