Logical Dynamics of Some Speech Acts that Affect Obligations and Preferences

Tomoyuki Yamada

ABSTRACT. In this paper, illocutionary acts of commanding will be differentiated from perlocutionary acts that affect preferences of addressees in a new dynamic logic which combines the preference upgrades introduced by van Benthem and Liu in [vBLar] with deontic updates introduced by Yamada in [Yam07b]. The resulting logic will incorporate Austin's distinction between illocutionary acts as acts having mere conventional effects and perlocutionary acts as acts having real effects upon attitudes and actions of agents, and help us understand why saying so can make things so in explicit performative utterances.

Keyword: illocutionary acts, perlocutionary acts, conventional effect, obligation, preference

1 Introduction

When we think of rational agents involved in social interactions, the distinction between illocutionary acts and perlocutionary acts seems to be of vital importance to a clear understanding of what such agents accomplish by their speech acts . For instance, van Benthem and Liu consider a command "see to it that φ!" as a trigger of preference change, and say that "intuitively," it "makes worlds where φ holds preferred over those where it does not – *at least, if we accept the preference induced by the issuer of the command*"([vBLar], my italics). The need they felt for the proviso here reflects an important logical gap between what an illocutionary act of commanding involves and perlocutionary effects it may have upon our preferences. Rational agents are not controlled mechanically by speech acts in the way in which voice controlled machines are. It is possible for us to disobey a command even if it is effective.

This gap raises a question pertaining to the foundation of the theory of illocutionary acts. If the notion of speech act is to be taken seriously, it must be possible to treat speech acts as acts. If we succeed in characterizing speech acts in terms of dynamic changes they bring about, it becomes possible to treat them within a general theory of action. In the case of perlocutionary acts, it is easy to identify

their effects in a sense. According to Austin, perlocutionary acts are acts that really produce "real effects" upon the feelings, thoughts, or actions of addressees, or of speakers, or of other people ([Aus55], p.103). They are recognized only when their effects are recognized. In the case of illocutionary acts, however, things are not so easy. Illocutionary acts do not directly affect brute facts, except for those physical conditions involved in the production of sounds and written symbols, nor do they directly affect our attitudes and actions.

Austin's answer to this question were simple. He considered illocutionary acts as acts whose effects are "what we regard as mere conventional consequences" (*ibid.*). Most philosophers, linguists and computer scientists since Strawson, however, have disregarded this conception of illocutionary acts (see [Str64]).[1] They tried, instead, to characterize uses of sentences in terms of utterers' intentions to produce various effects in addressees along the lines initiated by Grice [Gri57]. But utterers' intentions usually go beyond illocutionary acts by involving reference to perlocutionary effects, while illocutionary acts can be effective even if they failed to produce intended perlocutionary effects. In order to capture effects of illocutionary acts, we need to distinguish them from perlocutionary effects, and at this point, Austin's conception of illocutionary acts as acts producing conventional effects seems to be of considerable help. It enables us to make clear sense of the distinction between illocutionary acts and perlocutionary acts. Since perlocutionary acts are acts that really produce real effects, they cannot be completed without really producing them, yet illocutionary acts are completed when the conventional effects are produced. Thus "we can say 'I argue that' or 'I warn you that' but we cannot say 'I convince you that' or 'I alarm you that" (Austin [Aus55], pp.103-4.).

Can this conception of illocutionary acts be developed into a general theory of illocutionary acts? In order to do so, we have to specify conventional effects of a sufficiently rich variety of illocutionary acts, and develop a theory in which these illocutionary acts are shown to be fully characterized in terms of those conventional effects. Although such a comprehensive study is not a task for a single short paper, we will try to take one step forward in this direction by developing a logic in which illocutionary acts of commanding are differentiated from perlocutionary acts that affect preferences of addressees as a kind of case study. For this purpose, we will modify DEUL (dynamic epistemic upgrade logic) developed by van Benthem and Liu in [vBLar], and extend it by adding modalities taken from ECL II (eliminative command logic II) developed by Yamada in [Yam07b]. The basic idea is to use deontic updates of ECL II for interpreting illocutionary acts of commanding and preference upgrades of DEUL for interpreting perlocutionary

[1] One exception I know is Sbisá. Her work is based on the "revised conception" of illocutionary acts as acts having conventional effects in [Sbi84] and [Sbi01]. She explicitly ascribes this conception to Austin, and gives a detailed discussion of Austin's view in [Sbi05]. As the fact that she called her reading a "new reading of Austin" suggests, the standard understanding of Austin takes his view of conventional character of illocutionary acts in a different way. For more on this, see the last section.

acts that affect preferences of addressees.

