Incrementality all the way up

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1. Incrementality and content negotiation
2. Incrementality and argument negotiation
3. Record types and incremental specification

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Interpretation is incremental

One kind of example:

1. **A:** Er, the doctor
2. **B:** Chorlton?
3. **A:** Chorlton, mhm, he examined me . . .

[BNC: KPY 1006-1008]

- Dialogue involves interaction
- We need to model interaction

A	**Event**	**B**
	e_1:**A**/the doctor	
ref(e_1,c)		?ref(e_1,c)
	e_2:**B**/Chorlton?	
cont(e_2, ?ref(e_1,c))		cont(e_2, ?ref(e_1,c))
	e_3:**A**/Chorlton	
cont(e_3, ref(e_1,c))		cont(e_3, ref(e_1,c)) ref(e_1,c)

A	Event	B
	e_1:**A**/the doctor	
ref(e_1,c)		?ref(e_1,c)
	e_2:**B**/Chorlton?	
cont(e_2, ?ref(e_1,c))		cont(e_2, ?ref(e_1,c))
	e_3:**A**/Chorlton	
cont(e_3, ref(e_1,c))		cont(e_3, ref(e_1,c)) ref(e_1,c)

Mismatches in information states and accommodation

1. **A:** Er, the doctor
2. **B:** Chorlton?
3. **A:** no, Fitzgerald, mhm, he examined me

. . .

A	**Event**	**B**
	e_1:**A**/the doctor	
ref(e_1,f)		?ref(e_1,c)
	e_2:**B**/Chorlton?	
cont(e_2, ?ref(e_1,c))		cont(e_2, ?ref(e_1,c))
	e_3:**A**/no, Fitzgerald	
cont(e_3, ref(e_1,f))		cont(e_3, ref(e_1,f)) ref(e_1,f)

A	Event	B
	e_1:**A**/the doctor	
ref(e_1,f)		?ref(e_1,c)
	e_2:**B**/Chorlton?	
cont(e_2, ?ref(e_1,c))		cont(e_2, ?ref(e_1,c))
	e_3:**A**/no, Fitzgerald	
cont(e_3, ref(e_1,f))		cont(e_3, ref(e_1,f)) ref(e_1,f)

Misunderstanding

1. **A:** Er, the doctor
2. **A:** mhm, he examined me . . .

A	**Event**	**B**
	e_1:**A**/the doctor	
ref(e_1,f)		ref(e_1,c)
	e_2:**A**/he examined me	
cont(e_2, examine(f, *A*))		cont(e_2, examine(c, *A*))

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Accommodating arguments

1. **P**: Metal was actually the reason I started doing hip hop.
2. **P**: ...Because I hated metal
3. **J**: Oh, I thought you were going to say something completely different!

[radio interview with hip-hop artist Petter, translated from Swedish]

Two relevant arguments

- $$\frac{\text{like}(a, b) \qquad \text{similar}(b, c)}{\text{do}(a, c)}$$
- $$\frac{\text{hate}(a, b) \qquad \text{similar}(b, c)}{\text{do}(a, c)}$$
- and many more ...

- enthymematic arguments
  - not logically valid (can possibly be made so by adding premises)
  - can be defeasible

Topoi and enthymemes

topos abstract argument form

$$\frac{\mathrm{like}(a, b) \qquad \mathrm{similar}(b, c)}{\mathrm{do}(a, c)}$$

enthymeme instantiated topos

$$\frac{\mathrm{like}(\text{petter}, \text{metal}) \qquad \mathrm{similar}(\text{metal}, \text{hip-hop})}{\mathrm{do}(\text{petter}, \text{hip-hop})}$$

Call these τ_{like} and $\varepsilon_{\mathrm{like}}$

topos abstract argument form

$$\frac{\mathrm{hate}(a, b) \qquad \mathrm{similar}(b, c)}{\mathrm{do}(a, c)}$$

enthymeme instantiated topos

$$\frac{\mathrm{hate}(\text{petter}, \text{metal}) \qquad \mathrm{similar}(\text{metal}, \text{hip-hop})}{\mathrm{do}(\text{petter}, \text{hip-hop})}$$

Call these τ_{hate} and $\varepsilon_{\mathrm{hate}}$

Updating the dialogue gameboard

e_1: **P**/Metal was actually the reason I started doing hip hop.

