Preconditions, Common Sense Reasoning, and Context Shifts

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Outline

A failed illocutionary act

A private: I command you to clean my boots.
A sergeant: You don't have the authority to give me a command.

Normally, privates would not say things like this to a sergeant.
But how can we theorize about normality?

The attempted command misfired.
But was it a "command"?

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 light its bulb.

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

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

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?

Background conditions and context shifts

The switch being on entails that the bulb is lit.

⇓ The issue of whether the battery is alive or not is raised.

If the battery is live, the switch being on entails that the bulb is lit.

Two points to be noted about DEL (or PAL)

The formulas of the form $\varphi \to [\varphi!]K_i\varphi$ are shown to be valid for any $i \in I$ if no operators of the form K_i occur in φ.

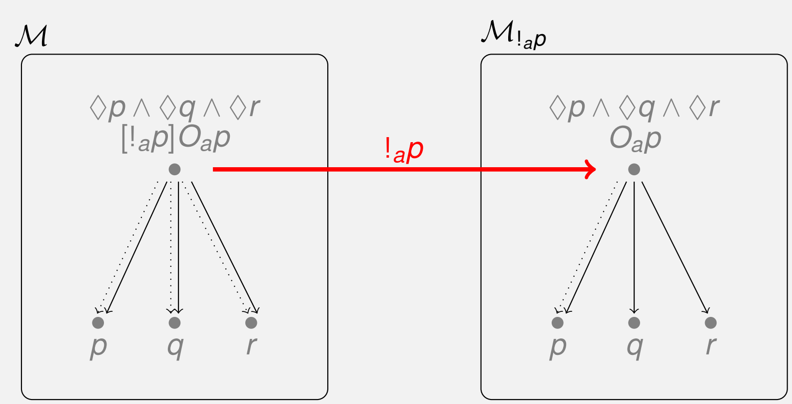
- This is too strong for interpreting natural language public announcements.
- There is a gap between announcing and getting people to know.
- $\varphi!$ can be reinterpreted as a type of an event in which people simultaneously and commonly learn that φ.

The method used in developing *DEL* can be used to develop logics that deal with a much wider variety of speech acts.

The recipe (Yamada, 2008c)

1. Carefully identify the aspects affected by the speech acts you want to study
2. find the modal logic that characterizes these aspects
3. add dynamic modalities that represent types of those speech acts
4. expand truth definition by adding clauses that interpret the speech acts under study as what update the very aspects
5. (if possible) find a complete set of reduction axioms for the resulting dynamic logic.

Your boss's act of commanding in ECL



$\mathcal{M}, w \models [!_i\varphi]\psi$ iff $\mathcal{M}_{!_i\varphi}, w \models \psi$.

Refinements and applications to other speech acts

Conflicting obligations, commanding and promising,

Dynamified deontic logics (Yamada 07a, 07b, 08a).

Differentiating illocutionary acts of commanding from perlocutionary acts that affects preferences

Dynamified deontic preference logic (Yamada 08b).

Asserting, conceding, and their withdrawals

Dynamic logics of propositional commitments (Yamada, 2012).

Differentiating acts of requesting from acts of commanding

A dynamified deontic epistemic logic (Yamada, 2011).

Acts of Commanding and Acts of Promising

The CUGO Principle

If φ is a formula of MDL^{+}III and is free of modal operators of the form $O_{(j,i,i)}$, the following formula is valid:

$$[Com_{(i,j)}\varphi]O_{(j,i,i)}\varphi$$

The PUGO Principle

If φ is a formula of MDL^{+}III and is free of modal operators of the form $O_{(i,j,i)}$, the following formula is valid:

$$[Prom_{(i,j)}\varphi]O_{(i,j,i)}\varphi$$

A command and a promise can lead to a dilemma

A contingent dilemma

$[Prom_{(a,b)}p][Com_{(c,a)}q](O_{(a,b,a)}p \wedge O_{(a,c,c)}q) \wedge \neg\Diamond(p \wedge q)$.

- p You will attend the conference in São Paulo on 11 July 2013.
- q You will join the demonstration in Sapporo on 11 July 2013.

Acts of requesting

The RUGO Principle

If φ is a formula of MEDL and is free of modal operators of the form $O_{(j,i,i)}$, $[Req_{(i,j)}\varphi]O_{(j,i,i)}(\varphi \vee K_iO_{(j,i,j)}\varphi \vee K_i\neg O_{(j,i,j)}\varphi)$ is valid.