In Section 2, we will briefly review DEUL and propose a modification to it. In Section 3, we will extend a modified version of DEUL by importing modalities standing for acts of commanding from ECL II, and list the complete set of so-called reduction axioms for this extended logic. In Section 4, we will briefly discuss philosophical implications of the results.

2 Preference Upgrades in DEUL

DEUL is a substantial extension of DEL (dynamic epistemic logic). DEL is developed by Plaza [Pla89], Groeneveld [Gro95], Gerbrandy and Groeneveld [GG97], Gerbrandy [Ger99], Baltag, Moss, & Solecki [BMS99], and Kooi & van Benthem [KvB04] among others. In DEL, new dynamic modalities that deals with effects of various "epistemic actions" are added to the language of standard epistemic logic. In the case of the logic of public announcements, for example, formulas of the static language of epistemic logic are used to describe situations before and after various public announcements. Each situation is represented by an epistemic model, and public announcements are analyzed as events that update epistemic models. Thus in DEL we have formulas of the form $[\varphi!]K_i\psi$, which means that after every truthful public announcement to the effect that φ, an agent i knows that ψ.[2]

Van Benthem and Liu extend the language of standard epistemic logic into a language of epistemic preference logic (EPL, hereafter) by adding modalities that deal with preferences relativized to agents. The language and the semantics are defined in the following way:

DEFINITION 1. Take a set P of proposition letters, and a set I of agents, with p ranging over P and i over I. The epistemic preference language is given by:

$$\varphi ::= \bot \mid p \mid \neg\varphi \mid \varphi \wedge \psi \mid U\varphi \mid K_i\varphi \mid [pref]_i\varphi$$

Intuitively, $K_i\varphi$ means that the agent i knows that φ, and $[pref]_i\varphi$ means that all worlds i considers at least as good as the current one satisfy φ. U is the so-called "universal modality", and $U\varphi$ means that φ holds at every world. We assume I to be a finite set.

DEFINITION 2. An epistemic preference model is a tuple $\mathcal{M} = (S, \{\sim_i \mid i \in I\}, \{\preceq_i \mid i \in I\})$, with S a set of possible worlds, $\sim_i$ the usual equivalence relation of epistemic accessibility for agent i, and V a valuation for proposition letters. Moreover, $\preceq_i$ is a reflexive and transitive relation over the worlds.

[2] The interpretation of public announcements as updators of epistemic models might be too strong in that it excludes the possibilities of disbelief. For more on this, see the discussion toward the end of this section.

We read $s \preceq_i t$ as "t is at least as good for agent i as s", or "t is weakly preferred to s by i". If $s \preceq_i t$ but not $t \preceq_i s$, then t is strictly preferred to s, written as $s \prec_i t$. If $s \preceq_i t$ and $t \preceq_i s$, then agent i is indifferent between s and t.

DEFINITION 3. Given an epistemic preference model $\mathcal{M} = (S, \{\sim_i \mid i \in I\}, \{\preceq_i \mid i \in I\})$, and a world $s \in S$, we define the relation $\mathcal{M}, s \models \varphi$ (formula φ is true in $\mathcal{M}$ at s) by induction on φ:

(a) $\mathcal{M}, s \models p$ iff $s \in V(p)$

(b) $\mathcal{M}, s \not\models \bot$

(c) $\mathcal{M}, s \models \neg\varphi$ iff $\mathcal{M}, s \not\models \varphi$

(d) $\mathcal{M}, s \models (\varphi \wedge \psi)$ iff $\mathcal{M}, s \models \varphi$ and $\mathcal{M}, s \models \psi$

(e) $\mathcal{M}, s \models U\varphi$ iff for all $t \in S$, $\mathcal{M}, t \models \varphi$

(f) $\mathcal{M}, s \models K_i\varphi$ iff for all $t \in S$ such that $s \sim_i t$, $\mathcal{M}, t \models \varphi$

(g) $\mathcal{M}, s \models [pref]_i\varphi$ iff for all $t \in S$ such that $s \preceq_i t$, $\mathcal{M}, t \models \varphi$.

The proof of the completeness of EPL is given by entirely standard techniques.