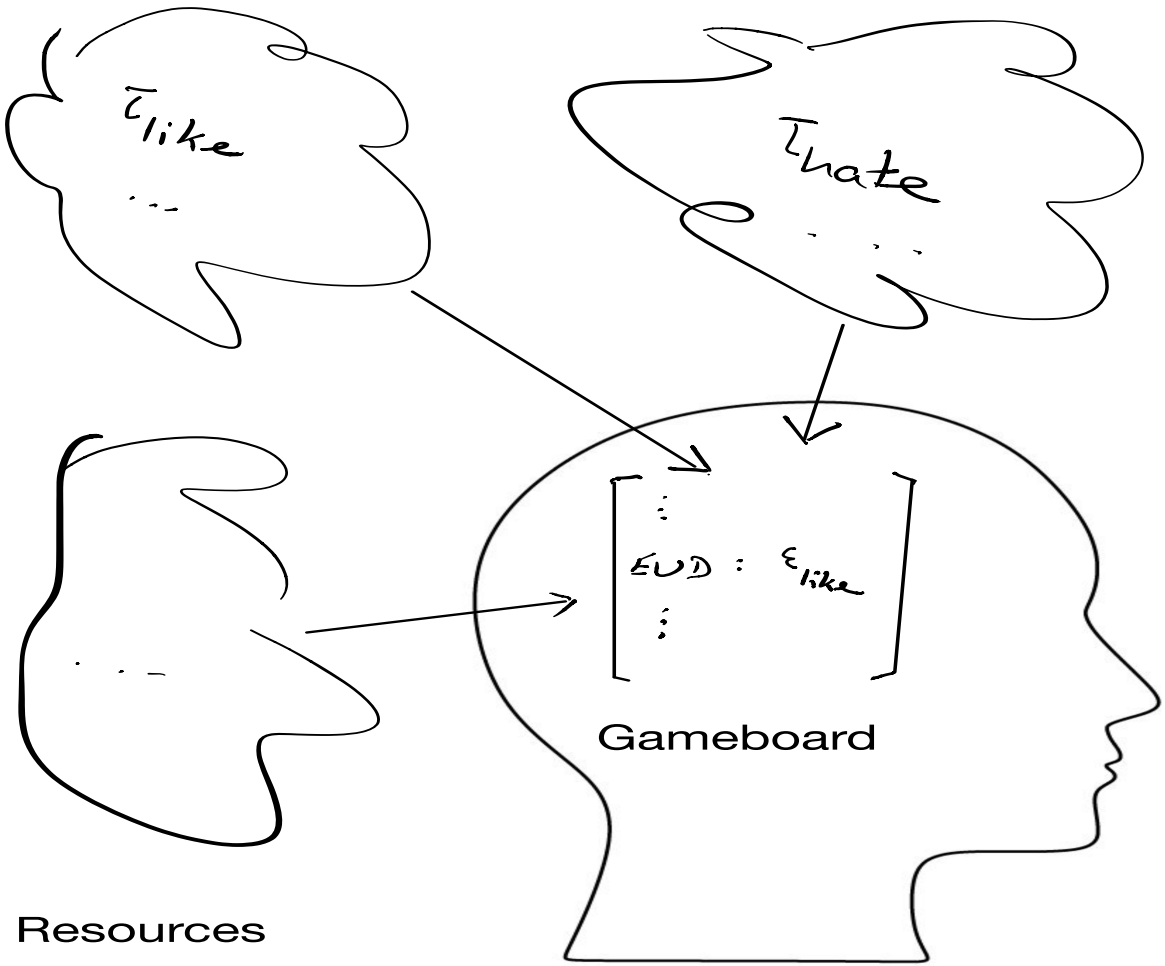
P	**J**
topos:τ_{hate}	topos:τ_{like}

e_2: **P**/...Because I hated metal

eud:$\varepsilon_{\text{hate}}$	topos:τ_{hate} eud:$\varepsilon_{\text{hate}}$

e_3: **J**/Oh, I thought you were going to say something completely different!

