Centre for Logic and Philosophy of Science
Centrum voor Logica en Wetenschapsfilosofie

UNIVERSITEIT GENT

FACULTY OF ARTS AND PHILOSOPHY

# On the Presumptive Meaning of Logical Connectives

## The Adaptive Logics Approach to Gricean Pragmatics

Hans Lycke

Centre for Logic and Philosophy of Science
Ghent University
Hans.Lycke@Ugent.be
http://logica.ugent.be/hans

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# Outline

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# Introduction

## Conversational Implicatures

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*Make your conversational contribution such as is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged.* (Grice 1989, p. 26)

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⇒ The Gricean Maxims
- Specific instantiations of the Cooperative Principle
- Presumptions about utterances a hearer relies on to get at the intended meaning of an utterance, and a speaker exploits to get a message transferred successfully.

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## Generalized Conversational Implicatures (**GCI**)

Conversational implicatures that only depend on **what** is said and not on the extra–linguistic context.

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- Nondetachability
  = the **GCI** related to some utterance would also have been triggered in case the literal content of the utterance would have been expressed differently (in the same context).
- Cancellability
  = **GCI** might be refuted because they are in conflict with other utterances (of the speaker) or with background knowledge (of the hearer) about the context.

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**GCI** are **defeasible steps** in the uncovering of the intended meaning of an utterance.

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to follow logically = derivable by means of classical logic (**CL**)

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**Levinson's Claim**

**GCI** should be modeled formally as non–monotonic inference rules!

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## Aim of this talk

### A Threefold Aim

- I will consider some of the earlier attempts to model **GCI** as non–monotonic inference rules.

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- I will contend that **GCI** can be captured satisfactorily by relying on the adaptive logics approach.
- [I will argue that cooperative communication is a very dynamic and context–dependent problem–solving activity.]

# Some Earlier Attempts

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### The quantitative scalar or–implicature

If a disjunction is asserted in a conversation, it should be interpreted as an exclusive disjunction.

Formally: If a speaker says *A* `or` *B*, it is implicated that `not` (*A* `and` *B*).

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- The approach confuses the viewpoint of the speaker with the viewpoint of the hearer.
  - $\Rightarrow$ Cooperative communication is a problem–solving activity.
    - $\Rightarrow$ Meaning is dependent on the context (= problem–solving situation).

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Substitute in a sentence every formula of the form $A \vee B$ by the formula $(A \vee B) \wedge \neg(A \wedge B)$ (a substitutional approach).

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  - $\Rightarrow$ Implicatures are not modeled as non–monotonic inference rules!

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BUT:
- Horsten does not provide a mechanism to reject implicatures in case this is necessary.
  - ⇒ Implicatures are not modeled as non–monotonic inference rules!
- This is a formal approach, but not a logic.

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Also a substitutional approach!

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MOREOVER: Wainer does provide a mechanism to reject implicatures in case this is necessary (by means of circumscription).

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## Wainer's Proposal

Also a substitutional approach!

MOREOVER: Wainer does provide a mechanism to reject implicatures in case this is necessary (by means of circumscription).

BUT: There is no proof theoretic characterization, only a semantic one.

$\Rightarrow$ Implicatures are not modeled as non–monotonic *inference rules*!

# Outline

# The Adaptive Logics Approach

## Introduction

### Adaptive Logics?

Adaptive Logics are formal logics that were developed to explicate dynamic (reasoning) processes (both monotonic and non–monotonic ones).

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## Example

I will show how two of the best–known **GCI** can be captured by means of an adaptive logic, viz.

- The *or*–implicature: $A$ `or` $B$ implicates `not` ($A$ `and` $B$).
- The *existential*–implicature: $(\texttt{some } \alpha)A(\alpha)$ implicates $\texttt{not } (\texttt{all } \alpha)A(\alpha)$.

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# The Adaptive Logics Approach

## Taking Utterances Seriously

### Main Idea

**GCI** are triggered by the utterances made by the speaker in a conversation.

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**GCI** are triggered by the utterances made by the speaker in a conversation.

