Reasoning about Trust and Aboutness in the Context of Communication

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Definition of restricted trust

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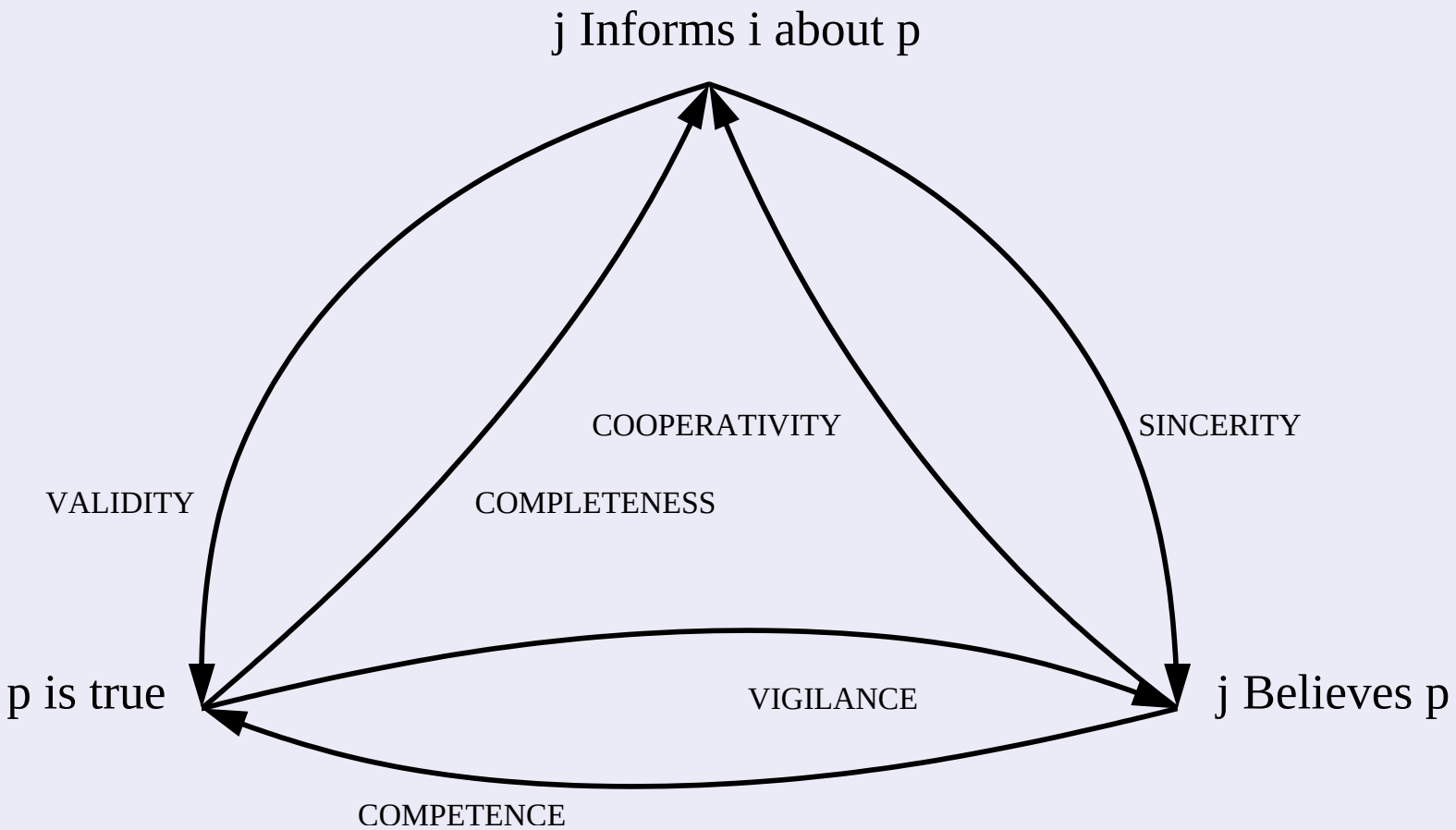
- Giulietta trusts Romeo in his sincerity about the fact that Giulietta is very pretty
- Giulietta believes that:
  IF Romeo told her that she is very pretty,
  THEN Romeo believes that she is very pretty