Topoi as resources



Ceci n’est pas une logique

- Topoi do not lead us to a monolithic consistent logic (Ducrot, 1980, 1988; Anscombre, 1995)
- Perhaps local consistency
- But the inference rules may change within a dialogue or even their appropriateness be discussed

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TTR

- TTR is a type theory with records
- Cooper (2005, 2012); Ginzburg (2012); Cooper and Ginzburg (2015)
- TTR applied to enthymematic reasoning: Breitholtz (2014a,b); Breitholtz and Cooper (2011); Breitholtz et al. (2015); Breitholtz and Howes (2015); Schlöder et al. (2016)

Record types in TTR

- A record type is a set of fields consisting of a label and a type
  Let T be
  $$\begin{bmatrix} \text{x} & : & \mathit{Ind} \\ \text{c} & : & \text{doctor(x)} \end{bmatrix}$$
- A record is a set of fields consisting of a label and an object.
  $r : T$ just in case r is of the form
  $$\begin{bmatrix} \text{x} & = & a \\ \text{c} & = & s \\ \vdots & & \end{bmatrix}$$
  where $a : \mathit{Ind}$ and
  $s : \text{doctor}(r.\text{x})$, i.e. $s : \text{doctor}(a)$

Partial specification using manifest fields

- Let T' be
$$\begin{bmatrix} \text{x=chorlton} & : & \mathit{Ind} \\ \text{c} & : & \text{doctor(x)} \end{bmatrix}$$
- $r : T'$ just in case r is of the form
$$\begin{bmatrix} \text{x} & = & a \\ \text{c} & = & s \\ \vdots & & \end{bmatrix}$$
where $a : \mathit{Ind}_{\text{chorlton}}$
i.e. $a : \mathit{Ind}$ and $a = \text{chorlton}$ and
$s : \text{doctor}(r.\text{x})$, i.e. $s : \text{doctor}(a)$

Note that $T' \sqsubseteq T$, i.e. $r : T'$ implies $r : T$

Adding fields to record types

- Let T'' be

$$\begin{bmatrix} \text{x=chorlton} & : & \mathit{Ind} \\ \text{c} & : & \text{doctor(x)} \\ \text{e} & : & \text{examine(x, } \mathbf{A}\text{)} \end{bmatrix}$$

- $T'' \sqsubseteq T'$
- Essentially similar to a DRT treatment (Kamp and Reyle, 1993)
- Records used to model situations (Barwise and Perry, 1983)

Enthymemes and topoi as type theoretic objects

- objects which can be loaded into the gameboard, have a type
- dependent types — functions from objects to types
- τ_{like} —

$$\lambda r{:}\begin{bmatrix} \text{x}{:}\mathit{Ind} \\ \text{y}{:}\mathit{Ind} \\ \text{z}{:}\mathit{Ind} \\ \text{e}_1{:}\text{like(x,y)} \\ \text{e}_2{:}\text{similar(y,z)} \end{bmatrix} . \left[\text{e}{:}\text{do}(r.\text{x},r.\text{z})\right]$$

Dependent types as functions

$$\tau_{\text{like}} : \left(\begin{bmatrix} x{:}\mathit{Ind} \\ y{:}\mathit{Ind} \\ z{:}\mathit{Ind} \\ e_1{:}\text{like}(x,y) \\ e_2{:}\text{similar}(y,z) \end{bmatrix} \rightarrow \mathit{RecType} \right)$$

Obtaining enthymemes by partial specification

$$\varepsilon_{\text{like}} \overline{\quad} \quad \lambda r{:}\begin{bmatrix} \text{x=petter:}\mathit{Ind} \\ \text{y=metal:}\mathit{Ind} \\ \text{z=hip-hop:}\mathit{Ind} \\ \text{e}_1\text{:like(x,y)} \\ \text{e}_2\text{:similar(y,z)} \end{bmatrix} . \left[\text{e:do}(r.\text{x},r.\text{z})\right]$$

(More sophisticated versions of τ_{like} and $\varepsilon_{\text{like}}$ in the paper.)

Using topoi and enthymemes to make inferences

- topoi and enthymemes can be used in various ways to make "inferences"
- $$\frac{\tau : (T \to Type) \qquad a : T}{a : \tau(a)} \qquad \frac{\tau : (T \to Type) \qquad a : T}{\tau(a) \text{ true}}$$
$$\frac{\tau : (T \to Type) \qquad a : T}{!\tau(a)}$$
- $!T$ — act of creating an object a, $a : T$
  $\sim\sim\sim$ — licensing an act such as a judgement or creation (Cooper, 2014, prep)

Conclusion

- incremental interpretation and incremental reasoning
- topoi as resources to underpin enthymemes necessary to establish coherence
- as in incremental interpretation there can be misunderstanding and accommodation
- topoi and enthymemes as type theoretic objects as opposed to external rules

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