The epistemic preference language can express various interesting notions. For example, according to van Benthem and Liu, the following formula expresses "one strong sense of 'agent i prefers φ to ψ', viz. each ψ-world has at least one epistemic alternative which is at least as good according to the agent", and in which φ holds:

$$U(\psi \to \langle pref\rangle_i\varphi) \ .$$

The interplay of preference and knowledge can also be expressed in this language. For example, the following formulas express "preference positive introspection" and "regret" respectively:

$$\langle pref\rangle_i\varphi \to K_i\langle pref\rangle_i\varphi$$
$$\langle pref\rangle_i\varphi \wedge K_i\neg\varphi \ .$$

The language of DEUL is obtained by adding two kinds of dynamic modalities to this language.

DEFINITION 4. Take a set P of proposition letters, and a set I of agents, with p ranging over P and i over I. The dynamic epistemic preference language is given by:

$$\varphi ::= \bot \mid p \mid \neg\varphi \mid \varphi \wedge \psi \mid U\varphi \mid K_i\varphi \mid [pref]_i\varphi \mid [\pi]\varphi$$
$$\pi ::= \varphi! \mid \sharp\varphi$$

The expression of the form $\varphi!$ stands for the type of acts of publicly announcing that φ, and that of the form $\sharp\varphi$ stands for the type of acts of publicly suggesting φ. The modalities of the form $[\varphi!]$ and those of the form $[\sharp\varphi]$ are called action modalities, and the modalities of the form $\langle\varphi!\rangle$ and those of the form $\langle\sharp\varphi\rangle$ are their duals.

This language can be interpreted on epistemic preference models as follows:

DEFINITION 5. Given an epistemic preference model $\mathcal{M} = (S, \{\sim_i \mid i \in I\}, \{\leq_i \mid i \in I\})$, and a world $s \in S$, the truth definition for formulas is as before, but with two new clauses for the action modalities:

(h) $\mathcal{M}, s \models [\varphi!]\psi$ iff if $\mathcal{M}, s \models \varphi$, then $\mathcal{M}_{\varphi!}, s \models \psi$

(i) $\mathcal{M}, s \models [\sharp\varphi]\psi$ iff $\mathcal{M}_{\sharp\varphi}, s \models \psi$,

where

(1) $\mathcal{M}_{\varphi!}$ is an epistemic preference model obtained from $\mathcal{M}$ by replacing $\sim_i$ with $\sim_i - \{(s,t) \mid \mathcal{M}, s \models \varphi \text{ and } \mathcal{M}, t \models \neg\varphi\} - \{(s,t) \mid \mathcal{M}, s \models \neg\varphi \text{ and } \mathcal{M}, t \models \varphi\}$ for each $i \in I$

(2) $\mathcal{M}_{\sharp\varphi}$ is an epistemic preference model obtained from $\mathcal{M}$ by replacing $\leq_i$ with $\leq_i - \{(s,t) \mid \mathcal{M}, s \models \varphi \text{ and } \mathcal{M}, t \models \neg\varphi\}$ for each $i \in I$.

Note that acts of public announcements and public suggestions are interpreted here as events affecting epistemic states and preferences of all the agents uniformly and directly respectively.

This interpretation is clearly too strong with respect to natural language public suggestions. A gap similar to the one we have seen in the case of acts of commanding in Section 1 is also present here. Someone may be remain unaffected by a public suggestion simply because he find it uninteresting. But this doesn't mean that the preference upgrading operation is useless. It can be utilized to interpret perlocutionary acts that affect preferences of addressees. Thus we propose to modify DEUL by allowing the program term "$\sharp\varphi$" to be indexed by the set I, and interpret the expression "$\sharp_i\varphi$" as standing for the type of acts of getting an addressee i to prefer φ.[3]

In the case of public announcements, the above interpretation might also be too strong in that it precludes the possibility of disbelief on the side of addressees. In the typical situations analyzed in the developments of DEL such as those in the so-called puzzles of muddy children, agents involved usually have no reason for disbelieving the announcements, but in real life situations, announcements can fail

[3]In this paper, we will only consider a single addressee for each perlocutionary act for the sake of simplicity, but it is not very difficult to extend the analysis to more complex cases where more than one addressees are involved.

to convince people. Thus acts of publicly announcing that φ has to be distinguished from perlocutionary acts of getting addressees to know that φ. In order to treat this problem adequately, however, we have to be able to be more clear about how acts of announcing are different not only from perlocutionary acts of getting addressees to know but also from illocutionary acts of asserting. Since such a task is beyond the scope of this paper, we will ignore announcements hereafter.