An unexpected results

The CUGU Principle

If φ is a formula of DMEDL and is free of modal operators of the form $O_{(j,i,i)}$, $[Com_{(i,j)}\varphi]K_iO_{(j,i,i)}\varphi$ is valid.

The PUGU Principle

If φ is a formula of DMEDL and is free of modal operators of the form $O_{(i,j,i)}$, $[Prom_{(i,j)}\varphi]K_iO_{(i,j,i)}\varphi$ is valid.

The RUGU Principle

If φ is a formula of MEDL and is free of modal operators of the form $O_{(j,i,i)}$, $[Req_{(i,j)}\varphi]K_iO_{(j,i,i)}(\varphi \vee K_iO_{(j,i,j)}\varphi \vee K_i\neg O_{(j,i,j)}\varphi)$ is valid.

Why such things happen

The crucial phrase

$M, w \models_{\mathrm{DMDL+III}} [Com_{(i,j)}\varphi]\psi$ iff $M_{Com_{(i,j)}\varphi}, w \models_{\mathrm{DMDL+III}} \psi$,
where $M_{\mathrm{Com}_{(i,j)}\varphi}$ is the $\mathcal{L}_{\mathrm{DMDL+III}}$-model obtained from M by replacing $D_{(j,i,i)}$ with its subset
$\{(x, y) \in D_{(j,i,i)} \mid M, y \models_{\mathrm{DMDL+III}} \varphi\}$.

Product update?

- Action models
- Preconditions

Classification (Barwise & Seligman, p. 28)

Definition. A *classification* $\mathsf{A} = \langle A, \Sigma_{\mathsf{A}}, \models_{\mathsf{A}} \rangle$ consists of a set A of objects to be classified, called *tokens* of A, a set Σ_{A} of objects used to classify the tokens, called the *types* of A, and a binary relation $\models_{\mathsf{A}}$, that tells one which tokens are classified as being of which types.

If $a \models_{\mathsf{A}} \alpha$, then a is said to be *of type* α *in* A.

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

Sequents, constraints, the complete theory (Barwise & Seligman, p. 29)

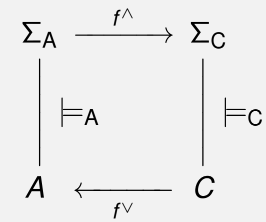
By a *sequent* we just mean a pair $\langle \Gamma, \Delta \rangle$ of sets of types.

Definition. Let A be a classification and let $\langle \Gamma, \Delta \rangle$ be a sequent of A. A token a of A satisfies $\langle \Gamma, \Delta \rangle$ provided that if a is of type α for every $\alpha \in \Gamma$ then a is of type α for some $\alpha \in \Delta$. We say that Γ *entails* Δ in A, written $\Gamma \vdash_{\mathrm{A}} \Delta$, if every token a of A satisfies $\langle \Gamma, \Delta \rangle$. If $\Gamma \vdash_{\mathrm{A}} \Delta$ then the pair $\langle \Gamma, \Delta \rangle$ is called a *constraint* supported by the classification A.

The set of all constraints supported by A is called the complete theory of A and is denoted by Th(A). The complete theory of A represents all the regularities supported by the system being modeled by A.

Infomorphisms (Barwise & Seligman, p. 32)

Definition. If $\mathrm{A} = \langle A, \Sigma_{\mathrm{A}}, \models_{\mathrm{A}} \rangle$ and $\mathrm{C} = \langle C, \Sigma_{\mathrm{C}}, \models_{\mathrm{C}} \rangle$ are classifications, then an *infomorphism* is a pair $f = \langle f^{\wedge}, f^{\vee} \rangle$ of functions



satisfying the biconditional:

$$f^{\vee}(c) \models_{\mathrm{A}} \alpha \quad \text{iff} \quad c \models_{\mathrm{C}} f^{\wedge}(\alpha)$$

for all tokens c of C and all types α of A.

