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

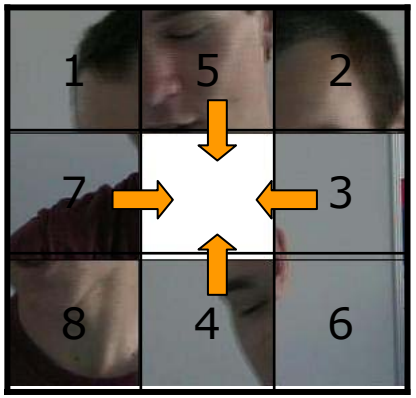
Background

- 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 Rotate	mein my	Kästchen box	so, so	dass that	es it	hinein fits	passt 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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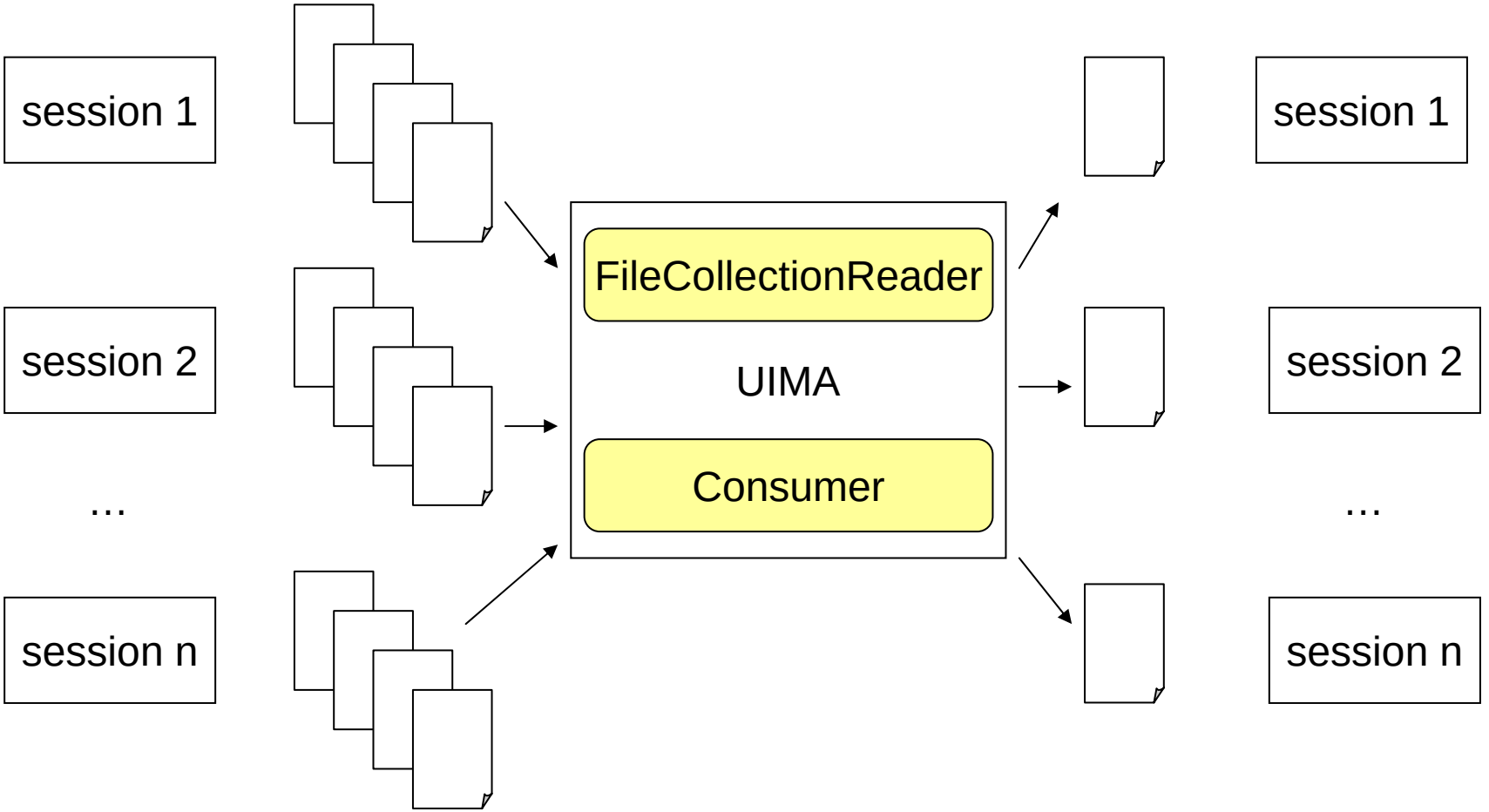
Processing Annotations by UIMA