3 Dynamic Deontic Epistemic Preference Logic DDEPL

In this section, we will extend a modified version of DEUL by importing modalities that deals with acts of commanding from ECL II. ECL II is a slight refinement of ECL of Yamada [Yam07a]. ECL is a variant of update logic, inspired by the development of DEL (dynamic epistemic logic). The basic idea of ECL is to capture the workings of acts of commanding in terms of changes they bring about in the deontic status of possible courses of actions in the form of update logic by using multi-agent deontic logic instead of epistemic logic as its static base. Just as formulas from static epistemic logic are used in describing situations before and after various information transmissions in DEL, formulas from static deontic logic are used in order to describe situations before and after various acts of commanding in ECL. Each situation is represented by a model for the static deontic logic and acts of commanding are interpreted as events that update such models. Thus in ECL, we have formulas of the form $[!_i\varphi]O_i\psi$, which means that after every successful acts of commanding addressed to an agent i to the effect that i should see to it that φ, it is obligatory upon i to see to it that ψ.

ECL II refines ECL by allowing command types and deontic operators to be indexed by the Cartesian product of a finite set of agents and a finite set of command issuing authorities instead of a finite set of agents. Thus in ECL II we have formulas of the form $[!_{(i,j)}\varphi]O_{(i,j)}\psi$, which means that after every successful act of commanding addressed to an agent i by an authority j to the effect that i should see to it that φ, it is obligatory upon i with respect to j to see to it that ψ. This enables us to treat obligational dilemmas generated by two mutually incompatible commands coming from different authorities adequately. For example, suppose an authority b commands you to see to it that p after another authority c commands you to see to it that $\neg p$. Let a represent you. Then, in ECL II, the following formula holds in the resulting situation:

$$O_{(a,c)}\neg p \wedge O_{(a,b)}p \ .$$

Note that this is not a logical contradiction. It only means that it is now obligatory upon you with respect to b to see to it that p while it is obligatory upon you with respect to c to see to it that $\neg p$. But it is not logically possible for you to respect both obligations since $p \wedge \neg p$ is a logical contradiction. If you obey b, it is not

possible for you to obey c, while if you obey c, it is not possible for you to obey b. Although it is possible for you to obey either command, whichever command you may choose to obey, there will be a command which you will fail to obey, and thus you will go against at least one obligation anyway.[4]

As the effects of illocutionary acts of commanding are captured in terms of changes in deontic aspects of the situation in ECLII, we can isolate them from the perlocutionary effects utterances may have upon actions and attitudes of addressees by combining ECLII with a logic that deals with attitudes and/or actions of agents. As is proposed in Section 2, we will use preference ordering to interpret operators representing preferences of individual agents. Although preference ordering is often used to interpret deontic operators, preference orderings relativized to individual agents can be considered as representing preferences as attitudes of agents. By keeping deontic accessibility relations and preference orderings distinct from each other, it becomes possible to talk about the relation between obligation and preference explicitly. Thus we extend the epistemic preference language as follows:

DEFINITION 6. Take a set P of proposition letters, and a set I of agents, with p ranging over P and i, j over I. The deontic epistemic preference language is given by:

$$\varphi ::= \bot \mid p \mid \neg\varphi \mid \varphi \wedge \psi \mid U\varphi \mid K_i\varphi \mid [pref]_i\varphi \mid O_{(i,j)}\varphi$$

Intuitively, the formula of the form $O_{(i,j)}\varphi$ means that it is obligatory upon the agent i with respect to the authority j that i should see to it that φ.

Then we define a model for this language:

DEFINITION 7. A deontic epistemic preference model is a tuple $\mathcal{M} = (S, \{\sim_i \mid i \in I\}, \{\preceq_i \mid i \in I\}, \{\smile_{(i,j)} \mid i, j \in I\})$, with S a set of possible worlds, $\sim_i$ the usual equivalence relation of epistemic accessibility for agent i, $\preceq_i$ a reflexive and transitive relation over the worlds, and V a valuation for proposition letters. Moreover, $\smile_{(i,j)}$ is an arbitrary relation over the worlds.

Note that the set I of agents here plays the role of the set of commandees as well as the role of the set of commanding authorities. This doesn't reflect any substantial theoretical commitments. We could use two different sets with no substantial change.

