A Formal Account of Disorders in Dialogues

CLASP

Maxime Amblard
November 15, 2017
Plan

Introduction

SLAM

Corpus Tagging

Toward a formal treatment

Perspectives
Introduction
1. A formal account of natural language
2. Thought and language disorders
Semantics

- Semantics

Compositionality (Frege)

Logical approaches (Montague)

John loves Mary

How to use these representations?

Usefulness of these representations?

If a farmer owns a donkey, he beats it

Cognitive reality, conceptual reality?
Semantics

- Semantics
- Compositionality (Frege)
Semantics

• Semantics
• Compositionality (Frege)
• Logical approaches (Montague)
Semantics

- Semantics
- Compositionality (Frege)
- Logical approaches (Montague)

  (1) John loves Mary
Semantics

- Semantics
- Compositionality (Frege)
- Logical approaches (Montague)

(1) John loves Mary

\[ \text{love}(\text{John}, \text{Mary}) \]
Semantics

• Semantics
• Compositionality (Frege)
• Logical approaches (Montague)
  (1) John loves Mary

  love(John, Mary)

• How to use these representations?
• Usefulness of these representations?
Semantics

- Semantics
- Compositionality (Frege)
- Logical approaches (Montague)
  
  (1) John loves Mary

  \[ \text{love}(\text{John}, \text{Mary}) \]

- How to use these representations?
- Usefulness of these representations?
  
  (2) If a farmer owns a donkey, he beats it


- Semantics
- Compositionality (Frege)
- Logical approaches (Montague)

(1) John loves Mary

\[ \text{love}(\text{John}, \text{Mary}) \]

(2) If a farmer owns a donkey, he beats it

\[ \exists x (\exists y. (\text{farmer } x \land \text{donkey } y \land \text{own } x y) \rightarrow \text{beat } x y) \]
Semantics

- Semantics
- Compositionality (Frege)
- Logical approaches (Montague)

(1) John loves Mary

\[ \text{love}(\text{John}, \text{Mary}) \]

- How to use these representations?
- Usefulness of these representations?

(2) If a farmer owns a donkey, he beats it

\[ \exists x (\exists y. (\text{farmer } x \land \text{donkey } y \land \text{own } x y) \rightarrow \text{beat } x y) \]

- Cognitive reality, conceptual reality? ...
Can we understand madness?

Article “The Conversation France” 05.31.2017

http://theconversation.com/p...
SLAM
- Linguistic studies of mental diseases (Chaika 1974) and (Fromkin 1975)
- Pragmatic discontinuities in performing verbal interaction (Trognon and Musiol 1996)
- Discontinuities **definitive** (Musiol 2009): pathological use of discourse planning for patients with schizophrenia (paranoid)
The project aims to systematize the study of pathological conversations under interdisciplinary approaches.

- Building of a linguistic resource on mental pathology
The project aims to systematize the study of pathological conversations under interdisciplinary approaches.

- Building of a linguistic resource on mental pathology
  - semi-supervised interviews
  - neuro-cognitive tests
  - double eye-trackers
The project aims to systematize the **study of pathological conversations** under **interdisciplinary approaches**

- Building of a linguistic resource on mental pathology
  - semi-supervised interviews
  - neuro-cognitive tests
  - double eye-trackers

- Epistemological and philosophical studies (norm, madness, rationality)
The project aims to systematize the study of pathological conversations under interdisciplinary approaches:

- Building of a linguistic resource on mental pathology
  - semi-supervised interviews
  - neuro-cognitive tests
  - double eye-trackers
- Epistemological and philosophical studies (norm, madness, rationality)
- Identify these purposes with:
  - formal models
  - NLP methods and tools
- Corpus

- Formalization

- Epistemology
SLAM

- **Corpus**
  - organize the interviews
  - transcription and tagging
  - analyse different linguistic levels