Trusted properties

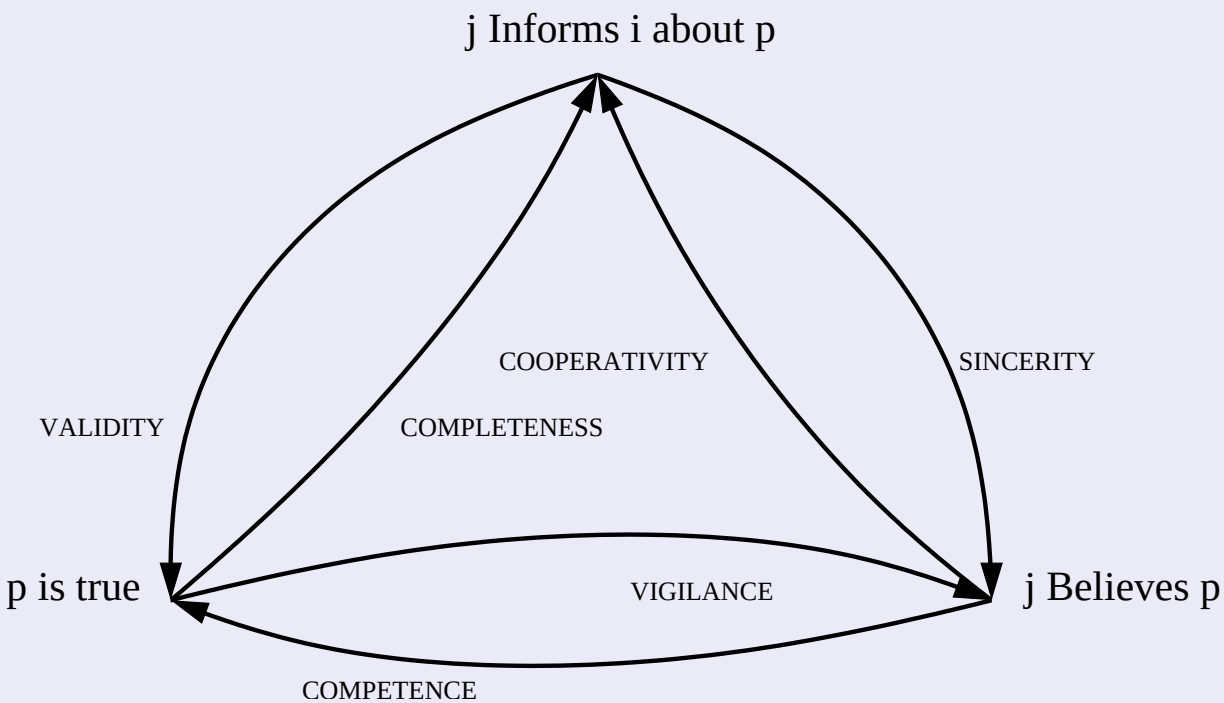
Form: IF ... Then ...
Relationships between:

- j Informs i about p : $Inf_{j,i}(p)$
- j Believes p : $Bel_j(p)$
- p is true : p