- 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

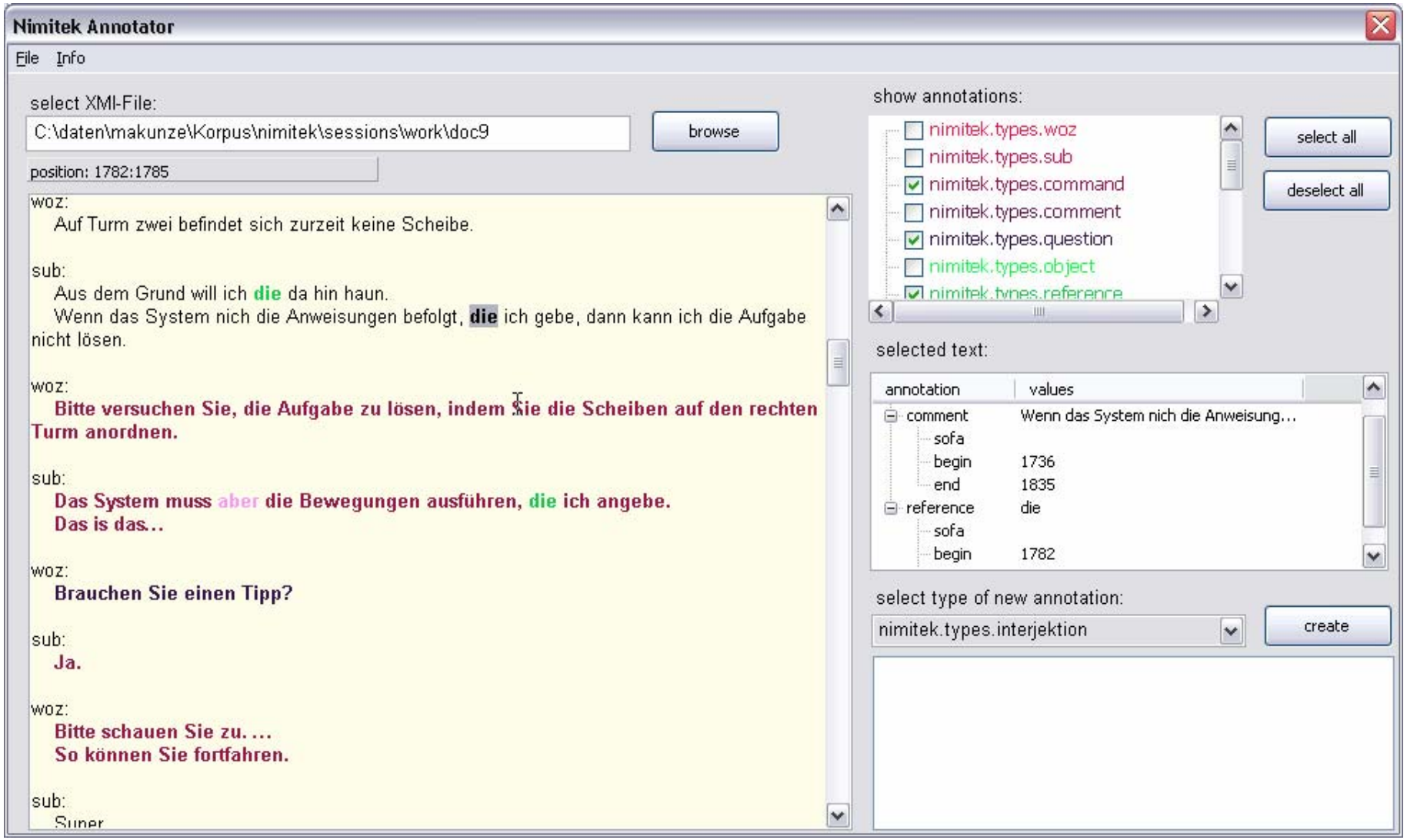
```
<woz>
    <command>Bitte wählen sie eines der vier Teile auf der rechten Seite. Sagen sie dann, ob
    es in das Feld mit dem Fragezeichen passt.</command>
</woz>
<sub>
    <command>Unten....</command>
    <command>Unten rechts....</command>
    <command>Rechts...</command>
    <comment>Passt nicht...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



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: Nimitek 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