FACULTY OF !INFORMATICS

Gaining Process Information from Clinical Practice Guidelines

Katharina Kaiser, Cem Akkaya, Silvia Miksch

Institute of Software Technology & Interactive Systems
Vienna University of Technology

Motivation

Treatment planning

Systematic approaches to assist physicians in their decisions and promulgate most effective and efficient treatment

Clinical practice guidelines (CPGs)

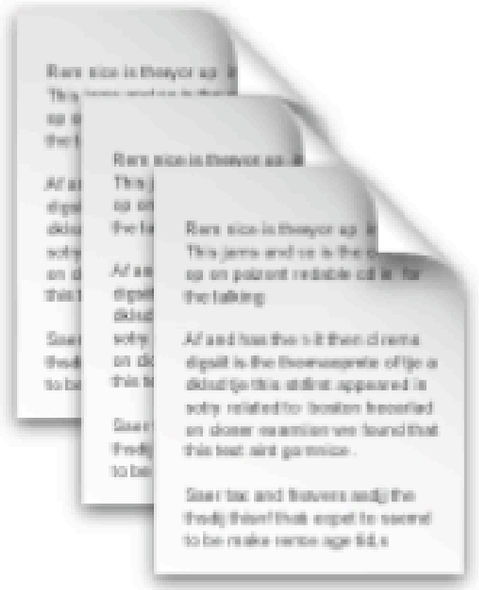
Modelling computer-based CPGs

The Problem

Knowledge-intensive

Cumbersome

Time-consuming



Clinical Guideline or Protocol

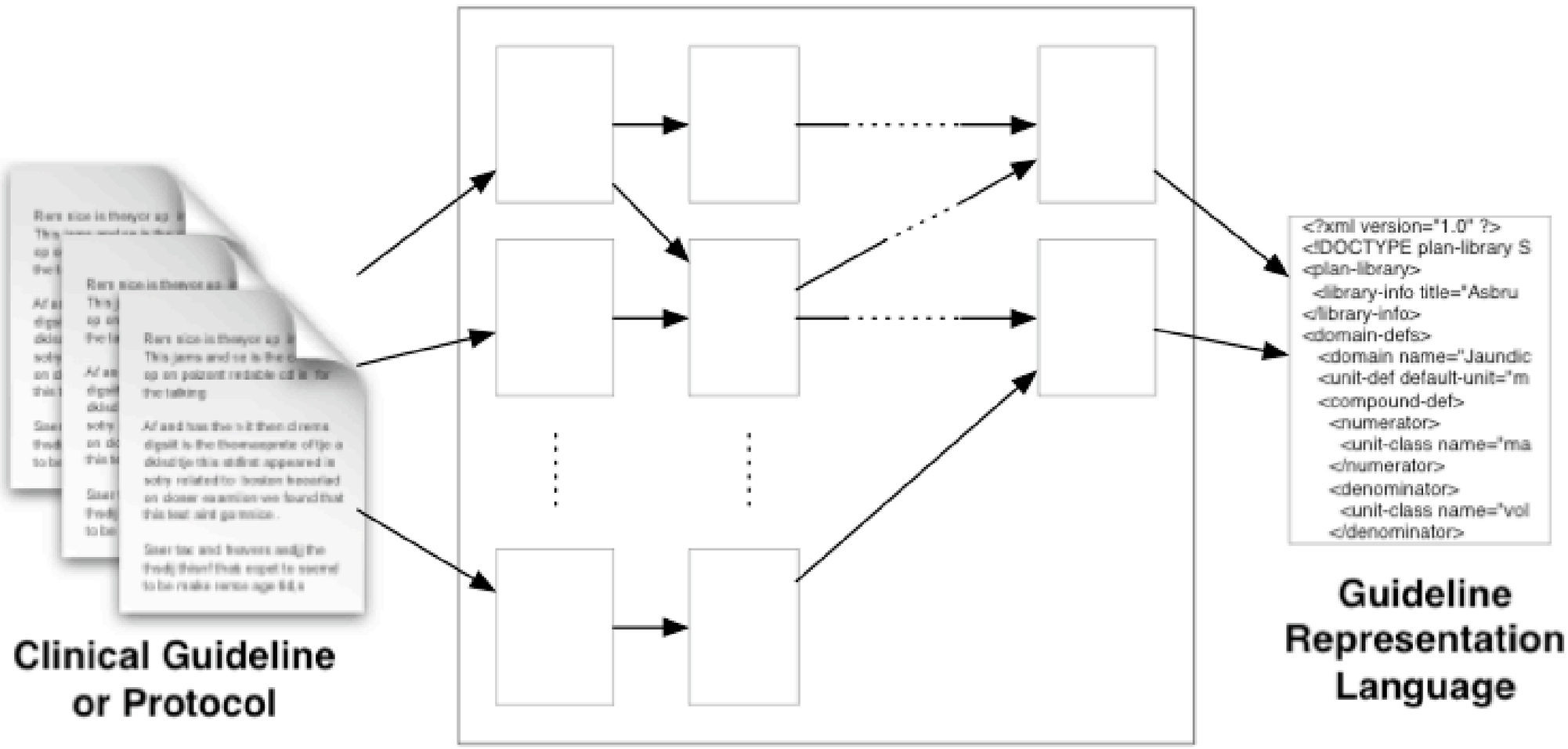
Automation

Structuring

Traceability

Guideline Representation Language

Our Approach