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$\Rightarrow$ the logic $\mathbf{CL^d}$

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### Preview

The logic $\mathbf{CL^d}$ will be used to capture **GCI**

= by means of the adaptive logic $\mathbf{CL^{gci}}$, based on $\mathbf{CL^d}$

# The Adaptive Logics Approach

## Taking Utterances Seriously

### Language Schema of $\mathbf{CL^d}$

| language | letters | connectives | set of formulas |
|---|---|---|---|
| $\mathcal{L}$ | $\mathcal{S}$ | $\neg, \wedge, \vee, \supset, \equiv, \exists, \forall, =$ | $\mathcal{W}$ |
| $\mathcal{L}^+$ | $\mathcal{S}$ | $\neg, \wedge, \vee, \supset, \equiv, \exists, \forall, =$ | $\mathcal{W}^+$ |
| | | $\dot{\neg}, \dot{\wedge}, \dot{\vee}, \dot{\supset}, \dot{\equiv}, \dot{\exists}, \dot{\forall}, \doteq$ | |

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## Representing Utterances

In order to express that a formula is an utterance, it will be formalized using *dotted connectives* only.

$\Rightarrow$ $A^d$ will be used to express that the formula $A$ is an utterance (only contains dotted connectives).

# The Adaptive Logics Approach

Taking Utterances Seriously

## Proof Theory of $\mathbf{CL^d}$

= the axiom system of **CL**, extended by the following axiom schemas,

| | | | |
|---|---|---|---|
| DN | $\dot{\neg} A \supset \neg A$ ($A \in \mathcal{S}$) | DDN | $\dot{\neg}\dot{\neg} A \supset A$ ($A$ an utterance) |
| DC | $(A \dot{\wedge} B) \supset (A \wedge B)$ | NDC | $\dot{\neg}(A \dot{\wedge} B) \supset (\dot{\neg} A \dot{\vee} \dot{\neg} B)$ |
| DD | $(A \dot{\vee} B) \supset (A \vee B)$ | NDD | $\dot{\neg}(A \dot{\vee} B) \supset (\dot{\neg} A \dot{\wedge} \dot{\neg} B)$ |
| DF | $(\dot{\forall}\alpha)A(\alpha) \supset (\forall\alpha)A(\alpha)$ | NDF | $\dot{\neg}(\dot{\forall}\alpha)A(\alpha) \supset (\dot{\exists}\alpha)\dot{\neg}A(\alpha)$ |
| DId | $(\alpha \dot{=} \beta) \supset (\alpha = \beta)$ | | |

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| DId | $(\alpha \dot{=} \beta) \supset (\alpha = \beta)$ | | |

and the following definitions.

$A \dot{\supset} B =_{df} \dot{\neg} A \dot{\vee} B$

$A \dot{\equiv} B =_{df} (A \dot{\supset} B) \dot{\wedge} (B \dot{\supset} A)$

$(\dot{\exists}\alpha)A(\alpha) =_{df} \dot{\neg}(\dot{\forall}\alpha)\dot{\neg} A(\alpha)$

# The Adaptive Logics Approach

## Taking Utterances Seriously

### Definition

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Premise sets are restricted to subsets of the set $\mathcal{W} \cup \mathcal{W}^d$.

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## Representing Communicative Situations

Premise sets are restricted to subsets of the set $\mathcal{W} \cup \mathcal{W}^d$.

$\Rightarrow$ Premise sets only contain

- utterances (elements of $\mathcal{W}^d$), and
- background knowledge about the communicative context that is taken (by the hearer) to be shared by both speaker and hearer (elements of $\mathcal{W}$).

[Appendix 1]

## Inferential Strength of the logic $\mathbf{CL^d}$

Some **CL**–inference rules are not valid for dotted connectives, e.g.

- From a formula $A$, it is impossible to derive $A \dot{\vee} B$.
- From a formula $A(\beta)$, it is impossible to derive $(\dot{\exists}\alpha)A(\alpha)$.

# The Adaptive Logics Approach

## Taking Utterances Seriously

[Appendix 2]

**Definition**

$\Gamma^d = \{A^d \mid A \in \Gamma \subset \mathcal{W}\}$.

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## The Classical Consequence Set

For $\Gamma \cup \{A\} \subset \mathcal{W}$, $\Gamma \vdash_{\mathbf{CL}} A$ iff $\Gamma^d \vdash_{\mathbf{CL^d}} A$.

# The Adaptive Logics Approach

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### The Classical Consequence Set

For $\Gamma \cup \{A\} \subset \mathcal{W}$, $\Gamma \vdash_{\mathbf{CL}} A$ iff $\Gamma^d \vdash_{\mathbf{CL^d}} A$.

$\Rightarrow$ The hearer is able to derive all **CL**–consequences from the utterances of the speaker.