- **Formalization**

- **Epistemology**
- Corpus

- Formalization
  - question the cognitive reality of semantico-pragmatic models,
  - automatically identify unusual uses of the language

- Epistemology
- Corpus

- Formalization

- Epistemology
  - question the normative concepts of rationality and logicity
  - study interpretation under linguistic interaction, and the status of implicit norms
Discontinuity example

B124 Oh oui (↑) et pis compliqué (↓) et c’est vraiment très très compliqué (→) la politique c’est quelque chose quand on s’en occupe faut être gagnant parce qu’autrement quand on est perdant c’est fini quoi (↓)
Oh yeah (↑) and complicated (↑) and it’s really very very complicated (→) politics, it’s really something when you get into it, have to win or else when you lose, well, you’re finished (↓)

A125 Oui
Yes

B126 J. C. D. est mort, L. est mort, P. est mort euh (…) JCD is dead, L is dead, P is dead uh (…)

A127 Ils sont morts parce qu’ils ont perdu à votre avis (↑)
So you think they’re dead because they lost (↑)

B128 Non ils gagnaient mais si ils sont morts, c’est la maladie quoi c’est c’est (→) No they won but if they’re dead, it’s their disease well it’s (→)

A129 Ouaïs c’est parce qu’ils étaient malades, c’est pas parce qu’ils faisaient de la politique (↑) Yeah it’s because they had a disease, it’s not because they were in politics (↑)

B130 Si enfin (→) Yes I mean (→)

A131 Si vous pensez que c’est parce qu’ils faisaient de la politique (↑) Yes you think it’s because they were in politics (↑)

B132 Oui tiens oui il y a aussi C. qui a accompli un meurtre là (→) il était présent lui aussi qui est à B. mais enfin (→) c’est encore à cause de la politique ça Yes, so well yeah there was C too who committed murder, uh huh (→) he was there too, the one in B but well (→) it, that, it’s because of politics again
Discontinuity example

B124 Oh ouais (↑) et pis compliqué (↓) et c’est vraiment très très compliqué (→) la politique c’est quelque chose quand on s’en occupe faut être gagnant parce qu’autrement quand on est perdant c’est fini quoi (↓)
Oh yeah (↑) and complicated (↑) and it’s really very very complicated (→) politics, it’s really something when you get into it, have to win or else when you lose, well, you’re finished (↓)

A125 Oui
Yes

B126 J. C. D. est mort, L. est mort, P. est mort euh (…)
JCD is dead, L is dead, P is dead uh (…)

A127 Ils sont morts parce qu’ils ont perdu à votre avis (↑)
So you think they’re dead because they lost (↑)

B128 Non ils gagnaient mais si ils sont morts, c’est la maladie quoi c’est c’est (→)
No they won but if they’re dead, it’s their disease well it’s it’s (→)

A129 Ouaïs c’est parce qu’ils étaient malades, c’est pas parce qu’ils faisaient de la politique (↑)
Yeah it’s because they had a disease, it’s not because they were in politics (↑)

B130 Si enfin (→)
Yes I mean (→)

A131 Si vous pensez que c’est parce qu’ils faisaient de la politique (↑)
Yes you think it’s because they were in politics (↑)

B132 Oui tiens oui il y a aussi C. qui a accompli un meurtre là (→) il était présent lui aussi qui est à B. mais enfin (→) c’est encore à cause de la politique ça
Yes, so well yeah there was C too who committed murder, uh huh (→) he was there too, the one in B but well (→) it, that, it’s because of politics again
B124 Oh yeah (↑) and complicated (↑) and it’s really very very complicated (→) politics, it’s really something when you get into it, have to win or else when you lose, well, you’re finished (↓)

A125 Yes

B126 JCD is dead, L is dead, P is dead uh (…)

A127 So you think they’re dead because they lost (↑)

B128 No they won but if they’re dead, it’s their disease well it’s it’s (↑)

A129 Yeah it’s because they had a disease, it’s not because they were in politics (↑)

