Automatic User Support for Business Process Modeling

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Workshop “Semantics for Business Process Management”

Outline

1. Motivation
2. Foundations
3. Measuring Similarity between Process Elements
4. Analysis Methods for Petri nets
5. Conclusion and Outlook

Motivation - Application scenario

autocompletion of process models:

- process element names might differ in syntax or one process can be modeled in different ways even when utilizing the same modeling language

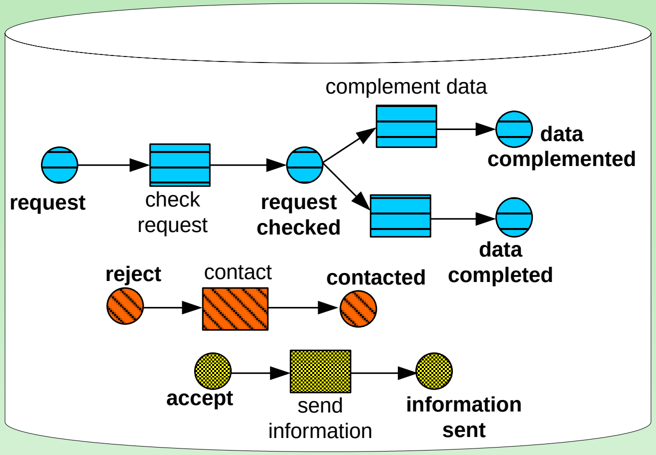
→ *how to solve ambiguity issues?*

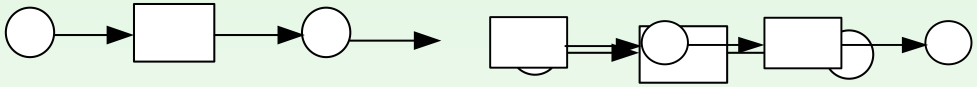
- typos and structural modeling errors make it particularly error prone to model processes manually

→ *which are appropriate subsequent elements? (find and proposition)*

Motivation

Process Templates Database





Automatic User Support for Business Process Modeling

Semantic Business Process Models

- missing semantic description of Petri net components hampers automated processing

- to uncover synonyms or homonyms of process element names a description of Petri nets in an unambiguous format is required (i.e. Web Ontology Language OWL)

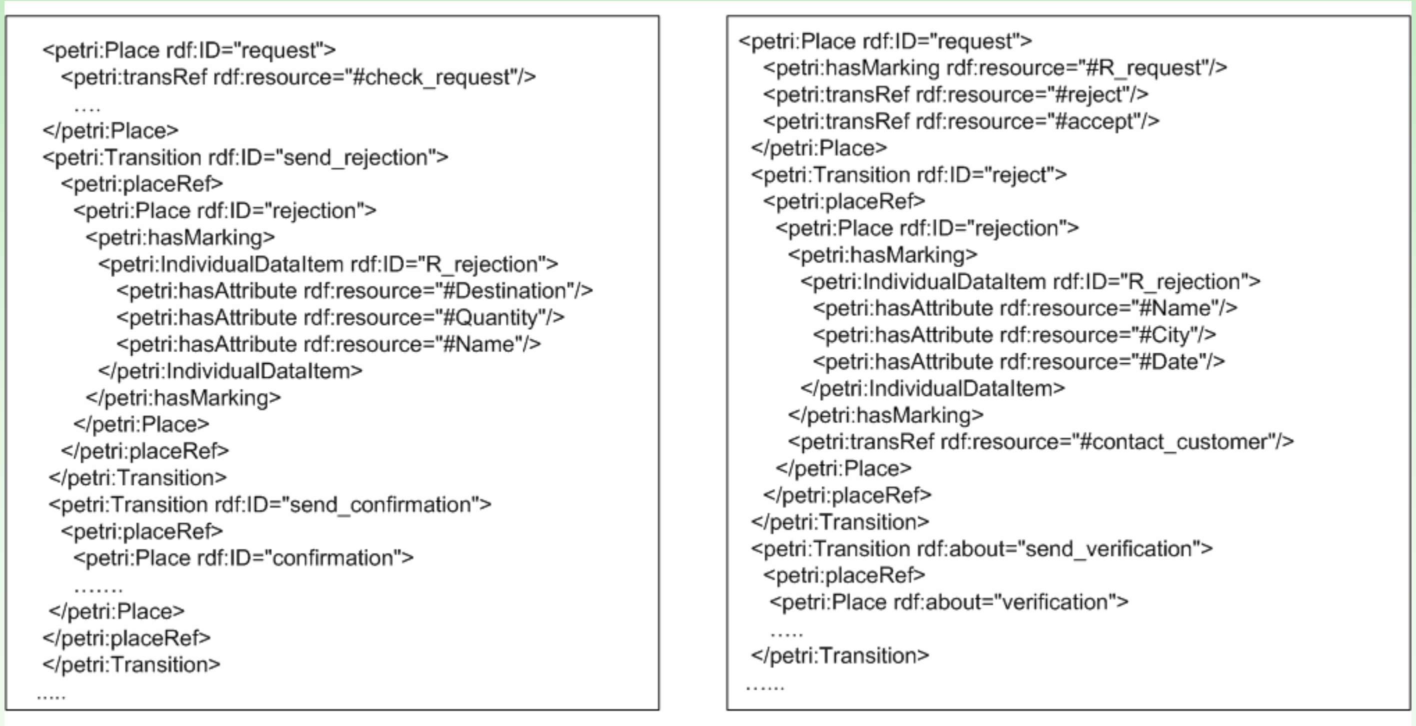
- machine readable and interpretable format, which might be used for ontological reasoning

