

Which Answers are expected?

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Sommaire

- 1 Which problems do we expect to study?
- 2 Which methodology to analyse such problems?
- 3 A few words on a formal framework
- 4 An example

Which problems do we expect to study?

Which methodology to analyse such problems?

A few words on a formal framework

An example

What could be *incoherence* in a dialogue?

From a very basic (tautological) observation,

*A dialogue sounds strangely when one locutor makes an **unexpected** intervention.*

Of course, such an intervention may be said *unexpected* with respect to a **given viewpoint**.

Moreover

Incoherence means either against logic, or against unity/cohesion of the dialogue

An unexpected intervention may be impolite, irrelevant, . . .

But it is said *incoherent* when it does not obey to some given laws, logical laws or unity laws.

Here, we focus on **incoherence as against logical laws**.

Which methodology?

We argue that we need a frame to consider **together**:

- 1 expectations
- 2 (distinct) viewpoints
- 3 logical elements and reasoning

The choice of a formal framework

Our dialogue modeling is based on Ludics, in which:

- 1 dialogues either converge or diverge when interventions of a locutor **do not meet expectations** of her addressee
- 2 each locutor has a **distinct cognitive base**
- 3 the formal elements are **primitively logical objects**

Strategies/Proofs

A player P has a starting strategy against a player O :

- she starts a play, playing a (positive) move m_1 : going from L_a to L_b
- she anticipates two (negative) moves from her opponent, either m_2 : going from L_b to L_{c_1} or m'_2 : going from L_b to L_{c_2} .

$$\begin{array}{c}
 \frac{\frac{\frac{\vdash L_{c_1} \quad \vdash L_{c_2}}{\vdash L_b}}{\vdash L_a}}{P} \quad \frac{\frac{L_{c_1} \vdash}{\vdash L_b}}{L_a \vdash}}{O}
 \end{array}$$

A move is **positive** (anchored at the right side of the turnstyle) for the player who plays it,
 and **negative** (anchored at the left of the turnstyle) for the player who receives it.

Strategies/Proofs

Such a beginning strategy may be seen as a proof (bottom/up reading).
P tries to prove a proposition F against her opponent who tries to refute it.

$$\frac{\frac{\frac{\vdash F_1 \quad \vdash F_2}{\neg F_1 \vee \neg F_2 \vdash}}{\vdash F}}{P} \quad \frac{\frac{F_1 \vdash}{\vdash \neg F_1 \vee \neg F_2}}{F \vdash}}{O}$$

P tries to prove a conjunction $F_1 \wedge F_2$, he anticipates that O will try to refute this conjunction, that is, that:

- O will try to refute F_1 , or will try to refute F_2 .

Then P has to be ready to justify F_1 , and to justify F_2 .

Strategies/Proofs/Dialogues

P questions O, on F ...

$$\frac{\frac{\frac{\vdash F_1 \quad \vdash F_2}{? F_1/F_2 \vdash}}{\vdash F}}{P} \quad \frac{\frac{F_1 \vdash}{\vdash F_1/F_2}}{F \vdash} O$$

P proposes an alternative on F (F is a invitation: F_1 or F_2 ?).

O receives the proposition and chooses between F_1 and F_2 .

P has to be ready to develop F_1 , and to develop F_2 .

Elements of knowledge as proof like objects

We represent *knowledges*, *entitlements*, *beliefs* by proof-like objects:

by rendering more or less explicite their logical structure

A proposition A is a proof-like object based on $\vdash L_A$.

- **Simple statements** It may be just the belief A is true :

$$\frac{\text{---}\emptyset}{\vdash L_A}$$

(as an axiom in such proofs system)

- It may be a more developed justification :

A conjunction:

$$\frac{\frac{\vdots}{\vdash L_A} \quad \frac{\vdots}{\vdash L_B}}{\frac{?L_A \vdash \quad ?L_B \vdash}{\vdash L_{A \wedge B}}}$$

Elements of knowledge as proof like objects

We represent *knowledges*, *entitlements*, *beliefs* by proof-like objects:

- **Inferences** An inference “from A then B” is a proof like object based on

$$\frac{\begin{array}{c} \vdots \\ L_A \vdash L_B \end{array}}{\vdash L_{A \Rightarrow B}}$$

They may be just the effect of inference:

$$\frac{\frac{\frac{\frac{\quad}{\emptyset}}{\vdash L_B}}{\frac{\quad}{\emptyset}}}{L_A \vdash L_B}}{\vdash L_{A \Rightarrow B}}$$

Elements of knowledge as proof like objects

We represent *knowledges*, *entitlements*, *beliefs* by proof-like objects:

- Or more developed justification:

$$\frac{\frac{\vdots}{\vdash ?L_A, ?L_B, L_C}}{L_{A \wedge B} \vdash L_C}}{\vdash L_{A \wedge B} \Rightarrow C}$$

Both may be **partial**.

Pieces of them may be either used for or obtained from a unfolding dialogue, by means of **delocalisations**.

A non convergent dialogue

An ethnologist P conducting a survey on logical behaviours gives to a native N the following informations:

All the Kpelle cultivate rice (P1). Mister Smith does not cultivate rice (P2).

and asks the following question:

Is Mister Smith a Kpelle? (Q)

The native answers:

I do not know. I do not know Mister Smith. (R)

Expectations of P , at the surface of the dialogue

$$\frac{\frac{\frac{\vdash L_{non} \quad \vdash L_{oui}}{\vdash L_R} \vdash}{\vdash L_Q}}{\vdash L_Q} \quad \frac{\frac{L_{not-know} \vdash}{\vdash L_R} \vdash}{L_Q \vdash}}$$

After her question, P is ready to receive either a **logically correct answer**, or an **incorrect one**. But, she did not anticipate the answer given by N . **And she does not know how to continue the dialogue.**

This is the reason why the dialogue is said divergent (with respect to the viewpoint of the ethnologist).

More on “convergent” dialogues

- 1 Either the answer is logically correct and the ethnologist considers that the dialogue is ended (\dagger), the native has correct logical abilities.

$$\frac{\frac{\frac{\frac{\text{---}\dagger}{\vdash L_{non}}}{L_R \vdash}}{\vdash L_Q} \quad \frac{\frac{L_{non} \vdash}{\vdash L_R}}{L_Q \vdash}}{\vdash L_Q \quad L_Q \vdash}}$$

- 2 Or, she is ready to make explicit the expected logical calculus and to analyse more deeply the logical difficulties.

$$\frac{\frac{\frac{\frac{\frac{\vdots}{L_{corr} \vdash}}{\vdash L_{oui}}}{L_R \vdash}}{\vdash L_Q} \quad \frac{\frac{L_{oui} \vdash}{\vdash L_R}}{L_Q \vdash}}{\vdash L_Q \quad L_Q \vdash}}$$

The strategy of the ethnologist

In all cases, her strategy to conduct such a dialogue is:

$$\frac{\frac{\frac{\text{---} \dagger}{\vdash L_{non}} \quad \frac{\begin{array}{c} \vdots \\ L_{corr} \vdash \end{array}}{\vdash L_{oui}}}{L_R \vdash}}{\vdash L_Q}$$

In fact, the complete strategy is:

$$\frac{\frac{\frac{\vdots}{\frac{\frac{\frac{\frac{\frac{\vdots}{L_{corr} \vdash}}{\vdash L_{oui}}}{L_R \vdash}}{\vdash L_Q}}{P_2 \vdash}}{\vdash L_{P_2}, L_Q}}{P_1 \vdash L_{P_2}, L_Q}}{\vdash L_{P_1}, L_{P_2}, L_Q}}$$

She expects that:
N records P_1 ,
then N records P_2 ,
the question activates a calculus
the result of that calculus is given.

then some appropriate reactions according
to the relevance of the given answer.

More on cognitive bases in the case of convergent dialogues

- 1 The native is supposed to record the propositions
 P_1 : “All the Kpelle cultivate rice.”
 P_2 : “Mister Smith does not cultivate rice.”