B130 Yes I mean (→)

A131 Yes you think it’s because they were in politics (↑)

B132 Yes, so well yeah there was C too who committed murder, uh huh (→) he was there too, the one in B but well (→) it, that, it’s because of politics again
The schizophrenic switch twice from a theme to another one:
The schizophrenic switch twice from a theme to another one:

- politic death (symbolic)
- death (literal)
The schizophrenic switch twice from a theme to another one:

- politic death (symbolic)
- death (literal)

The two themes are relied but they express two different realities.
A relatively large corpus

<table>
<thead>
<tr>
<th></th>
<th>La Rochelle</th>
<th>Lyon</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>♂</td>
<td>♀</td>
<td>tot</td>
</tr>
<tr>
<td>Schizophrenics</td>
<td>15</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Controls</td>
<td>15</td>
<td>8</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>11</td>
<td>41</td>
</tr>
</tbody>
</table>

31,575 speeches / 375,000 words
A relatively large corpus

<table>
<thead>
<tr>
<th></th>
<th>La Rochelle</th>
<th>Lyon</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>♂</td>
<td>♀</td>
<td>tot</td>
</tr>
<tr>
<td>Schizophrenics</td>
<td>15</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Controls</td>
<td>15</td>
<td>8</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>11</td>
<td>41</td>
</tr>
</tbody>
</table>

31 575 speeches / 375 000 words

<table>
<thead>
<tr>
<th></th>
<th>La Rochelle</th>
<th></th>
<th>Lyon</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># speeches</td>
<td># words</td>
<td># speeches</td>
<td># words</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>3 863</td>
<td>11 145</td>
<td>4 062</td>
<td>4 433</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>7 282</td>
<td>72 903</td>
<td>12 356</td>
<td>79 081</td>
<td></td>
</tr>
<tr>
<td>P + S</td>
<td>3 819</td>
<td>11 517</td>
<td>4 098</td>
<td>4 480</td>
<td></td>
</tr>
<tr>
<td>P + T</td>
<td>7 698</td>
<td>108 278</td>
<td>138 571</td>
<td>37 842</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>22 662</td>
<td>258 333</td>
<td>8 913</td>
<td>116 923</td>
<td></td>
</tr>
</tbody>
</table>
A corpus hard to constitute

- A lot of administrative steps:
  - CPP of the area of the medical institution (including a finalise description of the all protocol)
  - CNIL
- Data should not be use for/against the patient
- Patient involvement (significant loss of participation >55%)
- Heavy protocol
Interview(s) (hand transcription with a guide)

Neuro-cognitive tests:
- Wechsler Adult Intelligence Scale-III (IQ)
- California Verbal Learning Test (strategy and cognitive abilities)
- Trail Making Test (deprecation of cognitive flexibility and inhibition)

Oculomotor behavior (double Eye-Trackers)

Brain activity (EEG)
Two interlocutors, thus two (spontaneous) views on the exchange.

<table>
<thead>
<tr>
<th>Discourse interpretation by</th>
<th>normal subject</th>
<th>Schizophrenic</th>
</tr>
</thead>
<tbody>
<tr>
<td>(3\textsuperscript{rd} person)</td>
<td>hypothesis: pragmatic correctness \downarrow semantics incorrectness</td>
<td>pragmatic incorrectness \uparrow hypothesis: semantic correctness</td>
</tr>
<tr>
<td></td>
<td>contradictory contents: \textit{look} like a contradiction</td>
<td>coherent content: \textit{possibility of interpretation}</td>
</tr>
</tbody>
</table>

⇒ The representation \textit{need more} than logical semantics
Use of SDRT + thematic boxes (grey ones)

[Diagram showing the relationships between nodes A1, B2, A3, B4, A5, and B6 with labels such as "narr", "el", and "question".]
Use of SDRT + thematic boxes (grey ones)

They are thematic islands
Two conjectures

- Schizophrenics are *logically consistent*. 
Two conjectures

- Schizophrenics are **logically consistent**.
  Hence discontinuities appear in the process which produce the representation, thus at the pragmatic level.
Two conjectures

- Schizophrenics are *logically consistent*. Hence discontinuities appear in the process which produce the representation, thus at the pragmatic level.