→ *Semantic Business Process Models (SBPM)*

Semantic Business Process Models

- Combination of process modeling methods with semantic technologies

two semantic business process models



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<petri:Place rdf:ID="request">
  <petri:transRef rdf:resource="#check_request"/>
    ....
</petri:Place>
<petri:Transition rdf:ID="send_rejection">
  <petri:placeRef>
    <petri:Place rdf:ID="rejection">
      <petri:hasMarking>
        <petri:IndividualDataItem rdf:ID="R_rejection">
          <petri:hasAttribute rdf:resource="#Destination"/>
          <petri:hasAttribute rdf:resource="#Quantity"/>
          <petri:hasAttribute rdf:resource="#Name"/>
        </petri:IndividualDataItem>
      </petri:hasMarking>
    </petri:Place>
  </petri:placeRef>
 </petri:Transition>
 <petri:Transition rdf:ID="send_confirmation">
  <petri:placeRef>
    <petri:Place rdf:ID="confirmation">
    .......
 </petri:Place>
</petri:placeRef>
</petri:Transition>
.....
```

```
<petri:Place rdf:ID="request">
  <petri:hasMarking rdf:resource="#R_request"/>
  <petri:transRef rdf:resource="#reject"/>
  <petri:transRef rdf:resource="#accept"/>
 </petri:Place>
 <petri:Transition rdf:ID="reject">
  <petri:placeRef>
    <petri:Place rdf:ID="rejection">
      <petri:hasMarking>
        <petri:IndividualDataItem rdf:ID="R_rejection">
          <petri:hasAttribute rdf:resource="#Name"/>
          <petri:hasAttribute rdf:resource="#City"/>
          <petri:hasAttribute rdf:resource="#Date"/>
        </petri:IndividualDataItem>
      </petri:hasMarking>
      <petri:transRef rdf:resource="#contact_customer"/>
    </petri:Place>
  </petri:placeRef>
 </petri:Transition>
 <petri:Transition rdf:about="send_verification">