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1. Lower Limit Logic (**LLL**)
2. Set of Abnormalities $\Omega = \Omega^{\dot{\vee}} \cup \Omega^{\dot{\exists}}$
3. Adaptive Strategy

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$$\Omega^{\dot\vee} = \{(A^d \dot\vee B^d) \wedge (A \wedge B) \mid A, B \in \mathcal{W}\}$$

$$\Omega^{\dot\exists} = \{(\dot\exists\alpha)A^d(\alpha) \wedge (\forall\alpha)A(\alpha) \mid A \in \mathcal{W}\}$$

3. Adaptive Strategy

# The Adaptive Logics Approach **CL**$^{\mathbf{gci}}$



## General Characterization

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$$\begin{aligned} \Omega^{\dot{\vee}} &= \{(A^d \dot{\vee} B^d) \wedge (A \wedge B) \mid A, B \in \mathcal{W}\} \\ \Omega^{\dot{\exists}} &= \{(\dot{\exists}\alpha)A^d(\alpha) \wedge (\forall\alpha)A(\alpha) \mid A \in \mathcal{W}\} \end{aligned}$$

3. Adaptive Strategy: reliability, minimal abnormality, normal selections,...

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# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL^{gci}}$: Proof Theory (1)

### General Features

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  - Adding a line = to move on to a next stage
- Each line consists of 4 elements:
  - Line number
  - Formula
  - Justification
  - Adaptive condition = set of abnormalities

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- Deduction Rules
- Marking Criterium
  - Dynamic proofs

# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL}^{\mathbf{gci}}$: Proof Theory (2)

### Deduction Rules

PREM If $A \in \Gamma$:

$$\begin{array}{ll} \ldots & \ldots \\ \hline A & \emptyset \end{array}$$

RU If $A_1, \ldots, A_n \vdash_{\mathbf{CL}^{\mathbf{d}}} B$:

$$\begin{array}{ll} A_1 & \Delta_1 \\ \vdots & \vdots \\ A_n & \Delta_n \\ \hline B & \Delta_1 \cup \ldots \cup \Delta_n \end{array}$$

RC If $A_1, \ldots, A_n \vdash_{\mathbf{CL}^{\mathbf{d}}} B \vee Dab(\Theta)$

$$\begin{array}{ll} A_1 & \Delta_1 \\ \vdots & \vdots \\ A_n & \Delta_n \\ \hline B & \Delta_1 \cup \ldots \cup \Delta_n \cup \Theta \end{array}$$

### Definition

$Dab(\Delta) = \bigvee(\Delta)$ for $\Delta \subset \Omega$.

# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL^{gci}}$: Proof Theory (3)

### Marking Criterium: Normal Selections Strategy

- *Dab*–consequences

  *Dab*$(\Delta)$ is a *Dab*–consequence of $\Gamma$ at stage $s$ of the proof iff *Dab*$(\Delta)$ is derived at stage $s$ on the condition $\emptyset$.

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## Marking Criterium: Normal Selections Strategy

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- Marking Definition

  Line $i$ is marked at stage $s$ of the proof iff, where $\Delta$ is its condition, $Dab(\Delta)$ is a *Dab*–consequence at stage $s$.

# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL}^{\mathbf{gci}}$: Proof Theory (4)

### Derivability

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$A$ is derived from $\Gamma$ at stage $s$ of a proof iff $A$ is the second element of an unmarked line at stage $s$.

## Final Derivability

- $A$ is finally derived from $\Gamma$ on a line $i$ of a proof at stage $s$ iff (i) $A$ is the second element of line $i$, (ii) line $i$ is not marked at stage $s$, and (iii) every extension of the proof in which line $i$ is marked may be further extended in such a way that line $i$ is unmarked.
- $\Gamma \vdash_{\mathbf{CL}^{\mathbf{gci}}} A$ iff $A$ is finally derived on a line of a proof from $\Gamma$.

