Count-as Conditionals in Channel Theory

Tomoyuki Yamada
Faculty of Humanities and Human Sciences, Hokkaido University

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Formal approaches to count-as conditionals

Several attempts to capture the logic of count-as conditionals have been made in the deontic logic literature recently. Grossi and Jones (2013) gives a succinct overview of the following works:

1. Jones et al. (1996),
2. Gelati et al. (2002, 2004),
4. Lorini et al. (2008, 2009),
5. Governatori et al. (2008),
7. Lindahl et al. (2006, 2008a, b).

A problem

Count-as conditionals are introduced by John Searle (1969) as "constitutive rules" of the following form.

\[ \text{X counts as Y in context C.} \]

I'm wondering whether the recent discussions pay enough attention to the distinction between concrete particular contexts in which entities or processes of type X count as Y and the common type C shared by such contexts.

The purpose of this paper is to show how this problem can be avoided by modeling contexts and actions done in them in channel theory of Barwise and Seligman (1997).

Why this is a problem?

In Grossi and Jones (2013, p.416), Jones and Sergot (1996) are said to represent count-as conditional as \( \phi_1 \Rightarrow c \phi_2 \).

They proposed the following principle as one of the "minimal core of the logical principles for the logic of count-as" (Grossi et al. 2013, pp. 416-417. Cf. Jones and Sergot, 1996, pp. 436).

\[ (\phi_1 \Rightarrow c \phi_2) \land (\phi_2 \Rightarrow c \phi_3) \Rightarrow (\phi_1 \Rightarrow c \phi_3) \]

As Jones and Sergot (1996, p. 430) understand c as an institution, it is natural to think of c as fixed.

If c is understood just as an arbitrary context, however, we have to admit the possibility of a context being part of two or more institutions.

Iteration

Consider the following quotation from Searle (1995).

Making certain noises counts as uttering an English sentence, uttering a certain sort of English sentence in certain circumstance counts as entering into a contract, entering into certain sorts of contracts counts as getting married (Searle, 1995, p. 83).

Consider a particular context \( c_1 \) in which a person a gets married.
Count-as Conditionals

Here we can assume that $c_1$ is:

-the context in which $a$’s entering into a certain sort of contract counts as getting married.

But if so, it can also be

-the context in which $a$’s uttering a certain sort of English sentence counts as entering into a certain sort of contract

and similarly.

-the context in which $a$’s making certain noises counts as uttering an English sentence.

Context Types

Compare that with the following:

Performing such and such speech acts (the $X$ term) in front of a presiding official (the $C$ term) now counts as getting married (the $Y$ term). Saying those very same words in a different context, while making love, for example, will not constitute getting married (Searle 1995, p. 82).

Here the $C$ term seems to refer to a repeatable condition “in front of a presiding official”.

Two hierarchical structures

Now let us compare the following two hierarchical structures.

$$c_1 \subseteq x_3 \subseteq x_2 \subseteq x_1$$

Here $c_1$ counts-as $y_3$ in $C_3$

Here $x_2$ counts-as $y_2$ in $C_2$

Here $x_1$ counts-as $y_1$ in $C_1$

Suppose $X_1 = \{ x : x$ is of type $C_1 \}$, etc. Then we have

- $c_1$ is of type $C_1$ of type $C_2$ and of type $C_3$

But we can also say:

- $C_1$, $C_2$, and $C_3$ are distinct from each other.

What channel theory enables us to do

Channel theory enables us to talk not only about particular contexts such as $c_1$ but also about types of contexts such as $C_1$, $C_2$, and $C_3$.

If we are to be able to say under what conditions $X$ counts as $Y$, we need to be able to say, at least partly, what these types are.

This is one of the things we need to do in order to develop a logical analysis of social institutions in general and speech acts in particular.
Judith’s flashlight (Barwise and Seligman, 1997, p. 23)

In doing things in everyday life, we rely on various regularities that hold normally.

For example, by turning the switch of her flashlight on, Judith lights its bulb.

(1) The switch being on entails that the bulb is lit.

What will happen, however, if the battery is dead?

In channel theory (Barwise & Seligman 1997), the switch being on entails that the bulb is lit.

What will happen, however, if the bulb is gone?

Weakening? (Barwise & Seligman, p. 23)

By applying the inference rule called weakening, we could derive the following:

(2) The switch being on and the battery being dead entails that the bulb is lit.

Since this conclusion is unacceptable, we might wish to revise (1) and say:

(3) The switch being on and the battery being live entails that the bulb is lit.

What will happen, however, if the bulb is gone?

Classification (Barwise & Seligman, p. 69)

Definition. A classification \( A = \langle \text{tok}(A), \text{typ}(A), \models_A \rangle \) consists of

1. a set \( \text{tok}(A) \) of objects to be classified, called the tokens of \( A \),
2. a set \( \text{typ}(A) \) of objects used to classify the tokens, called the types of \( A \), and
3. a binary relation, \( \models_A \), between tokens of \( A \) and types of \( A \).

