
Processing Dialogue-Based Data in the UIMA Framework

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Overview

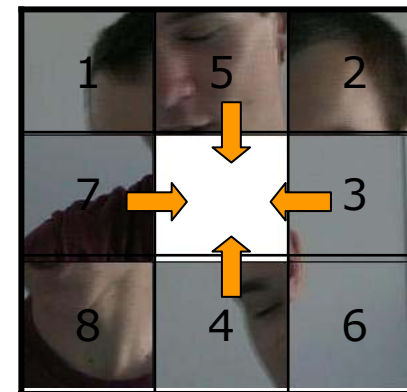
- Background
- Processing dialogue-based Data
- Conclusion

Background

- NIMITEK project
 - the role of emotions and intentions in human-machine dialogue
 - <http://wwwai.cs.uni-magdeburg.de/nimitek>
- Wizard-of-Oz experiments
 - simulation of a speech based system with a human operator playing the role of the system
 - test of intelligence and communication abilities supported by the spoken natural language dialogue system

Background

- Subjects were only allowed to address the system verbally:
 - to instruct the system what operation to perform, or
 - to ask the system for a help.
- Tasks were specified with the intention to stimulate the verbal interaction.
- Subjects might use a limited number of different words to solve a task; but they had to produce a number of utterances to accomplish the whole test.
- different tasks e.g. solving graphical puzzle



Examples

videos are available on request



Background

- over 13 hours of sessions were recorded
 - 9 persons (6 female, 3 male)
 - ca. 18.7 GB
- material was transcribed and annotated with different information

Background

- several annotated XML files:
 - material of sessions is annotated with different information

	Dreh	mein	Kästchen	so, dass	es	hinein	passt
	Rotate	my	box	so that	it	fits	into
annotation 1:	command						
annotation 2:					reference		
annotation 3:	action	entity			entity		
annotation 4:			↓ tonic prominence				

Annotations:

1. semantic classes of utterances
2. anaphoric references and ellipsis-substitutions
3. functional elements related to the focus of attention in the dialogue
4. prosodic cues

Background

```
<woz>
  <comment>Diese Operation ist nicht erlaubt.</comment>
</woz>
<sub>
  <command>2 setzen.</command>
  <command>2 hinlegen.</command>
</sub>
<woz>
  <comment>Auf der 2 befindet sich eine Scheibe.</comment>
</woz>
<sub>
  <command>Ja darum sollst du die ja da hinlegen...</command>
</sub>
```

1st annotation

2nd annotation

```
<woz>
  Diese Operation ist nicht erlaubt.
</woz>
<sub>
  2 setzen.
  2 hinlegen.
</sub>
<woz>
  Auf der 2 befindet sich eine Scheibe.
</woz>
<sub>
  Ja darum sollst du <reference>die</reference> ja da hinlegen...
</sub>
```


Background

- analyses of the material
 - interdependencies between linguistic cues in commands produced by the subject and focusing structure of recorded material
 - e.g. prosody and syntactic pattern

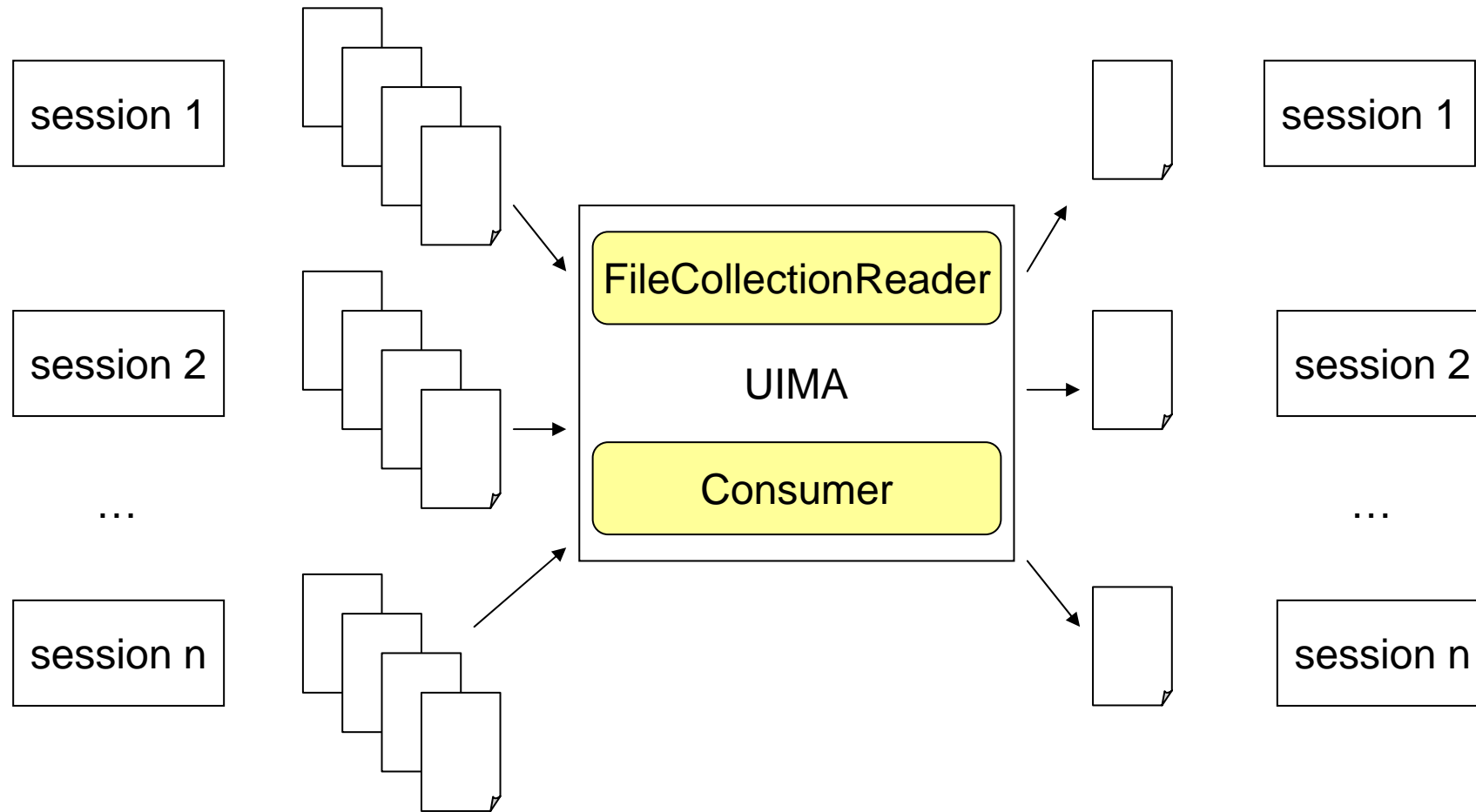
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Processing Annotations by UIMA

