Computing Compliance

Floris Roelofsen

www.illc.uva.nl/inquisitive-semantics

Umass Amherst, February 1, 2010

Sources

- Computing compliance
  Ivano Ciardelli, Irma Cornelisse, Jeroen Groenendijk, and Floris Roelofsen. Workshop on Logic of Rational Interaction, Chongqing, China, October 2009.
- Irma Cornelisse's BSc thesis
  defended June 2009 at the University of Amsterdam.
- Inquisitive logic
  Ivano Ciardelli and Floris Roelofsen.
  To appear in the Journal of Philosophical Logic.
- Accompanying website:
  `http://www.illc.uva.nl/inquisitive-semantics/computing-compliance/`

Compliance

The logical notion of compliance judges wether a sentence makes a contribution towards resolving a given issue.

Just as. . .

The logical notion of entailment judges whether a sentence follows from a given set of premises.

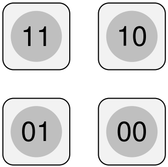
Why bother?

- In many practical applications, it is important to know what the appropriate responses to a given question are. Think of question-answer systems or dialogue systems;
- People generally assume each other to say things that are compliant with the issues at hand. This common assumption gives rise to pragmatic enrichment of the literal content of what is said.

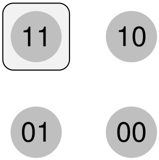
Three Ways of Being Compliant

1. completely resolve the given issue;
2. partially resolve the given issue;
3. replace the given issue by an easier to answer sub-issue.

Example, complete resolution:



$?p \wedge ?q$



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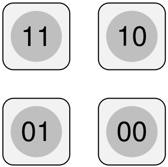
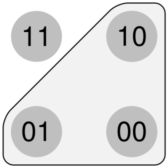
Example, partial resolution:



$?p \wedge ?q$



$p \rightarrow \neg q$

Three Ways of Being Compliant

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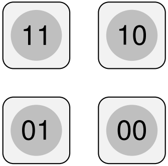
Example, replace by an easier to answer sub-issue:



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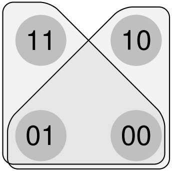


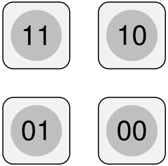
$p \rightarrow ?q$

Formal Characterization

φ is compliant with ψ iff:

1. every possibility in $[\varphi]$ is the union of some possibilities in $[\psi]$;
2. every possibility in $[\psi]$ restricted to $|\varphi|$ is contained in a possibility in $[\varphi]$.

Example, complete resolution:



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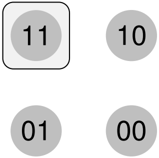

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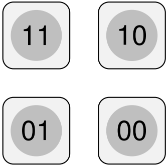

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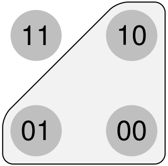

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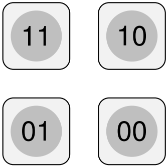
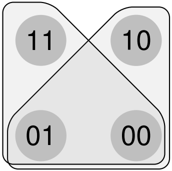


$?p \wedge ?q$



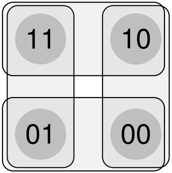
$p \rightarrow ?q$

The Restriction Clause

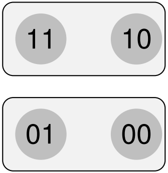
Every possibility in $[\psi]$ restricted to $|\varphi|$ must be contained in a possibility in $[\varphi]$.

$\Rightarrow$ possibilities in $[\psi]$ may only be eliminated by providing information.

Example, violation of the restriction clause:



$?p \vee ?q$



$?p$

Computing Compliance

Task

For a given formula ψ, compute all compliant responses to ψ.

Crucial Step

Compute a disjunctive normal form $\text{DNF}(\psi)$, such that:

- $\text{DNF}(\psi) \equiv \psi$
- $\text{DNF}(\psi) = \psi_1 \vee \psi_2 \vee \ldots \vee \psi_n$

  where each ψ_i uniquely corresponds with a possibility for ψ

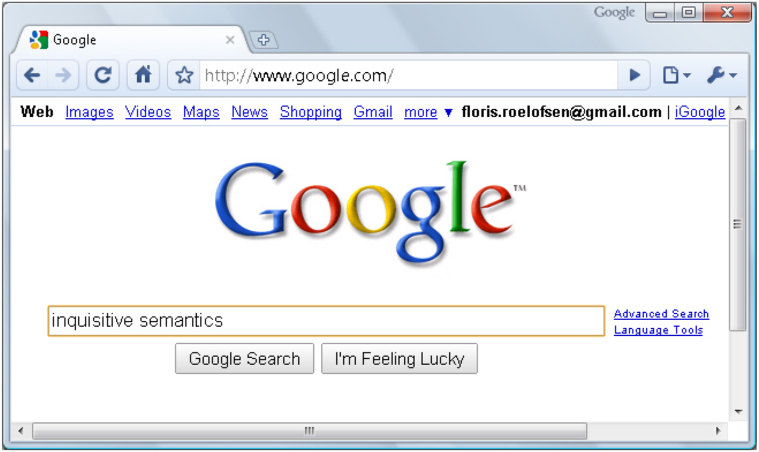
Computing Compliance

Then...

- Each formula of the form $!(\psi_{i_1} \vee \ldots \vee \psi_{i_k})$ is a compliant response;
- Each disjunction of such formulas is a potentially compliant response;
- Filter out all potentially compliant responses that violate the restriction clause;
- and you're done.