- Underspecification (ambiguity) plays a central role
Two conjectures

- Schizophrenics are **logically consistent**.
  Hence discontinuities appear in the process which produce the representation, thus at the pragmatic level.

- Underspecification (ambiguity) plays a central role

  *Slogan:* “A choice is never a definitive one!”
Two conjectures

- Schizophrenics are **logically consistent**.
  Hence discontinuities appear in the process which produce the representation, thus at the pragmatic level.

- Underspecification (ambiguity) plays a central role

  *Slogan:* “A choice is never a definitive one!”

  Phonological, morphological, lexical, discourse, ...
Guy experienced a lovely evening last night

Elaboration

He had a fantastic meal

Elaboration

He ate salmon

Narration

He devoured lots of cheese
Guy experienced a lovely evening last night

Elaboration

He had a fantastic meal

Elaboration

He ate salmon

Elaboration

He devoured lots of cheese

Narration

“He found it really marvelous”

Constraints on attachment: right frontier rule
Patient understanding
Psychologist understanding
l’an dernier euh (→) j’savais pas comment faire j’étais perdue et pourtant j’avais pris mes médicaments j’suis dans un état vous voyez même ma bouche elle est sèche j’suis dans un triste état

I didn’t know what to do. I was lost.

Vous êtes quand même bien (↑)

J’pense que ma tête est bien mais on croirait à moitié (↓) la moitié qui va et la moitié qui va pas j’ai l’impression de ça vous voyez (↑)

D’accord

Ou alors c’est la conscience peut être la conscience est ce que c’est ça (↑)

Vous savez ça arrive à tout le monde d’avoir des moments biens et des moments où on est perdu

Everybody is lost at times.

Oui j’ai peur de perdre tout le monde

Yes I am afraid I lose everybody.

Mais ils vont plutôt bien vos enfants (↑)

Ils ont l’air ils ont l’air mais ils ont des allergies ils ont (→) mon petit fils il s’est cassé le bras à l’école tout ça
Corpus Tagging
SLAMtk (python)

- Limit human actions:
  → Disfluencies, Distagger (Constant and Dister 2010)
  → POS and lemmas, MElt (Denis and Sagot 2009)
SLAMtk (python)

- Limit human actions:
  - Disfluencies, Distagger (Constant and Dister 2010)
  - POS and lemmas, MElt (Denis and Sagot 2009)

Why?

- Study conventionnal vs pathological uses
- rebuild more consistent speeches (syntactically)
SLAMtk (python)

- Limit human actions:
  - Disfluencies, Distagger (Constant and Dister 2010)
  - POS and lemmas, MElt (Denis and Sagot 2009)

Why?

- Study conventional vs pathological uses
- Rebuild more consistent speeches (syntactically)

Results:

- Patients with schizophrenia produce slightly more disfluencies
- But they have no specific behavior for POS / lemmas
f-score : 95,5 %, precision : 95,3 %, recall : 95,8 % (Constant and Dister 2010)

1. ’euh’
   