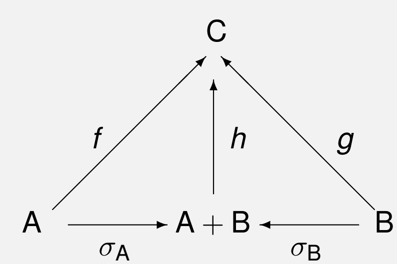
Sums of Classifications (Barwise & Seligman, p. 33)

Given two (or more) classifications A and B, these classifications can be combined into a single classification A + B with important properties. The tokens of A + B consist of pairs $\langle a, b \rangle$ of tokens from each. The types of A + B consist of the types of both, except that if there are any types in common, then we make distinct copies, so as not to confuse them. This construction works nicely with infomorphism as well. First of all, there are natural infomorphisms $\sigma_{\boldsymbol{A}} : \boldsymbol{A} \rightleftarrows \boldsymbol{A} + \boldsymbol{B}$ and $\sigma_{\mathrm{B}} : \mathrm{B} \rightleftarrows \mathrm{A} + \mathrm{B}$ defined as follows:

1. $\sigma_{\mathrm{A}}(\alpha) = \alpha_{\mathrm{A}}$ (the A-copy of α) for each $\alpha \in type(\mathrm{A})$,
2. $\sigma_{\mathrm{B}}(\beta) = \beta_{\mathrm{B}}$ for each $\beta \in type(\mathrm{B})$, and
3. for each pair $\langle a, b \rangle \in tok(\mathrm{A} + \mathrm{B})$, $\sigma_{\mathrm{A}}(\langle a, b \rangle) = a$ and $\sigma_{\mathrm{B}}(\langle a, b \rangle) = b$.

Sums of Infomorphisms (Barwise & Seligman, p. 34)

More importantly, given any classification C and infomorphism $f : \mathrm{A} \rightleftarrows \mathrm{C}$ and $g : \mathrm{B} \rightleftarrows \mathrm{C}$, there is a unique infomorphism $h = f + g$ such that the following diagram commutes.



Each of the arrow represents an infomorphism. On tokens, $h(c) = \langle f(c), g(c) \rangle$. On types of the form α_{A}, h gives $f(\alpha)$. On types of the form α_{B}, h gives $g(\alpha)$.

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

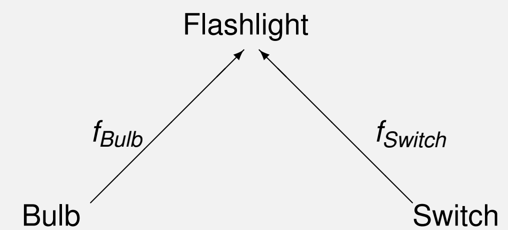
Definition. An *information channel* consists of an indexed family $\mathcal{C} = \{f_i : A_i \rightleftarrows C\}$ of infomorphisms with a common codomain C called the *core* of the channel.

A God's eye analysis of information flow Suppose that the token a is of type α. Then a's being of type α *carries the information that b is of type* β, relative to the channel $\mathcal{C}$, if a and b are connected in $\mathcal{C}$ and if the translation α' of α entails the translation β' of β in the theory $\mathrm{Th}(C)$, where C is the core of $\mathcal{C}$.

The problem
Logical dynamics of speech acts
Actions in channel theory (Barwise & Seligman 1997)
What failures tell us

An example.

$$\{f^{\wedge}_{Switch}(\mathrm{ON})\} \vdash_{\mathrm{Flushlight}} \{f^{\wedge}_{Bulb}(LIT)\} \ .$$



$f^{\vee}_{Bulb}(f_t) \models_{Bulb}$ LIT $\qquad f^{\vee}_{Switch}(f_t) \models_{Switch}$ ON

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Reasoning at a distance (Barwise & Seligman, pp. 38-39)

Let arbitrary classification A and B and an infomorphism $f : A \rightleftarrows B$ are given. We write Γ^f for the set of translations of types in Γ when Γ is a set of types of A. If Γ is a set of types of B, we write Γ^{-f} for the set of types whose translations are in Γ.

$$f\text{-Intro} : \frac{\Gamma^{-f} \vdash_{\mathrm{A}} \Delta^{-f}}{\Gamma \vdash_{\mathrm{B}} \Delta}$$

$$f\text{-Elim} : \frac{\Gamma^{f} \vdash_{\mathrm{B}} \Delta^{f}}{\Gamma \vdash_{\mathrm{A}} \Delta}$$

The rule f-Intro preserves validity but not non-validity. The rule f-Elim preserves non-validity but not validity.