Trusted properties

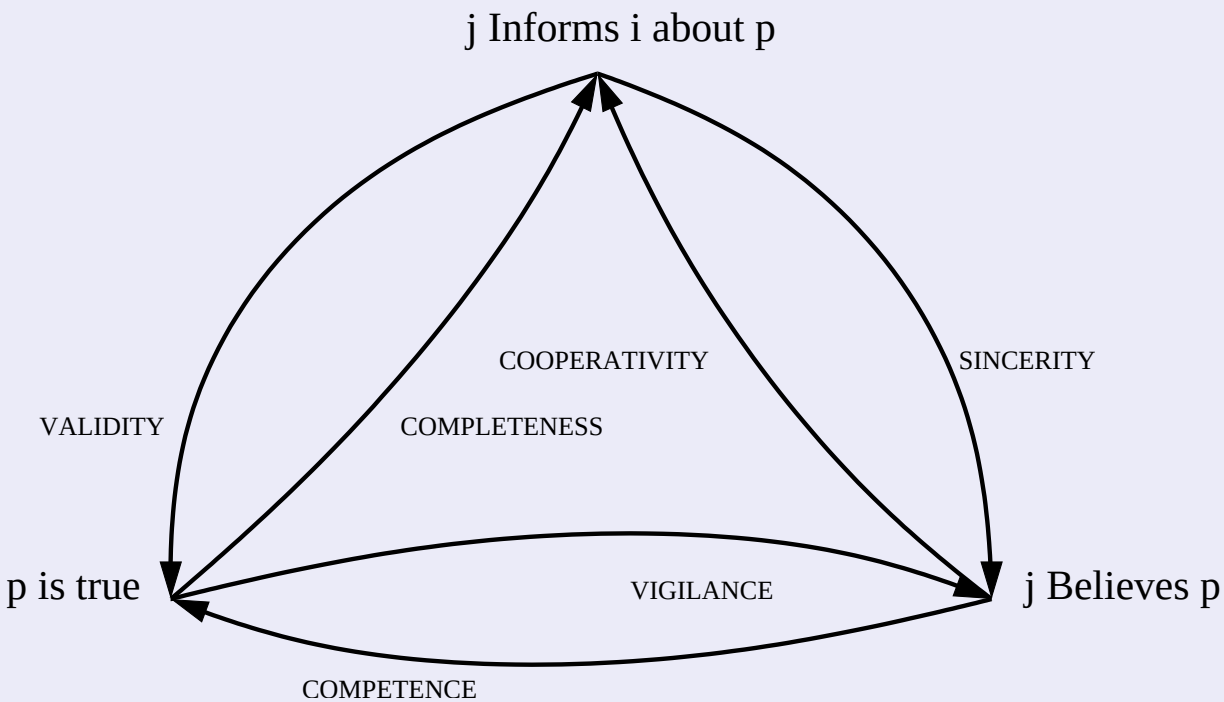


Trusted properties



p: Giulietta is very pretty
SINCERITY: If Romeo Informs Giulietta about *p*, Then Romeo Believes *p*
COMPETENCE: If Romeo Believes *p*, Then *p* is true
VALIDITY: If Romeo Informs Giulietta about *p*, Then *p* is true

Trusted properties



p: Giulietta is very pretty
VIGILANCE: If p is true, Then Romeo Believes p
COOPERATIVITY: If Romeo Believes p, Then Romeo Informs Giulietta about p
COMPLETENESS: If p is true, Then Romeo Informs Giulietta about p

Formalization

p: Classical Propositional Calculus
$Bel_i(p)$: KD logic
$Inf_{j,i}(p)$: Classical Modal (not Normal) Logic
$TrustSinc(i,j,p) \stackrel{\text{def}}{=} Bel_i(Inf_{j,i}(p) \rightarrow Bel_j(p))$
Assumption: perfect communication
(OBS) $Inf_{j,i}\phi \rightarrow Bel_i(Inf_{j,i}\phi)$
(OBS') $\neg Inf_{j,i}\phi \rightarrow Bel_i(\neg Inf_{j,i}\phi)$