   (1) *moi ça m’est presque plus *euh* difficile et *euh* anti-naturel de parler*

2. Repeat
   
   (2) *j’ arrive à être à être concentrée quand il faut faire quelque chose*

3. self-corrections
   
   (3) *enfin je sais pas trop le les termes*

4. starters
   
   (4) *pis progressivement vous av- pouvez travailler sur votre concentration*
Distribution of disfluencies in an interview
<table>
<thead>
<tr>
<th></th>
<th>S</th>
<th>C</th>
<th>S+C</th>
<th>P+S</th>
<th>P+C</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Corpus Lyon</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>by speeches</td>
<td>0.5417</td>
<td>0.5589</td>
<td>0.545</td>
<td>0.1400</td>
<td>0.1513</td>
<td>0.1424</td>
</tr>
<tr>
<td>by words</td>
<td>0.032</td>
<td>0.0168</td>
<td>0.0288</td>
<td>0.0144</td>
<td>0.0138</td>
<td>0.0142</td>
</tr>
<tr>
<td><strong>Corpus La Rochelle</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>by speeches</td>
<td>0.7117</td>
<td>0.484</td>
<td>0.5842</td>
<td>0.3338</td>
<td>0.7369</td>
<td>0.5599</td>
</tr>
<tr>
<td>by words</td>
<td>0.0595</td>
<td>0.0468</td>
<td>0.0524</td>
<td>0.0421</td>
<td>0.0496</td>
<td>0.0463</td>
</tr>
</tbody>
</table>
### Results (% of disfluencies)

<table>
<thead>
<tr>
<th></th>
<th>S</th>
<th>C</th>
<th>S+C</th>
<th>P+S</th>
<th>P+C</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>by speeches</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corpus Lyon</td>
<td>0.5417</td>
<td>0.5589</td>
<td>0.545</td>
<td>0.1400</td>
<td>0.1513</td>
<td>0.1424</td>
</tr>
<tr>
<td>Corpus La Rochelle</td>
<td>0.7117</td>
<td>0.484</td>
<td>0.5842</td>
<td>0.3338</td>
<td>0.7369</td>
<td>0.5599</td>
</tr>
<tr>
<td><strong>by words</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corpus Lyon</td>
<td>0.032</td>
<td>0.0168</td>
<td>0.0288</td>
<td>0.0144</td>
<td>0.0138</td>
<td>0.0142</td>
</tr>
<tr>
<td>Corpus La Rochelle</td>
<td>0.0595</td>
<td>0.0468</td>
<td>0.0524</td>
<td>0.0421</td>
<td>0.0496</td>
<td>0.0463</td>
</tr>
</tbody>
</table>

### Significance: > 1.96
Repartition of POS tagging for controls (on the left) and patients with schizophrenia (on the right)
FR and TTR

<table>
<thead>
<tr>
<th></th>
<th>La Rochelle</th>
<th>Lyon</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FR</td>
<td>TR</td>
<td>FR</td>
<td>TR</td>
</tr>
<tr>
<td>T</td>
<td>0,04</td>
<td>0,68</td>
<td>0,11</td>
<td>0,73</td>
</tr>
<tr>
<td>S</td>
<td>0,05</td>
<td>0,69</td>
<td>0,06</td>
<td>0,70</td>
</tr>
<tr>
<td>P</td>
<td>0,02</td>
<td>0,64</td>
<td>0,06</td>
<td>0,68</td>
</tr>
</tbody>
</table>

FR : ratio of the number of lemmas to the total number of forms

(T)TR : ratio of the number of lemmas to the total number of different forms (types)
• Differences between sub-corpus (different transcriptions)
• Differences in age and IQ
• Patients under medicine
Organization of 3 human annotation campaigns

- Identification of decisive discontinuities
- SDRT representation
Hand annotations

Organization of 3 human annotation campaigns

- Identification of decisive discontinuities
- SDRT representation

Results

- Huge difficulties for discontinuities
- Relative consensus for SDRT
SDRT annotations with Glozz on pretreated texts.