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## Example

# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL}^{\mathbf{gci}}$: Example 1

### Example

| | | | |
|---|---|---|---|
| 1 | $(\dot{\exists} x)Px$ | –;PREM$^u$ | $\emptyset$ |
| 2 | $(\forall x)(Px \wedge Qx)$ | –;PREM$^{bk}$ | $\emptyset$ |

# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL}^{\mathbf{gci}}$: Example 1

### Example

| | | | |
|---|---|---|---|
| 1 | $(\dot{\exists} x)Px$ | –;PREM$^u$ | $\emptyset$ |
| 2 | $(\forall x)(Px \wedge Qx)$ | –;PREM$^{bk}$ | $\emptyset$ |
| 3 | $\neg(\forall x)Px$ | 1;RC | $\{(\dot{\exists} x)Px \wedge (\forall x)Px\}$ |
| 4 | $(\exists x)\neg Px$ | 3;RU | $\{(\dot{\exists} x)Px \wedge (\forall x)Px\}$ |

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# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL}^{\mathbf{gci}}$: Example 1

### Example

| | | | |
|---|---|---|---|
| 1 | $(\dot{\exists}x)Px$ | –;PREM$^u$ | $\emptyset$ |
| 2 | $(\forall x)(Px \wedge Qx)$ | –;PREM$^{bk}$ | $\emptyset$ |
| 3 | $\neg(\forall x)Px$ | 1;RC | $\{(\dot{\exists}x)Px \wedge (\forall x)Px\}$ |
| 4 | $(\exists x)\neg Px$ | 3;RU | $\{(\dot{\exists}x)Px \wedge (\forall x)Px\}$ |
| 5 | $(\forall x)Px$ | 2;RU | $\emptyset$ |
| 6 | $(\dot{\exists}x)Px \wedge (\forall x)Px$ | 2,5;RU | $\emptyset$ |

# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL}^{\mathbf{gci}}$: Example 1

### Example

| | | | |
|---|---|---|---|
| 1 | $(\dot{\exists} x)Px$ | –;PREM$^u$ | $\emptyset$ |
| 2 | $(\forall x)(Px \wedge Qx)$ | –;PREM$^{bk}$ | $\emptyset$ |
| 3 | $\neg(\forall x)Px$ | 1;RC | $\{(\dot{\exists} x)Px \wedge (\forall x)Px\}$ ✓ |
| 4 | $(\exists x)\neg Px$ | 3;RU | $\{(\dot{\exists} x)Px \wedge (\forall x)Px\}$ ✓ |
| 5 | $(\forall x)Px$ | 2;RU | $\emptyset$ |
| 6 | $(\dot{\exists} x)Px \wedge (\forall x)Px$ | 2,5;RU | $\emptyset$ |

# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL^{gci}}$: Example 2

### Example

# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL^{gci}}$: Example 2

### Example

| | | |
|---|---|---|
| 1 | $p \dot{\vee} \dot{\neg}(\dot{\neg} q \dot{\wedge} \dot{\neg} r)$ | –;PREM $\emptyset$ |
| 2 | $q$ | –;PREM $\emptyset$ |

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# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL^{gci}}$: Example 2

### Example

| | | | |
|---|---|---|---|
| 1 | $p \dot{\vee} \dot{\neg}(\dot{\neg} q \dot{\wedge} \dot{\neg} r)$ | –;PREM | $\emptyset$ |
| 2 | $q$ | –;PREM | $\emptyset$ |
| 3 | $\neg(p \wedge \neg(\neg q \wedge \neg r))$ | 1;RC | $\{(p \dot{\vee} \dot{\neg}(\dot{\neg} q \dot{\wedge} \dot{\neg} r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |

## Example

| | | | |
|---|---|---|---|
| 1 | $p \dot{\vee} \dot{\neg}(\dot{\neg} q \dot{\wedge} \dot{\neg} r)$ | –;PREM | $\emptyset$ |
| 2 | $q$ | –;PREM | $\emptyset$ |
| 3 | $\neg(p \wedge \neg(\neg q \wedge \neg r))$ | 1;RC | $\{(p \dot{\vee} \dot{\neg}(\dot{\neg} q \dot{\wedge} \dot{\neg} r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |
| 4 | $\neg p \vee (\neg q \wedge \neg r)$ | 3;RU | $\{(p \dot{\vee} \dot{\neg}(\dot{\neg} q \dot{\wedge} \dot{\neg} r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |
| 5 | $\neg p \vee \neg q$ | 4;RU | $\{(p \dot{\vee} \dot{\neg}(\dot{\neg} q \dot{\wedge} \dot{\neg} r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |

# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL}^{\mathbf{gci}}$: Example 2