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Local logic (Barwise & Seligman, p. 40)

Definition. A *local logic* $\mathfrak{L} = \langle \mathrm{A}, \vdash_{\mathfrak{L}}, N_{\mathfrak{L}} \rangle$ consists of a classification A, a set $\vdash_{\mathfrak{L}}$ of sequents (satisfying certain structural rules) involving the types of A, called the *constraints* of $\mathfrak{L}$, and a subset $N_{\mathfrak{L}}$ of the set of all the tokens of A, called the *normal tokens* of $\mathfrak{L}$, which satisfy all the constraints of $\vdash_{\mathfrak{L}}$.

A local logic $\mathfrak{L}$ is *sound* if every token is normal; it is *complete* if every sequent that holds of all normal tokens is in the consequence relation $\vdash_{\mathfrak{L}}$.

Moving logics (Barwise & Seligman, pp. 40-41)

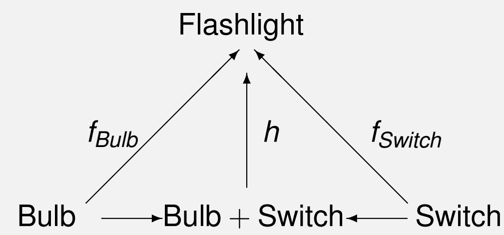
Given an infomorphism $f : A \rightleftarrows B$ and a logic $\mathcal{L}$ on one of these classifications, we obtain a natural logic on the other.

If $\mathcal{L}$ is a logic on A, then $f|\mathcal{L}|$ is the logic on B obtained from $\mathcal{L}$ by f-intro.

If $\mathcal{L}$ is a logic on B, then $f^{-1}|\mathcal{L}|$ is the logic on A obtained from $\mathcal{L}$ by f-Elim.

The above example again (Barwise & Seligman, pp. 41-42)

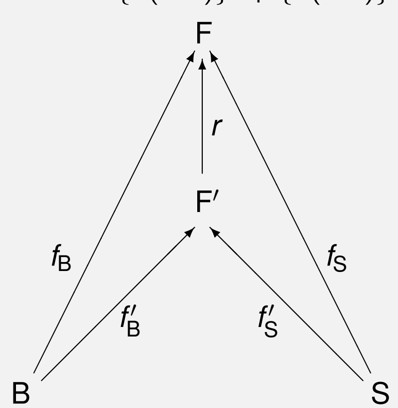
$$\{h^{\wedge}(\mathrm{ON})\} \vdash_{\mathrm{Flushlight}} \{h^{\wedge}(LIT)\} \ .$$



$$\{\mathrm{ON}\} \nvdash_{\mathrm{Bulb+Switch}} \{\mathrm{LIT}\} \ .$$

A refinement (Barwise & Seligman, pp. 43–44)

Even if $\{h(\mathrm{ON})\} \vdash_{\mathrm{F}} \{h(\mathrm{LIT})\}$ holds,



$\{h'(\mathrm{ON})\} \vdash_{\mathrm{F'}} \{h'(\mathrm{LIT})\}$ might not hold.

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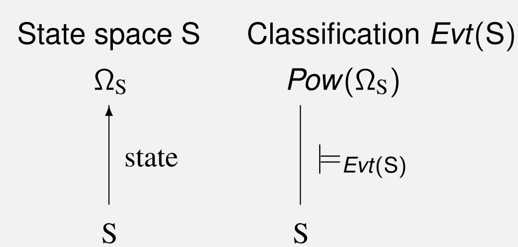
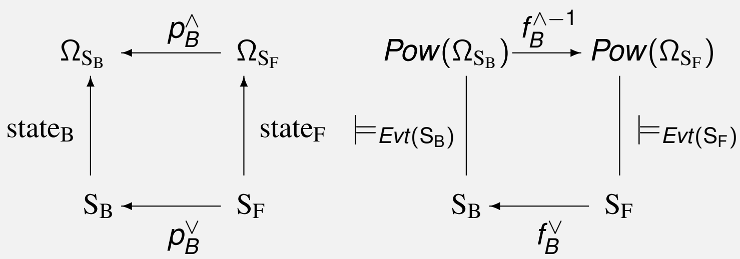
State spaces and classifications (B & S, pp. 46–48)

State space consists of a set S of tokens, a set Ω_{S} of states, and a function state that maps S into Ω_{S}.
Subsets of Ω_{S} can be used to classify states. Such subsets are called events. Thus the power set of Ω_{S}, called $Evt(\Omega_{\mathrm{S}})$ is the set of types of the event classification $Evt(\mathrm{S})$ that classifies the tokens in S. A token $s \in \mathrm{S}$ is of type $\alpha \in Evt(\Omega_{\mathrm{S}})$ iff $\mathrm{state}(s) \in \alpha$.