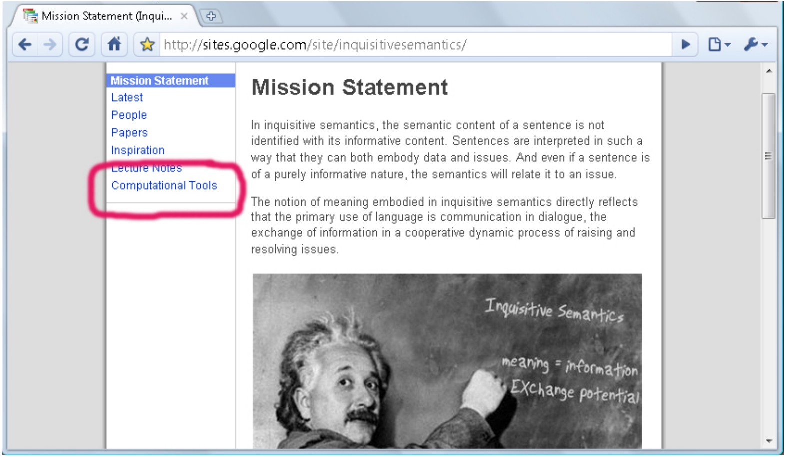
Demo

Google: inquisitive semantics



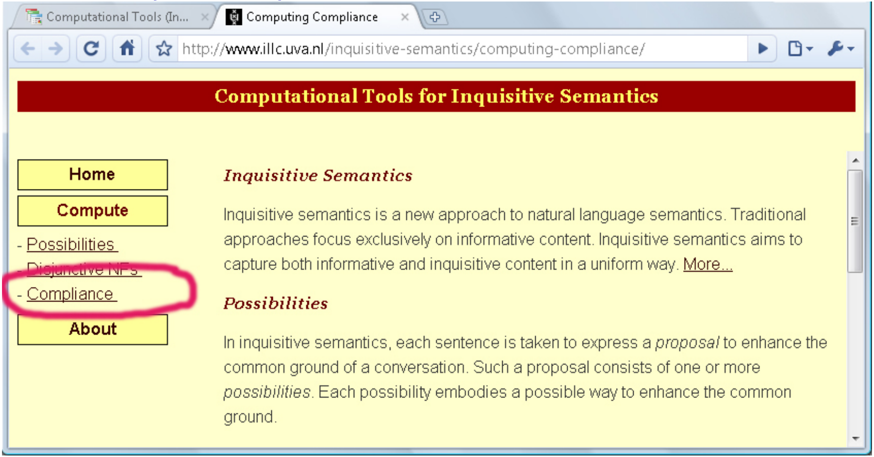
Demo

Go to: computational tools



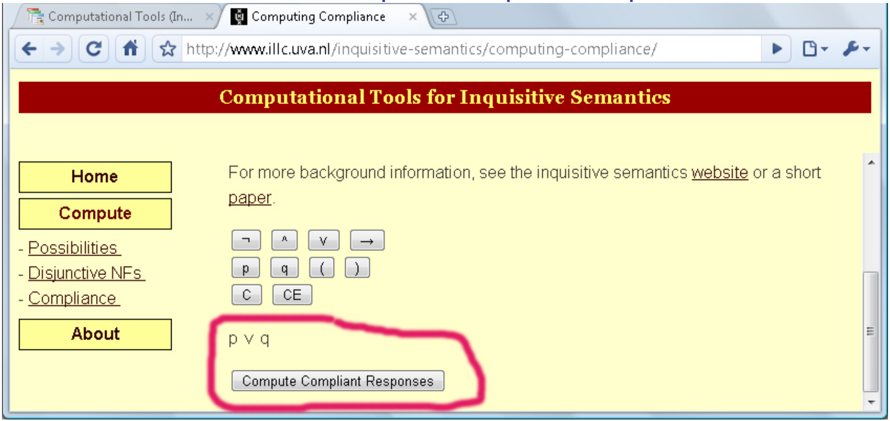
Demo

Go to: compute compliance



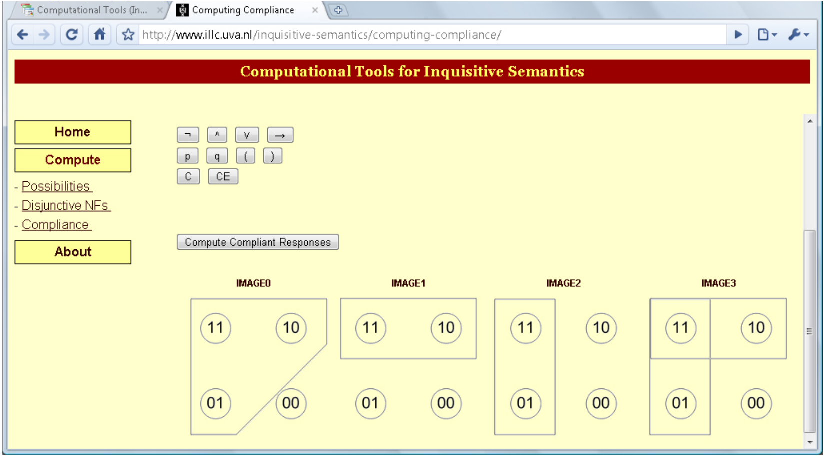
Demo

Enter a formula and hit ‘compute compliant responses’



Demo

Lo and behold



Possible extension

Computing preferred compliant responses

- There are often good reasons to prefer certain compliant responses over others (Groenendijk and Roelofsen, 2009);
- Develop an algorithm that, given an initiative ψ and an agent A with information state σ_A, determines the most compliant response(s) to ψ that A may truthfully utter.