If \( \beta \models_A \alpha \), then \( \beta \) is said to be of type \( \alpha \) in \( A \).

A classification is depicted by means of a diagram as follows.

\[
\text{typ}(A) \quad \models_A \quad \text{tok}(A)
\]

Information Channels (Barwise & Seligman, pp. 34–35)

We say that \( f = (f^r, f^\perp) \) is a contravariant pair from \( A \) to \( B \), and write \( f : A \leadsto B \), if \( f^r : \text{typ}(A) \to \text{typ}(B) \) and \( f^\perp : \text{tok}(A) \to \text{tok}(B) \).

We think of an infomorphism \( f = (f^r, f^\perp) \) as an infomorphism from \( A \) to \( B \) if it is a contravariant pair form \( A \) to \( B \).

Definition. An information channel consists of an indexed family \( C = \{ \cdot : A \leadsto C \} \) of infomorphisms with a common codomain \( C \) called the core of the channel.
An example.

\[
\{ f_{\text{Bulb}}^{\text{ON}} \} \vdash \text{Flashlight} \{ f_{\text{Bulb}}^{\text{LIT}} \}
\]

Local logic (Barwise & Seligman, p. 40)

**Definition.** A *local logic* \( L = (A, \vdash \), \( N_L) \) consists of:
- a classification \( A \),
- a set \( \vdash \) of sequents (satisfying certain structural rules)
  involving the types of \( A \), called the constraints of \( L \), and
- a subset \( N_L \) of the set of all the tokens of \( A \), called the
  normal tokens of \( L \), which satisfy all the constraints of \( \vdash \).

A local logic \( L \) is sound if every token is normal; it is complete if
  every sequent that holds of all normal tokens is in the
  consequence relation \( \vdash \).

The Outline of a Dynamic Theory of Action (Barwise & Seligman, pp. 50-65)

**Actions in channel theory**

**Acts of controlling in channel theory**

**Acts of using flashlights in channel theory**

Flashlight using actions are modeled as connections that connects
  initial states and final states of such actions by constructing an
  information channel \( C_{\text{Act}} = (f_{\text{in}}, f_{\text{out}}, f_{\text{in}}, f_{\text{out}}) \) such that
  \( f_{\text{in}} \) and \( f_{\text{out}} \) classify initial states and final states respectively. Thus two copies
  of the earlier classification Flashlight can be used as \( f_{\text{in}} \) and \( f_{\text{out}} \).

Non-normal action tokens in the flashlight example

Even if \( \{ f_{\text{Bulb}}^{\text{ON}} \} \vdash \{ f_{\text{Bulb}}^{\text{LIT}} \} \) holds,

\( \{ f_{\text{Bulb}}^{\text{ON}} \} \vdash \{ f_{\text{Bulb}}^{\text{LIT}} \} \) might not hold.
### The problem

1. Actions in channel theory (Barwise & Seligman 1997)
2. Logical dynamics of speech acts
3. Acts of commanding in channel theory

### Actions in channel theory (Barwise & Seligman 1997)

Logical dynamics of speech acts

Acts of commanding in channel theory

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### The development of PAL

#### Public Announcement Logic PAL

- Adding dynamic modalities
- Rewriting along recursion axioms

#### Multi-agent Epistemic Logics EL

- $K_{EI}$


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### The development of DMEDL+$^+$

#### Yamada (2016)

- $\text{command}_{i,j,k}^j$: Do $j$ command $k$ to see to $i$ that $\varphi$
- $\text{promise}_{i,j,k}^j$: $j$ promise $k$ to see to $i$ that $\varphi$
- $\text{assert}_{i,j,k}^j$: $j$ assert the proposition $\varphi$

#### DMEDL+$^+$ (Dynamified MEDL+$^+$)

- Adding dynamic modalities
- Rewriting along recursion axioms

#### MEDL+$^+$ (Multi-agent Epistemic Deontic Logic)

- $K_{EI}$, $O_{i,j,k}^j$

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### The Language of MLD+$^+$ III and DMDL+$^+$ III

#### $O_{i,j,k}^j$

It is obligatory for $i$ with respect to $j$ by the name of $k$ to see to it that $\varphi$.

- $i$: The agent who owes the obligation (obligor)
- $j$: The agent to whom the obligation is owed (obligee)
- $k$: The agent who creates the obligation

#### $\text{command}_{i,j,k}^j$

Whenever an agent $i$ commands an agent $j$ to see to it that $\varphi$, $\psi$ holds in the resulting situation.

#### $\text{promise}_{i,j,k}^j$

Whenever an agent $i$ promises an agent $j$ that $\varphi$ will see to it that $\varphi$, $\psi$ holds in the resulting situation.