This means that, in the cognitive base of N , there is:

$$\begin{array}{c}
 \frac{}{\vdash C(a)} \quad \frac{}{\vdash C(b)} \\
 \frac{}{K(a) \vdash C(a)} \quad \frac{}{K(b) \vdash C(b)} \\
 \vdots \qquad \qquad \qquad \vdots \\
 \hline
 K(x) \vdash C(x)
 \end{array}$$

and

$$\frac{}{\vdash} \quad \frac{}{C(\text{smith}) \vdash}$$

If x is a kpelle x cultivates rice.

Smith does not cultivate rice.

More on cognitive base in the case of convergent dialogues

- 1 To answer the question “Is Mister Smith a Kpelle?”, the Native is supposed
 - to test a **temporary information** “Mister Smith is a Kpelle”

$$\frac{}{\vdash K(\text{smith})} \emptyset$$

- and to **perform logical calculi**.
- 2 Finally, he has to **recognize**, inside his cognitive base that the inference : **from** “mister smith is a kpelle” one derives a **contradiction**, one may **conclude** “mister smith is not a Kpelle”.

Calculi in N's cognitive base

- First calculus:

The **co-presence** of both pieces of information, **sharing** an element:

$$\frac{\frac{\frac{}{\emptyset}}{\vdash K(smith)} \quad \frac{\frac{}{\emptyset}}{\vdash C(smith)}}{\vdash K(smith) \quad \vdash C(smith)}}{\vdash K(smith) \quad \vdash C(smith)}$$

triggers a calculus: a rewriting process

$$\frac{\frac{\frac{}{\emptyset}}{\vdash K(smith)} \quad \frac{\frac{\frac{}{\emptyset}}{\vdash C(smith)}}{\vdash K(smith) \quad \vdash C(smith)}}{\vdash K(smith) \quad \vdash C(smith)}}{\vdash C(smith)} \mapsto \frac{}{\vdash C(smith)}$$

Calculi in N's cognitive base

- Second calculus:

The **co-presence** of two pieces of information **sharing** an element triggers another calculus:

The interaction $\frac{\frac{\frac{}{\vdash C(\text{smith})}}{\emptyset}}{\vdash C(\text{smith})} \quad \frac{\frac{\frac{}{\vdash}}{\emptyset}}{\vdash}}{\vdash C(\text{smith})}}{\vdash}$ becomes $\frac{}{\vdash}$

That is : the addition of a data “Smith is a Kpelle” yields a **contradiction**.

Calculi in N's cognitive base

Therefore, N has to be able to update his cognitive base:

- He has to **record** that the proposition *M. Smith is a kpelle* implies a contradiction:

$$\frac{\frac{\text{---} \dagger}{\vdash}}{\text{---} \emptyset} \\ K(\textit{smith}) \vdash$$

- Then, he has to recognize that this latter information is exactly the affirmation that *Smith is not a Kpelle*.

$$\frac{\frac{\frac{\text{---} \dagger}{\vdash}}{\text{---} \emptyset} \\ K(\textit{smith}) \vdash}{\text{---} \vdash \neg K(\textit{smith})}$$

- Then, he is able to give the **expected** answer to the ethnologist.

What could be missing?

- The translation of “All kpelle cultivates rice” as an inference.
- The explicitation of “M. Smith does not cultivate rice” as a logical negation.
- The authorization, even more, the invitation to add/test a proposition “M. Smith is a Kpelle”.
- The use to trigger logical calculi as free games

The usefulness of such an example

To account for such unexpected interventions, we have to rebuild

- the expectations of the locutor: the viewpoint according to which the intervention is not coherent
- her strategy: the way the locutor builds (the surface of) the dialogue

But also we have to make explicit the cognitive steps that are expected (at the level of the cognitive bases).

The usefulness of such a formal framework

The framework we propose enables to account for the following elements, in a consistent way:

- the computation in a cognitive base by means of interaction between proof-like objects
- the interpretation of the surface of the dialogue by means of interaction between two strategies

This gives us the means to make explicit the possible points of failures. As it enables to decompose logical abilities in elementary steps.

Which problems do we expect to study?
Which methodology to analyse such problems?
A few words on a formal framework
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Thank you for your attention