DEFINITION 8. Given a deontic epistemic preference model $\mathcal{M} = (S, \{\sim_i \mid i \in I\}, \{\preceq_i \mid i \in I\}, \{\smile_{(i,j)} \mid i, j \in I\})$, and a world $s \in S$, we define the relation $\mathcal{M}, s \models \varphi$ (formula φ is true in $\mathcal{M}$ at s) by induction on φ:

[4] More mundane kind of obligational dilemma will arise, for example, when you receive two commands such that it happens to be physically impossible for you to satisfy them both due to some contingent conditions. For more on this point, see the discussion in Section 4.

(a) $\mathcal{M}, s \models p$ iff $s \in V(p)$

(b) $\mathcal{M}, s \not\models \bot$

(c) $\mathcal{M}, s \models \neg\varphi$ iff $\mathcal{M}, s \not\models \varphi$

(d) $\mathcal{M}, s \models (\varphi \wedge \psi)$ iff $\mathcal{M}, s \models \varphi$ and $\mathcal{M}, s \models \psi$

(e) $\mathcal{M}, s \models U\varphi$ iff for all $t \in S$, $\mathcal{M}, t \models \varphi$

(f) $\mathcal{M}, s \models K_i\varphi$ iff for all $t \in S$ such that $s \sim_i t$, $\mathcal{M}, t \models \varphi$

(g) $\mathcal{M}, s \models [pref]_i\varphi$ iff for all $t \in S$ such that $s \preceq_i t$, $\mathcal{M}, t \models \varphi$

(h) $\mathcal{M}, s \models O_{(i,j)}\varphi$ iff for all $t \in S$ such that $s \prec_{(i,j)} t$, $\mathcal{M}, t \models \varphi$.

The proof system for the deontic epistemic preference logic (DEPL, hereafter) can be obtained by adding a K axiom and a necessitation rule for each modal operator of the form $O_{(i,j)}$ to the proof system of EPL.

This language can express various relation between obligation and preference. For example, the following formula expresses a conflict between obligation and preference:

$$O_{(i,j)}\varphi \wedge U(\varphi \rightarrow \langle pref\rangle_i\neg\varphi) \ .$$

Although it is obligatory upon i with respect to j to see to it that φ, i prefers $\neg\varphi$ to φ.

Moreover, the formulas of this language can be used to describe the situations before and after an issuance of a command. Suppose, for example, that your boss has just commanded you to attend an international workshop on logic to be held in São Paulo next year. Before the issuance of his command, it was not obligatory upon you to attend that conference, nor was it so not to attend it. But since the issuance, it has become obligatory upon you with respect to him that you should attend it. Let p express the proposition that you will attend that conference next year, and let the model world pair $(\mathcal{M}, s)$ and $(\mathcal{N}, s)$ represent the situation before and after the issuance. Let a and b represent you and him respectively. Then, we have:

$$\begin{aligned} \mathcal{M}, s &\models \neg O_{(a,b)}p \wedge \neg O_{(a,b)}\neg p \\ \mathcal{N}, s &\models O_{(a,b)}p \ . \end{aligned}$$

Thus, we can capture the dynamic change in a sense even by using the static language of DEPL.

But the change is not talked about as a change in DEPL. Your boss's act of commanding is not talked about in it either. They are talked about in the metalanguage. In order to have an object language in which we can talk about changes

of this kind and acts of commanding that bring them about, we extend the deontic epistemic preference language by adding action modalities to it:

DEFINITION 9. Take a set P of proposition letters, and a set I of agents, with p ranging over P and i, j over I. The dynamic deontic epistemic preference language is given by:

$$\begin{array}{lll} \varphi & ::= & \bot \mid p \mid \neg\varphi \mid \varphi \wedge \psi \mid U\varphi \mid K_i\varphi \mid [pref]_i\varphi \mid O_{(i,j)}\varphi \mid [\pi]\varphi \\ \pi & ::= & \sharp_i\varphi \mid !_{(i,j)}\varphi \end{array}$$

A formula of the form $[\sharp_i\varphi]\psi$ means that after an perlocutionary act of getting an agent i to prefer φ, ψ holds, and a formula of the form $[!_{(i,j)}\varphi]\psi$ means that after an act of commanding addressed to an agent i by an authority j to the effect that i should see to it that φ, ψ holds. Note that we ignore announcements.