### Example

| | | | |
|---|---|---|---|
| 1 | $p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)$ | –;PREM | $\emptyset$ |
| 2 | $q$ | –;PREM | $\emptyset$ |
| 3 | $\neg(p \wedge \neg(\neg q \wedge \neg r))$ | 1;RC | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |
| 4 | $\neg p \vee (\neg q \wedge \neg r)$ | 3;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |
| 5 | $\neg p \vee \neg q$ | 4;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |
| 6 | $\neg p$ | 2,5;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |

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# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL}^{\mathbf{gci}}$: Example 2

### Example

| | | | |
|---|---|---|---|
| 1 | $p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)$ | –;PREM | $\emptyset$ |
| 2 | $q$ | –;PREM | $\emptyset$ |
| ... | ... | ... | ... |
| 6 | $\neg p$ | 2,5;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |

# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL}^{\mathbf{gci}}$: Example 2

### Example

| | | | |
|---|---|---|---|
| 1 | $p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)$ | –;PREM | $\emptyset$ |
| 2 | $q$ | –;PREM | $\emptyset$ |
| ... | ... | ... | ... |
| 6 | $\neg p$ | 2,5;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |
| 7 | $\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)$ | 1,6;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |
| 8 | $\dot{\neg}\dot{\neg}q\dot{\vee}\dot{\neg}\dot{\neg}r$ | 7;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |

# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL}^{\mathbf{gci}}$: Example 2

### Example

| | | | |
|---|---|---|---|
| 1 | $p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)$ | –;PREM | $\emptyset$ |
| 2 | $q$ | –;PREM | $\emptyset$ |
| ... | ... | ... | ... |
| 6 | $\neg p$ | 2,5;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |
| 7 | $\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)$ | 1,6;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |
| 8 | $\dot{\neg}\dot{\neg}q\dot{\vee}\dot{\neg}\dot{\neg}r$ | 7;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |
| 9 | $\neg(\neg\neg q \wedge \neg\neg r)$ | 8;RC | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r)),$ $(\dot{\neg}\dot{\neg}q\dot{\vee}\dot{\neg}\dot{\neg}r) \wedge (\neg\neg q \wedge \neg\neg r)\}$ |

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# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL}^{\mathbf{gci}}$: Example 2

### Example

| | | | |
|---|---|---|---|
| 1 | $p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)$ | –;PREM | $\emptyset$ |
| 2 | $q$ | –;PREM | $\emptyset$ |
| ... | ... | ... | ... |
| 6 | $\neg p$ | 2,5;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |
| 7 | $\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)$ | 1,6;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |
| 8 | $\dot{\neg}\dot{\neg}q\dot{\vee}\dot{\neg}\dot{\neg}r$ | 7;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |
| 9 | $\neg(\neg\neg q \wedge \neg\neg r)$ | 8;RC | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r)),$ $(\dot{\neg}\dot{\neg}q\dot{\vee}\dot{\neg}\dot{\neg}r) \wedge (\neg\neg q \wedge \neg\neg r)\}$ |
| 10 | $\neg q \vee \neg r$ | 9;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r)),$ $(\dot{\neg}\dot{\neg}q\dot{\vee}\dot{\neg}\dot{\neg}r) \wedge (\neg\neg q \wedge \neg\neg r)\}$ |
| 11 | $\neg r$ | 2,10;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r)),$ $(\dot{\neg}\dot{\neg}q\dot{\vee}\dot{\neg}\dot{\neg}r) \wedge (\neg\neg q \wedge \neg\neg r)\}$ |

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# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL}^{\mathbf{gci}}$: Example 2

### Example

| | | | |
|---|---|---|---|
| 1 | $p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)$ | –;PREM | $\emptyset$ |
| 2 | $q$ | –;PREM | $\emptyset$ |
| ... | ... | ... | ... |
| 6 | $\neg p$ | 2,5;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |
| ... | ... | ... | ... |
| 11 | $\neg r$ | 2,10;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r)),$ $(\dot{\neg}\dot{\neg}q\dot{\vee}\dot{\neg}\dot{\neg}r) \wedge (\neg\neg q \wedge \neg\neg r)\}$ |

# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL}^{\mathbf{gci}}$: Example 2

