ABSTRACT. The purpose of this paper is to explore a new deontic operator for representing what an agent ought to do; the operator is cast against the background of a modal treatment of action developed by Nuel Belnap and Michael Perloff, which itself relies on Arthur Prior's indeterministic tense logic. The analysis developed here of what an agent ought to do is based on a dominance ordering adapted from the decision theoretic study of choice under uncertainty to the present account of action. It is shown that this analysis gives rise to a normal deontic operator, and that the result is superior to an analysis that identifies what an agent ought to do with what it ought to be that the agent does.

1. INTRODUCTION

The purpose of this paper is to define and explore a new deontic operator for representing what an agent ought to do, a notion that must be distinguished from that of what ought to be. This new operator is cast against the background of a modal analysis of agency developed by Nuel Belnap and Michael Perloff in a series of papers beginning with Belnap and Perloff (1988). The general approach to agency set out in these papers—which itself relies on a theory of indeterministic time due to Arthur Prior—is sometimes described as stit semantics, because it concentrates on a construction of the form ‘α (an agent) sees to it that A’, usually abbreviated simply as [α stit: A]. The goal is to provide a precise semantic account of this stit operator within the overall logical framework of indeterminism.

As it happens, Prior’s indeterministic temporal framework allows also for the introduction of a standard deontic operator O, meaning ‘It ought to be that ...’. It is natural, therefore, to explore the interactions between this standard deontic operator and the stit operator representing agency; and it may seem reasonable to propose a logical complex of the form O[α stit: A]—meaning ‘It ought to be that α sees to it that A’—as an analysis of the notion that seeing to it that A is something α ought to do. The motive for this analysis, of course, is a philosophical thesis, advanced by some but disputed by others, according to which what an agent ought to do can be identified with what it ought to be that the agent does; a proposal based on this identification was investigated in Horty and Belnap (1995), and defended there against certain objections found in the literature.
In the present paper, I set out a new and powerful objection to the
general idea of identifying what an agent ought to do with what it ought to
be that he does; and driven by this objection, I propose a new analysis of
what an agent ought to do. This new analysis is based on a loose parallel
between action in indeterministic time and choice under uncertainty, as it
is studied in decision theory. Very roughly, a particular preference ordering
— a kind of dominance ordering — is adapted from the study of choice under
uncertainty to the present account of action; it is then proposed that an agent
ought to see to it that A whenever the agent has available some action which
guarantees the truth of A, and which is not dominated by another action
that does not guarantee the truth of A. The primary technical point of the
paper is the demonstration that this new analysis of what an agent ought to
do gives rise to a normal deontic operator.

The paper is organized as follows. Sections 2 first reviews the theory
of indeterministic time. Against this background, Section 3 then develops
a particularly simple version of stit semantics, and Section 4 defines a
standard deontic operator representing what ought to be. Section 5 com-
bines this standard ought operator with the simple stit operator to yield a
representation of what it ought to be that an agent ought to do. Section 6 is the heart of the paper: it sets out the objec-
tion to this previous analysis, introduces a relation of dominance among
actions, and then uses this dominance relation to define a deontic operator
that captures a new analysis of what an agent ought to do. Finally, Section
7 describes two ways in which this analysis might be generalized: first, by
focusing on strategies of action over time, rather than single actions; and
second, by exploring preference criteria other than the simple dominance
ordering considered here.

2. BRANCHING TIME

The theory of indeterminism underlying the present work — introduced in
Chapter 7 of Prior’s (1967), and developed in more detail by Richmond
Thomason in (1970) and (1981) — is based on a picture of moments as
ordered into a treelike structure, with forward branching representing the
openness or indeterminacy of the future and the absence of backward
branching representing the determinacy of the past.

Such a picture leads, formally, to a notion of branching temporal frames
as structures of the form \((\text{Tree}, <)\), in which \(\text{Tree}\) is a nonempty set
of moments and \(<\) is an ordering on \(\text{Tree}\) that is transitive, irreflexive, and
that satisfies the treelike property according to which, for any \(m_1, m_2,\) and