- in 2 steps
 - merging several annotation structures to one annotation file
 - to analyze the recorded and annotated material

Merging of Annotation



XML Files → XMI File

Merging of Annotation

- each XML annotation is transformed into a UIMA annotation
- attributes → features of an annotation
- position of an annotation based on position of XML Node (document offset)

Merging of Annotations

- annotations created by hand

```
<woz>  
  <command>Bitte wählen sie eines der vier Teile auf der rechten Seite. Sagen sie dann, ob  
  es in das Feld mit dem Fragezeichen passt.</command>  
</woz>  
<sub>  
  <command>Unten....</command>  
  <command>Unten rechts....</command>  
  <command>Rechts...</command>  
  <comment>Passt nicht...</comment>  
  <comment>Passt nicht...</comment>  
  <command>Anderes Eck...</command>  
  <comment>Ja, passt...</comment>  
</sub>
```

- problem

- different students, different editors
- adding of characters (e.g. space) during the annotation process → incorrect annotations in the merged document

Merging of Annotations

- simple UIMA based annotator was created
 - input: XMI-File, Type System Descriptor
 - output: XMI-File
- functionality (WYSIWYG-Annotator):
 - add new annotations
 - update/edit of annotations
 - highlighting of annotations

Nimitek Annotator

select XMI-File:
C:\daten\makunze\Korpus\nimitek\sessions\work\doc9

position: 1782:1785

woz:
Auf Turm zwei befindet sich zurzeit keine Scheibe.

sub:
Aus dem Grund will ich **die** da hin haun.
Wenn das System nich die Anweisungen befolgt, **die** ich gebe, dann kann ich die Aufgabe nicht lösen.

woz:
Bitte versuchen Sie, die Aufgabe zu lösen, indem Sie die Scheiben auf den rechten Turm anordnen.

sub:
Das System muss aber die Bewegungen ausführen, die ich angebe.
Das is das...

woz:
Brauchen Sie einen Tipp?

sub:
Ja.

woz:
Bitte schauen Sie zu. ...
So können Sie fortfahren.

sub:
Simer

show annotations:

- nimitek.types.woz
- nimitek.types.sub
- nimitek.types.command
- nimitek.types.comment
- nimitek.types.question
- nimitek.types.object
- nimitek.types.reference

selected text:

annotation	values
comment	Wenn das System nich die Anweisung...
sofa	
begin	1736
end	1835
reference	die
sofa	
begin	1782

select type of new annotation:
nimitek.types.interjektion

Import of Annotations: Problem

- annotations that not contain speech:
 - non-verbal sounds, like cough, laughter
 - non-articulated sounds, like clicking
 - subject's emotional expressions
 - etc.

```
<sub>
  <action what="lacht" />
  <comment>Das versteh ich.</comment>
  <comment>Ähm,...</comment>
  <action what="seufzt" />
  <comment>Welche..</comment>
  <question>Welche Befehle braucht der Computer, um mich zu verstehen?</question>
</sub>
```

- are not visible in document viewer like XCAS Viewer
- solution: a time-related presentation

Processing Dialogue-based Data

- several annotators about
 - statistics:
 - average length of specific kinds of utterances
 - linguistic analyses
 - POS Tagger, Chunker
 - analyses of speech acts
 - classifications of questions
 - types of questions: declarative, confirmative, descriptive
 - analyses of dialogue sequences
 - e.g. question-answer sequences
 - internal structure of interactions
 - analyses about the role of particles, interjections, discourse markers

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Conclusion

- dialogue-based data comprise verbal and non-verbal data
- advantage of UIMA (decision for UIMA)
 - management of annotations is easy and comfortable
 - definition of different views on annotations is possible
 - available interfaces (classes, methods) for processing annotations
 - experiences in other UIMA based projects
 - analyses of autopsy protocols, in teaching projects
- usage of UIMA framework in different process steps:
 - merge different annotated files
 - prototype: Nimitex Annotator (resulted in a general UIMA Annotator)
 - linguistic analyses of annotations

Future Work

- improving of annotator
 - XCAS format, simple text files as input
- linguistic analyses will be extended
 - focusing structure of recorded dialogue
- integration non-verbal data
 - subject's emotional expressions
 - mimic gesticulation
 - dialogue acts produced by the system
 - performing an action instructed by a subject