Début

B1: J’aimerais savoir ce que font les personnes qui sont à l’hôpital
ce que vous faites la journée par exemple...
A2: Je suis très amoureuse de Florence M.
B3: De Florence M.
A4: Oui superbe là...

comment elle s’appelle Florence R.
elle a tué quand même plus de un million de de personnes
B5: Qui ça ?
A6: Florence R.
B7: C'est qui cette dame là ?
A8: Elle était psychiatre 40 rue de N.
j'y allais une fois par semaine ou deux fois tous les quinze jours
elle aurait pu me tuer mais enfin...
Analyse of the annotations (ongoing work)

46 annotators on 3 extracts (+ one training text)
Difficulties

- Impossibility of disidentification
  - Task with a small context: randomise speeches
  - Inability to anonymize the history and the geography

- Patient reality
  - Formal analysis of language = define a standard
  - Deviate = dysfunction
  - But, every speaker is confronted daily with language disorders from healthy people
  - The diagnosis can not suffer from approximations
A current Extension: developing complex context

(Rebuschi 2015):

- **Discursive context** that depends on interaction and dynamics of interaction;
- **Doxatic context** which takes up all the presuppositions, beliefs about the world and the projection of the beliefs of the speakers;
- **Pragmatic context** that is interpreted by the situation of the interaction (the speaker who says "I" in playing a role does not say "me" to designate himself, but to designate the individual he plays);
- **Material and social context** in which the idea is to consider both the framework of interactions and all the influences which build it.
Toward a formal treatment
Type Theoretic Dynamic Logic

- **Type Theoretic Dynamic Logic (TTDL)** (de Groote 2006):
  - montagovian framework, with dynamicity which add continuation in λ-calculus
Type Theoretic Dynamic Logic

- **Type Theoretic Dynamic Logic (TTDL) (de Groote 2006):**
  - Montagovian framework, with dynamicity which add continuation in \( \lambda \)-calculus
- **Primitive types**
  - \( \iota \): individual / entity
  - \( \sigma \): proposition / truth value
  - \( \gamma \): left context
Type Theoretic Dynamic Logic

- **Type Theoretic Dynamic Logic (TTDL) (de Groote 2006):** montagovian framework, with dynamicity which add continuation in \(\lambda\)-calculus

- **Primitive types**
  - \(\nu\): individual / entity
  - \(o\): proposition / truth value
  - \(\gamma\): left context

\[
[s] = o
\]
Type Theoretic Dynamic Logic

- **Type Theoretic Dynamic Logic (TTDL) (de Groote 2006):**
  montagovian framework, with dynamicity which add continuation in
  $\lambda$-calculus

- **Primitive types**
  - $\iota$: individual / entity
  - $\sigma$: proposition / truth value
  - $\gamma$: left context

\[
\frac{\mathcal{S}}{\sigma} = o
\]
Type Theoretic Dynamic Logic

- **Type Theoretic Dynamic Logic (TTDL)** (de Groote 2006): Montagovian framework, with dynamicity which add continuation in \(\lambda\)-calculus
- Primitive types
  - \(\nu\): individual / entity
  - \(o\): proposition / truth value
  - \(\gamma\): left context

\[
\llbracket s \rrbracket = o
\]
Type Theoretic Dynamic Logic

- **Type Theoretic Dynamic Logic (TTDL)** (de Groote 2006): montagovian framework, with dynamicity which add continuation in $\lambda$-calculus

- Primitive types
  - $\nu$: individual / entity
  - $o$: proposition / truth value
  - $\gamma$: left context

\[ [s] = o \]
Type Theoretic Dynamic Logic

- **Type Theoretic Dynamic Logic (TTDL)** (de Groote 2006): montagovian framework, with dynamicity which add continuation in \(\lambda\)-calculus
- **Primitive types**
  - \(\nu\): individual / entity
  - \(o\): proposition / truth value
  - \(\gamma\): left context

\[
[s] = o
\]

(left context) \(\gamma\) \(\gamma \rightarrow o\) (right context)
Type Theoretic Dynamic Logic

- **Type Theoretic Dynamic Logic (TTDL) (de Groote 2006):** Montagovian framework, with dynamicity which add continuation in \(\lambda\)-calculus

- **Primitive types**
  - \(\nu\): individual / entity
  - \(o\): proposition / truth value
  - \(\gamma\): left context

\[
\begin{align*}
\llbracket S \rrbracket & = o \\
\llbracket S \rrbracket & = \gamma \rightarrow (\gamma \rightarrow o) \rightarrow o
\end{align*}
\]
Type Theoretic Dynamic Logic