The truth definition for this language can be given with reference to deontic epistemic preference models as follows:

DEFINITION 10. Given an deontic epistemic preference model $\mathcal{M} = (S, \{\sim_i \mid i \in I\}, \{\preceq_i \mid i \in I\}, \{\smile_{(i,j)} \mid i, j \in I\})$, and a world $s \in S$, the truth definition for formulas is as before, but with two new clauses for the action modalities:

(i) $\mathcal{M}, s \models [\sharp_i\varphi]\psi$ iff $\mathcal{M}_{\sharp_i\varphi}, s \models \psi$

(j) $\mathcal{M}, s \models [!_{(i,j)}\varphi]\psi$ iff $\mathcal{M}_{!_{(i,j)}\varphi}, s \models \psi$,

where

(1) $\mathcal{M}_{\sharp_i\varphi}$ is a deontic epistemic preference model obtained from $\mathcal{M}$ by replacing $\preceq_i$ with $\preceq_i - \{(s,t) \mid \mathcal{M}, s \models \varphi$ and $\mathcal{M}, t \models \neg\varphi\}$

(2) $\mathcal{M}_{!_{(i,j)}\varphi}$ is a deontic epistemic preference model obtained from $\mathcal{M}$ by replacing $\smile_{(i,j)}$ with $\smile_{(i,j)} - \{(s,t) \mid \mathcal{M}, t \models \neg\varphi\}$.

Note that we allow preference upgrading act modalities to be indexed by I while we allow command modalities to be indexed by $I \times I$. This corresponds to our treatment of preferences and obligations.

The proof system for the dynamic deontic epistemic preference logic (DDEPL) can be obtained by adding so-called reduction axioms and necessitation rules for action modalities to the proof system of DEPL as follows:

DEFINITION 11. The proof system for DDEPL contains all the axioms and rules of the proof system for DEPL, and in addition, the following axioms and rules:

($\sharp$1) $[\sharp_i\varphi]p \leftrightarrow p$

($\sharp$2) $[\sharp_i\varphi]\bot \leftrightarrow \bot$

($\sharp$3) $[\sharp_i\varphi]\neg\psi \leftrightarrow \neg[\sharp_i\varphi]\psi$

($\sharp$4) $[\sharp_i\varphi](\psi \wedge \chi) \leftrightarrow [\sharp_i\varphi]\psi \wedge [\sharp_i\varphi]\chi$

($\sharp$5) $[\sharp_i\varphi]U\psi \leftrightarrow U[\sharp_i\varphi]\psi$

($\sharp$6) $[\sharp_i\varphi]K_j\psi \leftrightarrow K_j[\sharp_i\varphi]\psi$

($\sharp$7) $[\sharp_i\varphi][pref]_j\psi \leftrightarrow [pref]_j[\sharp_i\varphi]\psi$ if $i \neq j$

($\sharp$8) $[\sharp_i\varphi][pref]_i\psi \leftrightarrow (\neg\varphi \rightarrow [pref]_i[\sharp_i\varphi]\psi) \wedge [pref]_i(\varphi \rightarrow [\sharp_i\varphi]\psi)$

($\sharp$9) $[\sharp_i\varphi]O_{(j,k)}\psi \leftrightarrow O_{(j,k)}[\sharp_i\varphi]\psi$

($\sharp$10) $[\sharp_i\varphi][!_{(j,k)}\psi]\chi \leftrightarrow [!_{(j,k)}\psi][\sharp_i\varphi]\chi$

(!1) $[!_{(i,j)}\varphi]p \leftrightarrow p$

(!2) $[!_{(i,j)}\varphi]\bot \leftrightarrow \bot$

(!3) $[!_{(i,j)}\varphi]\neg\psi \leftrightarrow \neg[!_{(i,j)}\varphi]\psi$

(!4) $[!_{(i,j)}\varphi](\psi \wedge \chi) \leftrightarrow [!_{(i,j)}\varphi]\psi \wedge [!_{(i,j)}\varphi]\chi$

(!5) $[!_{(i,j)}\varphi]U\psi \leftrightarrow U[!_{(i,j)}\varphi]\psi$

(!6) $[!_{(i,j)}\varphi]K_k\psi \leftrightarrow K_k[!_{(i,j)}\varphi]\psi$

(!7) $[!_{(i,j)}\varphi][pref]_k\psi \leftrightarrow [pref]_k[!_{(i,j)}\varphi]\psi$

(!8) $[!_{(i,j)}\varphi]O_{(k,l)}\psi \leftrightarrow O_{(k,l)}[!_{(i,j)}\varphi]\psi$ if $(i, j) \neq (k, l)$

(!9) $[!_{(i,j)}\varphi]O_{(i,j)}\psi \leftrightarrow O_{(i,j)}(\varphi \rightarrow [!_{(i,j)}\varphi]\psi)$

($\sharp$-nec) $\dfrac{\psi}{[\sharp_i\varphi]\psi}$

(!-nec) $\dfrac{\psi}{[!_{(i,j)}\varphi]\psi}$

The above rules obviously preserve validity, and all the axioms are easily seen to be valid. Thus this proof system is sound.