Formal example

q = Giulietta is in Toulouse

Romeo trusts Giulietta in her completeness about q

$Bel_R(q \rightarrow Inf_{G,R}(q))$

$\neg Inf_{G,R}(q)$

Entails: $Bel_R(\neg q)$

Formal example

q = Giulietta is in Toulouse

Romeo trusts Giulietta in her completeness about q

$Bel_R(q \rightarrow Inf_{G,R}(q))$

$\neg Inf_{G,R}(q)$

Entails: $Bel_R(\neg q)$

Romeo trusts X in his sincerity about q

$Bel_R(Inf_{X,R}(q) \rightarrow Bel_X(q))$

$Inf_{X,R}(q)$

Entails: $Bel_R(Bel_X(q))$

Entails: $Bel_R(\neg q \wedge Bel_X(q))$

Trust extended to topics (with Andrew J.I. Jones)

- Giulietta trusts Romeo in his validity about every sentence about the topic modal logic
- If sentence $'p'$ is about modal logic,
  then Giulietta trusts Romeo in his validity about the truth of the proposition represented by p

What does it mean that sentence $'p'$ is about topic t?

Trust extended to topics

"sentence $'p'$ is about topic t"
does not depend on the truth value of proposition p
it depends on its meaning

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- "KD is decidable" is about modal logic
- "KD is not decidable" is about modal logic
- "KD is decidable or KD is not decidable" is about modal logic
- "Toulouse is in Spain or Toulouse is not in Spain" is NOT about modal logic

Formalization

$A(t,' p')$: the proposition named by $'p'$ is about the topic t
Language of CPC.
atoms of CPC + $A(t,' p')$
Models. Two sorts for the interpretation of $A(t,' p')$
Satisfiability. Bochvar's 3 valued logic: true, false, undefined
true $\vee$ undefined = undefined

Formalization

Valid schema:

If $\models p \leftrightarrow q$ and $'p'$ and $'q'$ same atoms

Then $\models A(t,' p') \leftrightarrow A(t,' q')$

Additional schema:

$A(t,' p') \rightarrow A(t,' \neg p')$

Formalization

Valid schema:

If $\models p \leftrightarrow q$ and $'p'$ and $'q'$ same atoms

Then $\models A(t,' p') \leftrightarrow A(t,' q')$

Additional schema:

$A(t,' p') \rightarrow A(t,' \neg p')$

Rejected schema:

$A(t,' p \wedge q') \rightarrow A(t,' p') \vee A(t,' q')$

Example: t: bigamy

$'p'$: Romeo is married with Giulietta

$'q'$: Romeo is married with Venus

Trust extended to individuals (with Luis Fariñas del Cerro)

- Romeo trusts Giulietta in her validity about all the sentences which inform about Sorolla
- If p informs about Sorolla,
  then Romeo trusts Giulietta in her validity about p

What does it means that p informs about Sorolla?

Intuition

p = Sorolla is a Spanish painter

p informs about Sorolla

$\neg p$ informs about Sorolla

$p \vee \neg p$ does not inform about Sorolla

Intuition

p = Sorolla is a Spanish painter

p informs about Sorolla

$\neg p$ informs about Sorolla

$p \vee \neg p$ does not inform about Sorolla

q = Sorolla is a Spanish painter or Picasso is a Spanish painter

q informs about Sorolla

Formalization

p does NOT inform about Sorolla iff
In any model
If we change the truth value of the tuples which contain d and d is the interpretation of Sorolla (or a term which contains Sorolla),
Then the truth value of p does not change
(except if d is also the interpretation of another term)

Topics and Individuals

Giulietta trusts Romeo in his validity about the sentences which *inform about Gödel* and which are *about the topic* Logic

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Possible extension

Sentences which inform about a relationship between two individuals

Romeo loves Giulietta: YES

Romeo leaves in Toulouse and AND Giulietta leaves in Chiclana: NO

There exist a city x (Romeo leaves in x AND Giulietta leaves in x): YES

Graded Trust (with Leyla Amgoud)

What does it mean that i strongly trusts j?
Strength of i's belief?
Regularity level of $Inf_{j,i}(p) \rightarrow Bel_j(p)$?
Combination of both:
$Bel_i^g(Inf_{j,i}(p) \Rightarrow^h Bel_j(p))$

Conclusion

Many interesting topics to be investigated

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with Luis