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The paradoxes of permission an action based solution

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ABSTRACT

The aim of this article is to construct a deontic logic in which the free choice postulate allow (Ross, 1941) [11] would be consistent and all the implausible result mentioned in (Hanson, in press) [5] will be blocked. To achieve this we first developed a new theory of action. Then we build a new deontic logic in which the deontic action operator and the deontic proposition operator are explicitly distinguished.
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1. Background and orientation

1.1. Background discussion

Deontic logic is a field of logic that lets one reason about deontic concepts, such as obligations and permissions. SDL (Standard Deontic Logic) is a modal logic established by von Wright [18] to reason about such concepts. This logic has had difficulties and limitations and became outdated with the emergence of the DSDL (Dyadic Standard Deontic Logic) in 1969 by Hansson [4]. Nevertheless, our original idea to create a logic of action in order to reason about permissions and obligations comes from the analysis of paradoxes encountered while reasoning in SDL (Section 3.2). Traditional SDL uses the KD possible world semantics. Its models have the form (S, R, o) where $R \subseteq S^2$ is the accessibility relation, $o \in S$ is the actual world and we have that $\forall x \exists y (xRy)$ holds. Fig. 1 is a typical situation in the semantics. (In this figure, an arrow from x to y indicates xRy, and the labels on the arrows will be referred later, readers should ignore them here.)

To evaluate a modal formula for example $o \vDash \Diamond\Diamond q$,[1] one has to find two worlds a, b such that $oRa \wedge aRb$ and $b \vDash q$. The point of view of SDL about this model is the following:

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[1] In modal logic we use $\Box$ and $\Diamond := \neg\Box\neg$. In deontic logic, it is traditional to use $\bigcirc$ and $P := \neg \bigcirc \neg$.

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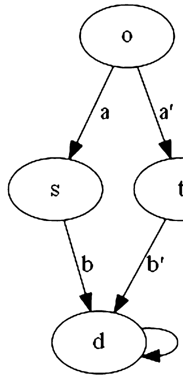

Fig. 1. Typical representation in SDL.

1. View the model from above. The model (S, R, o) is static and we evaluate deontic formulas in it.
2. The set of worlds $I_t = \{x|tRx\}$ is interpreted as a set of ideal worlds relative to t.

From this last point it follows that $\bigcirc q$ (read as obligatory q), holds at t if and only if q holds in all the ideal worlds in I_t.

The new action based solution we are presenting in this paper is more dynamic. It is the following:

When we evaluate $\bigcirc q$ at t we actually consider ourselves as living in world t performing actions which enable us to go to ideal worlds in I_t.

Let the annotations **a**, **a**′, **b**, **b**′ be the actions that can be taken in order to move from one world to another (from now on, bold faces symbols will be considered as actions). Then if we follow the model presented in Fig. 1, from world o we could take for example the action **a** and move to world s. The action has the effect of taking us to world s.

One of the main problems with formalizing Px (read x is permitted) is the intuitive rule

$$P(x \vee y) \leftrightarrow Px \wedge Py$$

(The so-called free choice postulate.) This together with another intuitive rule

$$\bigcirc x \rightarrow Px$$

and the rule

$$x \vdash y \quad \text{implies} \quad \bigcirc x \vdash \bigcirc y$$

yield

$$\bigcirc x \vdash \bigcirc(x \vee y) \vdash P(x \vee y) \vdash Py$$

In other words, if there is any obligation, then anything is permitted![2]

The above problem arises when we interpret x and y as variables ranging over formulas getting truth values in possible worlds, and we interpret x being obligatory as x being true in all ideal worlds.

[2] Similar observation can be found in [14].

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