Axioms $\sharp$1, $\sharp$2, !1, and !2 enable us to eliminate action modalities prefixed to proposition letters or $\bot$, and other axioms enable us to reduce the length of the sub-formulas to which action modalities are prefixed. Thus these reduction axioms jointly guarantee that we can translate any formula of the dynamic language of DDEPL to a provably equivalent formula of its static base DEPL. Hence the completeness of this proof system can be derived from the completeness of DEPL.

4 Conventional Effects of Acts of Commanding

Consider the example of your boss's command discussed in the last section. We have:

$$\begin{array}{rcl} \mathcal{M}, s & \models & \neg O_{(a,b)}p \wedge \neg O_{(a,b)}\neg p \\ \mathcal{N}, s & \models & O_{(a,b)}p \ . \end{array}$$

We can now identify $\mathcal{N}$ with $\mathcal{M}_{!_{(a,b)}p}$. Thus we have:

$$\mathcal{M}_{!_{(a,b)}p}, s \models \quad O_{(a,b)}p \ .$$

This is equivalent to:

$$\mathcal{M}, s \models [!_{(a,b)}p]O_{(a,b)}p \ .$$

This is an instantiation of the following general principle:

PROPOSITION 12 (CUGO Principle). *If no modal operators of the form $O_{(i,j)}$ occur in φ, then $[!_{(i,j)}\varphi]O_{(i,j)}\varphi$ is valid.*

CUGO Principle here characterizes, at least partially, the workings of acts of commanding; though not without exceptions, commands usually generate obligations.[5]

Note that an analogue of CUGO Principle for preference upgrading perlocutionary acts represented by $\sharp_i\varphi$ is not

$$[\sharp_i\varphi][pref]_i\varphi$$

but

$$[\sharp_i\varphi](\varphi \rightarrow [pref]_i\varphi)$$

with φ being free of modalities of the form $[pref]_i$. Even $[\sharp_i p][pref]_i p$ is not valid as every preference ordering link from $\neg p$-world to $\neg p$-world for i in $\mathcal{M}$ survives in $\mathcal{M}_{\sharp_i p}$. $[\sharp_i p]\langle pref\rangle_i p$ is not valid either, as a $\neg p$-world without a preference ordering link to a p-world for i in $\preceq_i$ of $\mathcal{M}$ won't have a preference ordering link to a p-world for i in $\mathcal{M}_{\sharp_i p}$.

Now, suppose you meet your political guru in the evening on the same day. She commands you to join an important political demonstration next year in Tokyo. It is to be held on the very same day on which the international workshop you are

[5]The restriction on φ here is motivated by the fact that the truth of φ at a point t in M does not guarantee the truth of φ at t in $M_{!_{(i,j)}\varphi}$ if φ involves deontic modalities for the pair (i, j). For example, $[!_{(i,j)}P_{(i,j)}q]O_{(i,j)}P_{(i,j)}q$ is not valid. For more on this point, see [Yam07a].

supposed to attend is to be held. Let q represent the proposition that you will join the demonstration in Tokyo, and c your guru. Then we have:

$$(\mathcal{M}_{!_{(a,b)}p})_{!_{(a,c)}q}, s \models O_{(a,b)}p \wedge O_{(a,c)}q \ .$$

Thus, it is obligatory upon you to see to it that p with respect to your boss while it is obligatory upon you to see to it that q with respect to your guru.

Unfortunately, however, no available means of transportation happens to be fast enough to enable you to join the demonstration in Tokyo and attend the conference in São Paulo on the same day. It is not possible for you to obey both commands. If you obey your boss's command you will disobey your guru's command; if you obey your guru's command you will disobey your boss's command. You are in an obligational dilemma. As $p \wedge q$ is not a logical contradiction, there may be a possible situation in which you could obey both commands, but unfortunately it is not the situation you are in.