Clinical Guideline or Protocol

Intermediate Representations (IR)

- actions
- processes, sequences
- parameter definitions
- ...

Guideline Representation Language

→ Information transformation by means of Information Extraction and XML transformation

Our Approach

Intermediate representations

- Concise formalisation process
- Different formats for various kinds of information
- Separate views and procedures for various kinds of information
- Application of specific heuristics for each particular kind of information
- Simpler and more concise evaluation and tracing of each process step

Information Extraction

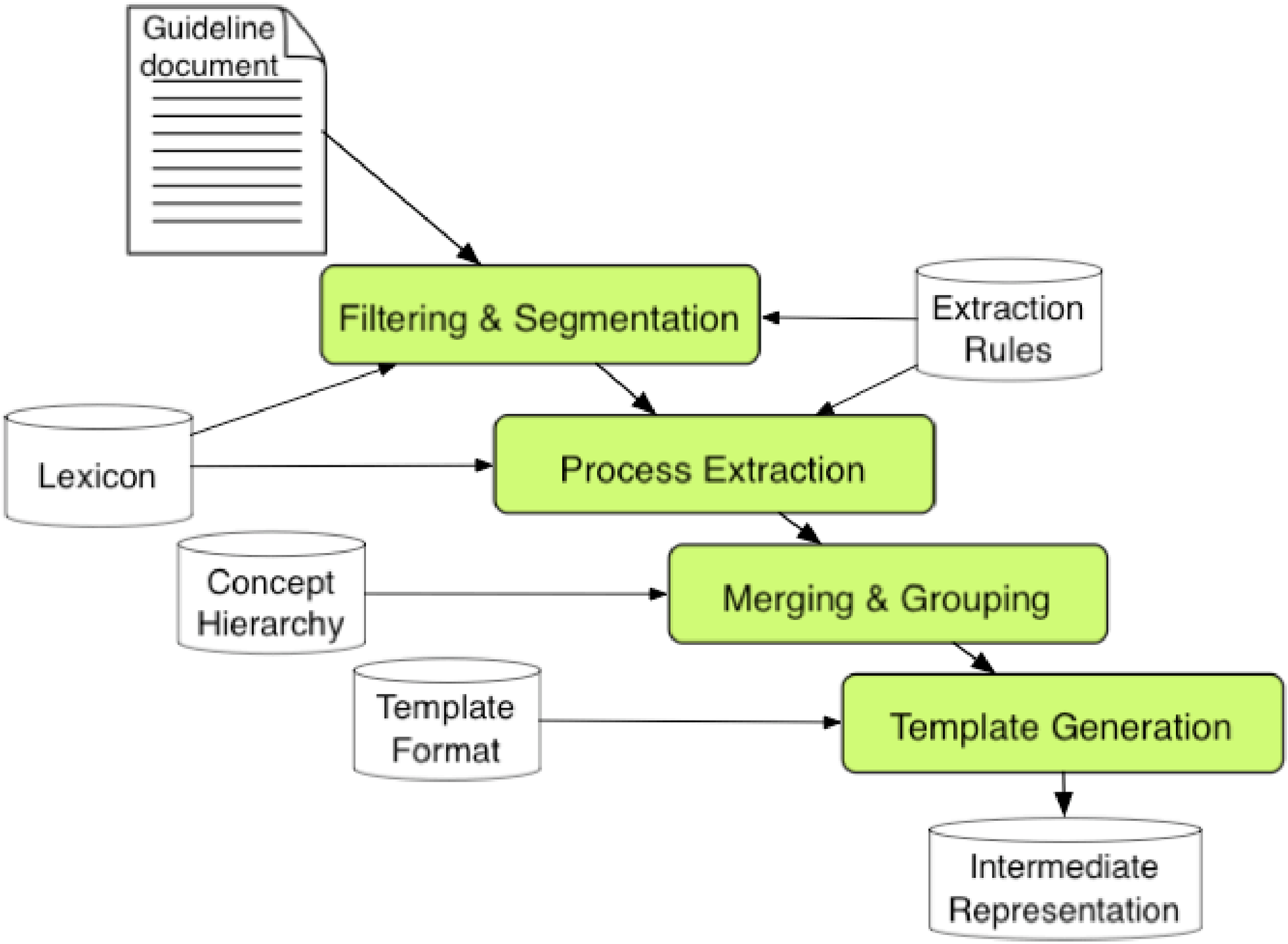
Extracting process information
(actions, properties, relations)