- **Type Theoretic Dynamic Logic (TTDL)** (de Groote 2006):
  - Montagovian framework, with dynamicity which add continuation in \( \lambda \)-calculus
- **Primitive types**
  - \( \iota \): individual / entity
  - \( o \): proposition / truth value
  - \( \gamma \): left context

\[
[s] = o
\]

(left context) \( \gamma \) \rightarrow (right context) \( \gamma \rightarrow o \)

\[
[s] = \gamma \rightarrow (\gamma \rightarrow o) \rightarrow o
\]

\[
\lambda e. \phi. \exists x. \text{candidate}(x) \land \phi(x :: e)
\]
Frame Semantics

Processing dialogue: access to subparts of the interaction for update.
Frame Semantics

Processing dialogue: access to subparts of the interaction for update.

A₁ Where do you live?

B In Paris.
Processing dialogue: access to subparts of the interaction for update.

A₁  Where do you live?

Diagram:

- **Agent**: you
- **Location**: live
- **Update**: ?
Frame Semantics

Processing dialogue: **access to subparts** of the interaction for **update**.

**A₁** Where do you live?

**B₂** In Paris.

![Diagram showing the interaction between 'you' as the agent and 'live' as the action, with 'Paris' as the location.](image)
Use of:

- TTDL for compositionality
- Frame Semantics for representation of the content
Use of:

- TTDL for compositionality
- Frame Semantics for representation of the content
- Ongoing work: defining such a framework and apply it to the SLAM corpus
Features extraction

• a feature $v$
• type of frames: $\gamma$

$$\text{find}_v: \gamma \rightarrow v \times (v \rightarrow \gamma)$$
Features extraction

- a feature $v$
- type of frames: $\gamma$

$$find_v : \gamma \rightarrow v \times (v \rightarrow \gamma)$$

Example:

$$[A_1] = \begin{bmatrix}
LIVE \\
Ag : A \\
Loc : Paris
\end{bmatrix}$$

$find_{Loc}$ to $A_1$:

$$(Paris, \lambda l. \begin{bmatrix}
LIVE \\
Ag : A \\
Loc : l
\end{bmatrix})$$
Utterances type

assertion  
\[ [u] = \gamma \rightarrow \gamma \]

question  
\[ [q_v] = \gamma \rightarrow v \times (v \rightarrow \gamma) \]

answer  
\[ [a_v] = v \times (v \rightarrow \gamma) \rightarrow \gamma \]
A₁ I live in Paris.
B₂ How long have you been living there?
A₃ For five years.
A_1  I live in Paris.
B_2  How long have you been living there?
A_3  For five years.

\[
\begin{align*}
\llbracket A_1 \cdot q B_2 \cdot a A_3 \rrbracket c_e &= \lambda c. \llbracket A_3 \rrbracket \left( \llbracket B_2 \rrbracket \left( \llbracket A_1 \rrbracket c \right) \right) c_e \\
&\rightarrow_\beta \llbracket A_3 \rrbracket \left( \llbracket B_2 \rrbracket \left( \llbracket A_1 \rrbracket c_e \right) \right)
\end{align*}
\]
\[
[A_1] c_e = \begin{bmatrix}
\text{LIVE} \\
\text{Ag: A} \\
\text{Loc: Paris}
\end{bmatrix} = 1
\]

\[
[B_2] 1 = \lambda t.
\begin{bmatrix}
\text{LIVE} \\
\text{Ag: A} \\
\text{Loc: Paris} \\
\text{Tmp: } t
\end{bmatrix} = 2
\]

\[
[A_3] 2 = \begin{bmatrix}
\text{LIVE} \\
\text{Ag: A} \\
\text{Loc: Paris} \\
\text{Tmp: Five years}
\end{bmatrix}
\]
Perspectives
• Increase the phenomena analyzed in SLAMtk
  Especially work on syntax and lexical statistics