Now, suppose you prefer to obey your guru. Then we may have:

$$(\mathcal{M}_{!_{(a,b)}p})_{!_{(a,c)}q}, s \models (O_{(a,b)}p \wedge O_{(a,c)}q) \wedge U(p \rightarrow \langle pref\rangle_a q) \ .$$

This does not mean that your boss's command is void. It is still effective in that we have $O_{(a,b)}p$ here. Thus your boss's act of commanding you to attend the conference was completed when he said, "Attend that workshop".

Moreover, you might even have come to prefer obeying it at that time. But your guru has changed your preference by commanding you to join the demonstration in Tokyo without making your boss's command void. Thus, we still have $O_{(a,b)}p$ at s in $\mathcal{M}_{!_{(a,b)}p})_{!_{(a,c)}q}$. If you obey your guru, you will disobey your boss's command after all, and thus go against one of your obligations unless your boss withdraws his command.[6]

This example can be used to illustrate how conventional effects of illocutionary acts are different from real effects of perlocutionary acts. Although your guru has gotten you to prefer to join the demonstration (a perlocutionary act) by commanding you to do so (an illocutionary act), the fact that your boss's command is still

[6] Strictly speaking, the preference upgrading act of type $\sharp_a q$ is not strong enough to model your guru's perlocutionary act adequately, as we have $[\sharp_a q]U(p \rightarrow \langle pref\rangle_a q) \leftrightarrow U(p \rightarrow \langle pref\rangle_a q)$. This implies that for any model world pair $(\mathcal{N}, s)$, if we have $\mathcal{N}_{\sharp_a q}, s \models U(p \rightarrow \langle pref\rangle_a q)$, we have $\mathcal{N}, s \models U(p \rightarrow \langle pref\rangle_a q)$. Although it is possible to build a model in such a way that we have both $\mathcal{N}, s \models U(\neg p \rightarrow \langle pref\rangle_a p)$ and $\mathcal{N}_{\sharp_a q}, s \models U(p \rightarrow \langle pref\rangle_a q)$, we still have $\mathcal{N}, s \models U(p \rightarrow \langle pref\rangle_a q)$ at the same time. It would not be very nice to say your guru has gotten you to prefer p to q on the ground that we have $\mathcal{N}_{\sharp_a q}, s \models U(p \rightarrow \langle pref\rangle_a q)$ if we also have $\mathcal{N}, s \models U(p \rightarrow \langle pref\rangle_a q)$. But this doesn't mean that $\sharp_a q$ represent no perlocutionary act. It represents a perlocutionary act that affects preference of the addressee anyway.

effective shows that the conventional effect of his command is independent from the real effect on your preference. Although people often tend to prefer obeying effective commands, it is obvious that what bridges the gap between illocutionary acts of commanding and perlocutionary effects on attitudes of addressees is not a logical law.

5 Conclusion

Since conventional effects depends on agreement among participants as to what has been done, the securing of uptake is necessary for performing illocutionary acts. The existence of the gap we have been discussing in this paper leads Strawson to assume that uptake is the sole effect of those felicitous illocutionary acts which he claims to be "not essentially conventional" in the sense that no special extralinguistic ritual or institution is involved in their performance. He finds Austin's use of the word "conventional" in the following remark unconventional ([Str64], p.31):[7]

> Speaking of the the 'use of "language" for arguing or warning' looks just like speaking of 'the use of "language" for persuading, rousing, alarming'; yet the former may, for rough contrast, be said to be *conventional*, in the sense that at least it could be made explicit by the performative formula; but the latter could not ([Aus55], p.103).

He tries to explain what leads Austin to call illocutionary acts in general "conventional", and concludes that it is the fact that the explicit performative formula is a "conventional linguistic means" that "serves $\cdots$ to *make explicit* the type of communication intention with which the speaker speaks, the type of force which the utterance has" ([Str64], pp.31–2). As Sbisà has pointed out, however, it is because the effects of illocutionary acts are conventional that illocutionary acts can be performed by explicit performative utterances ([Sbi05]).

As is clear from the above quotation, Austin contrasted the conventionality of illocutionary acts with the non-conventionality of perlocutionary acts. DDEPL incorporates Austin's distinction between illocutionary acts as acts having conventional effects and perlocutionary acts as acts producing real effects upon attitudes and actions of agents in the limited domain of acts of commanding and perlocutionary acts that affects preferences of agents. How far such a distinction can be generalized is yet to be seen.

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