### Example

| | | | |
|---|---|---|---|
| 1 | $p \dot{\vee} \dot{\neg}(\dot{\neg} q \dot{\wedge} \dot{\neg} r)$ | –;PREM | $\emptyset$ |
| 2 | $q$ | –;PREM | $\emptyset$ |
| ... | ... | ... | ... |
| 6 | $\neg p$ | 2,5;RU | $\{(p \dot{\vee} \dot{\neg}(\dot{\neg} q \dot{\wedge} \dot{\neg} r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |
| ... | ... | ... | ... |
| 11 | $\neg r$ | 2,10;RU | $\{(p \dot{\vee} \dot{\neg}(\dot{\neg} q \dot{\wedge} \dot{\neg} r)) \wedge (p \wedge \neg(\neg q \wedge \neg r)),$ $(\dot{\neg}\dot{\neg} q \dot{\vee} \dot{\neg}\dot{\neg} r) \wedge (\neg\neg q \wedge \neg\neg r)\}$ |
| 12 | $r$ | –;PREM | $\emptyset$ |

# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL^{gci}}$: Example 2

### Example

| | | | |
|---|---|---|---|
| 1 | $p \dot{\vee} \dot{\neg}(\dot{\neg} q \dot{\wedge} \dot{\neg} r)$ | –;PREM | $\emptyset$ |
| 2 | $q$ | –;PREM | $\emptyset$ |
| ... | ... | ... | ... |
| 6 | $\neg p$ | 2,5;RU | $\{(p \dot{\vee} \dot{\neg}(\dot{\neg} q \dot{\wedge} \dot{\neg} r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |
| ... | ... | ... | ... |
| 11 | $\neg r$ | 2,10;RU | $\{(p \dot{\vee} \dot{\neg}(\dot{\neg} q \dot{\wedge} \dot{\neg} r)) \wedge (p \wedge \neg(\neg q \wedge \neg r)),$ $(\dot{\neg}\dot{\neg} q \dot{\vee} \dot{\neg}\dot{\neg} r) \wedge (\neg\neg q \wedge \neg\neg r)\}$ |
| 12 | $r$ | –;PREM | $\emptyset$ |
| 13 | $\neg\neg q \wedge \neg\neg r$ | 2,12;RU | $\emptyset$ |
| 14 | $((\dot{\neg}\dot{\neg} q \dot{\vee} \dot{\neg}\dot{\neg} r) \wedge (\neg\neg q \wedge \neg\neg r)) \vee$ $((p \dot{\vee} \dot{\neg}(\dot{\neg} q \dot{\wedge} \dot{\neg} r)) \wedge (p \wedge \neg(\neg q \wedge \neg r)))$ | 1,13;RU | $\emptyset$ |

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# The Adaptive Logics Approach

## The Adaptive Logic $\mathbf{CL}^{\mathbf{gci}}$: Example 2

### Example

| | | | |
|---|---|---|---|
| 1 | $p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)$ | –;PREM | $\emptyset$ |
| 2 | $q$ | –;PREM | $\emptyset$ |
| ... | ... | ... | ... |
| 6 | $\neg p$ | 2,5;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r))\}$ |
| ... | ... | ... | ... |
| 11 | $\neg r$ | 2,10;RU | $\{(p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r)),$ $(\dot{\neg}\dot{\neg}q\dot{\vee}\dot{\neg}\dot{\neg}r) \wedge (\neg\neg q \wedge \neg\neg r)\}$ ✓ |
| 12 | $r$ | –;PREM | $\emptyset$ |
| 13 | $\neg\neg q \wedge \neg\neg r$ | 2,12;RU | $\emptyset$ |
| 14 | $((\dot{\neg}\dot{\neg}q\dot{\vee}\dot{\neg}\dot{\neg}r) \wedge (\neg\neg q \wedge \neg\neg r))\vee$ $((p\dot{\vee}\dot{\neg}(\dot{\neg}q\dot{\wedge}\dot{\neg}r)) \wedge (p \wedge \neg(\neg q \wedge \neg r)))$ | 1,13;RU | $\emptyset$ |

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# Conclusion

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It is possible to capture **GCI** as non–monotonic inference rules by relying on the adaptive logics approach.

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It is possible to capture **GCI** as non–monotonic inference rules by relying on the adaptive logics approach.

## Further Research

- To extend the approach to all scalar implicatures (to n–tuples).
- To extend the approach to non–scalar implicatures.
- To extend the approach to multiple speakers.

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# Conclusion

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It is possible to capture **GCI** as non–monotonic inference rules by relying on the adaptive logics approach.

## Further Research

- To extend the approach to all scalar implicatures (to n–tuples).
- To extend the approach to non–scalar implicatures.
- To extend the approach to multiple speakers.

Thank you!