Projections and infomorphisms (B & S, pp. 47-48)



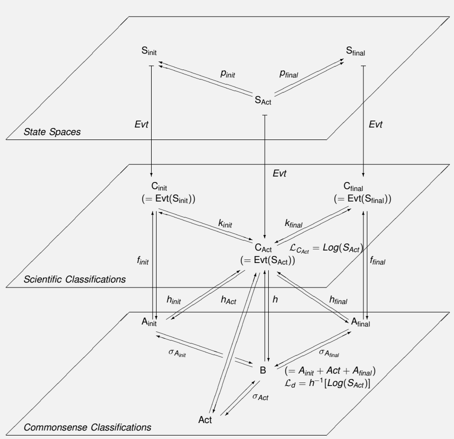
Local logics and state spaces (B & S, pp. 48-49)

Definition For any state space S, $\mathrm{Log}(\mathsf{S})$ is the local logic on the classification *Evt*(S) with every token normal and with constraints given by

$$\Gamma \vdash \Delta \text{ iff } \bigcap \Gamma \subseteq \bigcup \Delta \ .$$

Suppose we have an information channel with a core of the form *Evt*(S) for some state space *Evt*(S). The logic $\mathrm{Log}(\mathsf{S})$ is then a logic on this core that is suitable for distributing over the sum of the component classification.

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



Regularities and failures in dynamic cases

(1) By pushing the switch into the on position, you can light the bulb.

(2) If the battery is dead, even if you push the switch into the on position, you cannot light the bulb.

It seems that we need to consider the relation between action types.

(For exmple): Pushing the switch into the on position involves lighting the bulb.

What tokens are there in the failures.

If you fail to light the bulb, there seems to be no token of an act of lighting the bulb.

But a token of an act of pushing the switch into the on position does exist.

In successful cases, tokens of an act of pushing the switch into the on position are also tokens of an act of lighting the bulb.

In unsuccessful cases of the above kind, tokens of an act of pushing the switch into the on position fail to be tokens of an act of lighting the bulb. In this sense, there seem to be no non-normal tokens of an act of lighting the bulb here.

What about illocutionary acts?

Similarly, when an attempted act of commanding misfires, there seems to be no token of an act of commanding.

This implies that there are no non-normal token of an act of commanding in this case.

This enables us to justify our procedure of dealing only with normal tokens of illocutionary acts in studying their conventional (or institutional) effects. (The promised connection between the two initial questions!)

But, if so ...

Does this mean that there are no tokens to be classified in the cases of failure?

Austin would say that a locutionary act is performed in this case.

But Searle would deny this. He has rejected the distinction between locutionary acts and illocutionary acts. He would say that, in such a case, not a locutionary acts but an utterance act is performed.

Count-as relation

According to Searle's theory of social reality, illocutionary acts are performed according to the rule of the following form:

X counts as Y in context C.

Types of illocutionary acts occupy the Y position here. So the above question boils down to the question of what kind of acts occupy the X position here.

The above rule can be reformulated as the following:

X-ing involves Y-ing in context C.

Whether channel theory enables us to study the count-as relation in modal contexts in a fruitful way is yet to be seen.

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What failures tell us

A cojecture (Yamada 2013)

Definition

Let π_1 and π_2 be action types (or programs). Then π_1 involves π_2 iff for any formula φ, the validity of $[\pi_2]\varphi$ implies the validity of $[\pi_1]\varphi$.

An example

$\mathrm{Com}_{(b,\,a)}(p \wedge q)$ involves $\mathrm{Com}_{(b,\,a)}p$.

Proof: Note that we have $(M_{\mathrm{Com}_{(b,\,a)}q})_{\mathrm{Com}_{(b,\,a)}p} = M_{\mathrm{Com}_{(b,\,a)}(p \wedge q)}$, for any $\mathcal{L}_{\mathrm{DMDL+III}}$-model M and any world w of M.

A conjecture

By generalizing, we conjecture that $\mathrm{Com}_{(i,j)}\varphi$ involves $\mathrm{Com}_{(i,j)}\psi$ if $\varphi \rightarrow \psi$ is valid.

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