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### More formally

Take a countably infinite set $\text{Aprop}$ of proposition letters and a finite set $\mathcal{I}$ of agents, with $\phi$ ranging over $\text{Aprop}$ and $i, j, k$ over $\mathcal{I}$. The languages of MLD+$^+$ III and DMDL+$^+$ III are given respectively by:

- $\varphi ::= T | \phi \lor \psi | \varphi \land \psi | \neg \varphi | O_{i,j,k}^j \varphi$
- $\pi ::= \text{Com}_{i,j,k}^j | \text{Prom}_{i,j,k}^j \varphi$

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### An $LDML^{III}$-model

By an $LDML^{III}$-model, we mean a quadruple $\mathcal{M} = \langle W^\mathcal{M}, A^\mathcal{M}, \mathcal{D}_{i,j,k}^\mathcal{M}, V^\mathcal{M}\rangle$ where:

- $W^\mathcal{M}$ is a non-empty set (heuristically, of ‘possible worlds’),
- $A^\mathcal{M} \subseteq W^\mathcal{M} \times W^\mathcal{M}$,
- $\mathcal{D}_{i,j,k}^\mathcal{M} = \{i,j,k \in \mathcal{I}\} \subseteq A^\mathcal{M}$,
- $V^\mathcal{M}$ is a function that assigns a subset $V^\mathcal{M}(\rho)$ of $W^\mathcal{M}$ to each proposition letter $\rho \in \text{Aprop}$.
Your boss’s act of commanding

A command and a promise can lead to a dilemma

Acts of commanding in channel theory

How to do that

Deontic state classification 1/2
We will omit the superscript "\( \phi \)" hereafter.

The problem of how we could characterize the class of formulas \( \phi \) is still open.

More interestingly, we have

\[
\{ f_{D}\phi([\psi \land \xi]), \phi([\psi \land \xi]) \} \vdash_{D} \{ f_{D}\phi([\psi \land \xi]) \} .
\]

The problem of how we could characterize the class of formulas \( \psi \) such that \( \phi([\psi \land \xi]) \) is valid is still open.
If we only include constraints derived from valid formulas of DMDL-III, both $D_{CTR}$ and $D^{'}_{CTR}$ will be sound.

Similarly, the condition that the agent has the suitable authority to issue such and such a command is the condition that must be satisfied in order for her act of saying so and so counts as an act of commanding.

The language of DMDL-III has to be substantially extended if we are to talk about such background conditions. This is partly done in Yamada (2015).

Let $\text{org}_i$ indexed by a finite set of organizations $H$ be a function that assigns a possibly empty subset of the set of command types $\text{com}_{(i,j)^{\circ}}$ to each pair of agents $(i,j) \in I \times I$ for each world $w$. Thus, $\text{org}_i(l,j,w)$ is a set of command types an organization $h$ authorizes $l$ to give $j$ in $w$. Then we define

$M,w \models \text{DMDL-III} \land \text{Auth}((i,j)^{\circ} \circ \text{com}_{(i,j)^{\circ}} \in \text{org}_i(l,j,w)$.

An act of type $\text{Say}_{(i,j)^{\circ}}\text{CTR}$ counts as an act of type $\text{Com}_{(i,j)^{\circ}}$ in a context of type $\text{Auth}_{(i,j)^{\circ}}$ for some $h$. This is a channel theoretic analogue of count-as conditional.
Count-as Conditionals and CUGO Principle

A sergeant a said “Clean this room”, addressing a private b and pointing to the room r.

\[ \text{[count-as]} \quad \left\{ \text{Say}_{(a,b)}^{\text{CTR}} \right\} \vdash t_{\text{clean}} \left\{ \text{Com}_{(a,b)} \right\} \]

a commanded b to see to it that r is clean.

\[ \text{[CUGO]} \quad \left\{ \text{Com}_{(a,b)} \right\} \vdash t_{\text{clean}} \left\{ f_{\text{com}}(Q_{(b,a)}, P) \right\} \]

b is obligated to see to it that r is clean with respect to a by the name of a.

Count-as conditions and the Dynamic Logic of Y-ing

\( (X) \vdash_{C} \{ Y \}, \left( f_{\text{com}}(Y) \right) \cdot X \vdash_{C} \{ f_{\text{com}}(\cdot) \}) \)

What about the hierarchy?

\( (X_2) \vdash_{C_2} \{ Y_2 \}, \left( f_{\text{com}}(Y_2) \right) \cdot X_2 \vdash_{C_2} \{ f_{\text{com}}(\cdot) \}) \)

\( (X_1) \vdash_{C_1} \{ Y_1 \}, X_1 = X_0, (X_0) \vdash_{C_0} \{ Y_0 \}, \left( f_{\text{com}}(C_0) \right) \cdot X_0 \vdash_{C_0} \{ Y_0 \}) \)

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The End

Thanks!!