Process relevant text in respect to treatment instructions

Knowledge engineering approach

Rules of linguistic patterns and delimiter-based patterns

Our System


Guideline document
Filtering & Segmentation
Extraction Rules
Lexicon
Process Extraction
Concept Hierarchy
Merging & Grouping
Template Format
Template Generation
Intermediate Representation

Our System

Lexical Resources

Medical terms (drug agents, surgical procedures, diagnostic terms) based on a subset of MeSH

Trigger words activating medical terms (e.g., administer, take, treat)

Our System

Filtering and Segmentation

1. Filtering irrelevant text parts
2. Split sentences
3. Detecting relevant sentences

Our System

Process extraction

1. Categorising sentences

   <action> *"Take acetaminophen or ibuprofen."*

   <negative action> *"Do not use aspirin with children and teenagers, because …"*

   <annotation> *"There is no evidence that GABS are becoming resistant to macrolide antibiotics."*

2. Extracting attributes (e.g., therapy instrument, dosage, duration, condition)

Our System

Merging and Grouping

Assigning annotation sentences to actions or negative actions

Grouping actions in respect of their relations in the document

- Combining actions in select-one-of relation which models actions excluding each other
- Finding temporal relationships between actions

Our System

```
<?                                    0"?>
<p
        <action id="26" negative="f
            <description>Take acet
            <therapy id="D000082">
            <therapy id="D007052">
            <context>Acute Pharyng
                    Home remedies
        </action>

        <act                          ="true" selection="62">
                                      us                          cription>
            <therapy id="D001241">
             <condition>with child
             <context>Acute Pharyn
                    Home remedies
        </action>
        ...
    </actions>

    <relations>
        ...
        <group id="3">
            <selection id="62" />
            ...
        </group>
        ...
    </relations>
</processes>
```

group

select-one-of

action id=”26”

description:“Take acetaminophen or ibuprofen.”

action id=”27”

description:“Do not use aspirin with children and teenagers, because ...”

Evaluation

Definition of a class of CPGs

National Guideline Clearinghouse

Guideline category: treatment, management

Clinical speciality: otolaryngology

→ 18 guidelines

6 guidelines to develop extraction rules

12 guidelines to test extraction rules

Evaluation

Task 1: Detecting relevant sentences

Filtering and segmentation module

Recall: 76 % Precision: 97 %

Task 2: Extracting processes

Process extraction, merging & grouping modules

Recall: 94 % Precision: 84 %

Conclusions

Extracting process information on sentence level

Use of delimiters, simple NL analysis, and lexicons

Current & future work

Improving the system with respect to higher recall

Implementing DELT/A links to enable the user to trace the steps, evaluate, and intervene if necessary