• Try DDN approaches on the SLAM corpus
  Need more resources in French

• Deeply study the human annotations of the corpus

• Increase the coverage of the corpus in volume and number of pathologies studied
  Collection of data at the Montperrin Hospital of Aix-En-Provence

• Define remedial help process

• Refine the analysis of dysfunction, opening towards a cognitive interpretation and give more complex context for the interpretation
• Defining robust semantics grammars for TTDL
• Definition of a TTDL for dialogue framework
  Ongoing work on questions and answers with Maria Boritchev
• (French translation of Fracas)
Thanks!
• 5 persons
• Translation of 10% of the all corpus all together
• Many issues! especially:
  • do we translate word/word, syntax/syntax
  • do we translate the meaning?
• We define a short translation guide
• Translation by pairs (around 50% done)
• Then discussions all together about the hardest cases
• We will probably :
  • Produce two versions of the ressource
  • Test them with Game With A Purpose (GWAP) as Zombilingo
References


– (2015). “La non-commutativité comme argument linguistique : modéliser la notion de phase dans un cadre logique”. In: *Traitement Automatique des Langues* 56.1, pp. 91–115. URL: https://hal.inria.fr/hal-01188669.

Amblard, Maxime, Karên Fort, Caroline Demily, et al. (2015). “Analyse lexicale outillée de la parole transcrite de patients schizophrènes”. In: Traitement Automatique des Langues. Natural Language Processing and Cognition 55.3, pp. 91–115. URL: https://hal.inria.fr/hal-01188677.

Amblard, Maxime, Karên Fort, Michel Musiol, et al. (2014). “L'impossibilité de l'anonymat dans le cadre de l’analyse du discours”. In: Journée ATALA éthique et TAL. Paris, France. URL: https://hal.archives-ouvertes.fr/hal-01079308.


– (1999). Derivation by phase. ms, MIT.


Maršík, Jirka and Maxime Amblard (2013). “Integration of Multiple Constraints in ACG”. In: *Logic and Engineering of Natural Language Semantics 10*. Kanagawa, Japan, pp. 1–14. URL: https://hal.archives-ouvertes.fr/hal-00869748.


Qian, Sai, Philippe de Groote, and Maxime Amblard (2016). “Modal Subordination in Type Theoretic Dynamic Logic”. In: Linguistic Issues in Language Technology. Modes of Modality in NLP 14, p. 54. URL: https://hal.inria.fr/hal-01370557.


Oh yeah (↑) and complicated (↑) and it’s really very very complicated (→)

\[ B^{1}_{124} \]
politics, it's really something when you get into it, have to win or else when you lose, well, you're finished (↓)
(A125) Yes
(B126) JCD is dead, L is dead, P is dead uh (...)

Diagram:

- Node $B^1_{124}$ connected to $B^2_{124}$ via an edge labeled "el".
- Node $A_{125}$ connected to $B^1_{124}$ via an edge labeled "phatic".
- Node $B_{126}$ connected to $B^1_{124}$.
(A127) So you think they're dead because they lost (↑)
(B128) No they won but if they're dead, it's their disease well it's it's (→)
(B128) No they won but if they’re dead, it’s their disease well it’s it’s (→)
(A129) Yeah it's because they had a disease, it's not because they were in politics (†)
(B130) Yes I mean (→)
(A131) Yes you think it's because they were in politics (†)
(B132) Yes, so well yeah there was C too who committed murder, uh huh (→) he was there too, the one in B but well (→) it, that, it’s because of politics again
Yes, so well yeah there was C too who committed murder, uh huh (→) he was there too, the one in B but well (→) it, that, it's because of politics again.
Yes, so well yeah there was C too who committed murder, uh huh (→) he was there too, the one in B but well (→) it, that, it's because of politics again.