  <petri:placeRef>
   <petri:Place rdf:about="verification">
   .....
 </petri:Transition>
 ......
```

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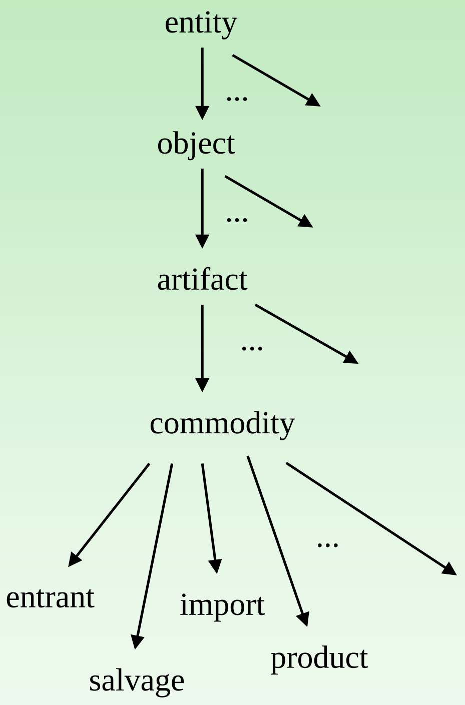
Measuring Similarity between Process Elements

Input:

- two semantic business process models
- background ontology:



Measuring Similarity between Process Elements

Similarity Computation

- syntactical similarity: how many changes are required to transform one string into the other one

- linguistic similarity: via a background ontology

- structural similiarity: considering context of process model elements

→ *combined similarity*

Measuring Similarity between Process Elements

Output

combined similarity results

name	sim_{com}	sim_{syn}	sim_{ling}	sim_{str_p}	$sim_{str_{At}}$	sim_{str_V}	sim_{str_T}
#confirmation	0.8	0.64	0.5	0.95	0.0	0.0	1.0
#verification	0.8	0.64	0.5	0.95	0.0	0.0	1.0

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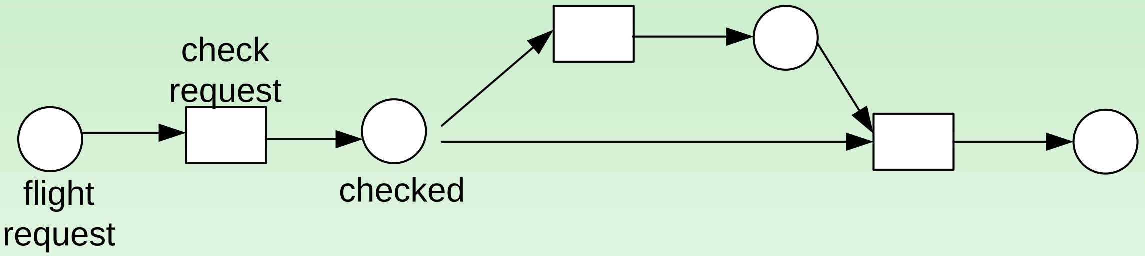
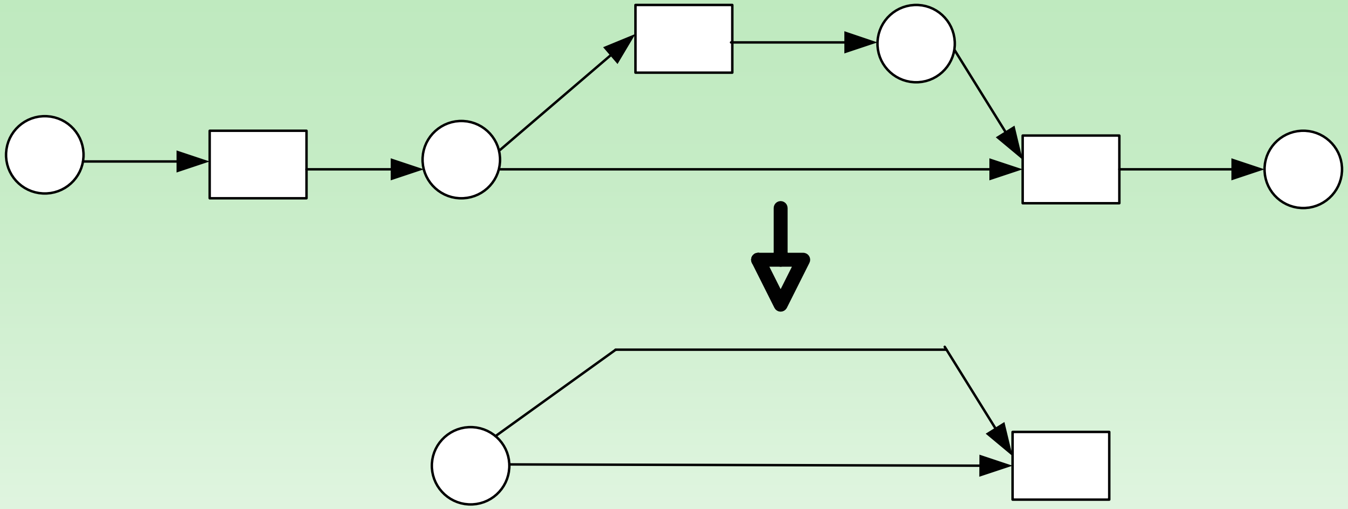
Analysis Methods for Petri nets

- proposed process fragments should not cause deadlocks and synchronization errors



→ free of structural errors if the reduction results in an empty graph

Analysis Methods for Petri nets



→ two nodes left over, thus the modeled process is not free of deadlocks

Conclusion

- Assisting users in process models modeling to improve the reusability of business processes
- Similarity measurement to solve ambiguity issues caused by the use of different names for describing the same tasks
- Recommendation system validates process properties of the automatically completed process to avoid deadlocks and synchronization errors.

Outlook

- Use of machine learning techniques

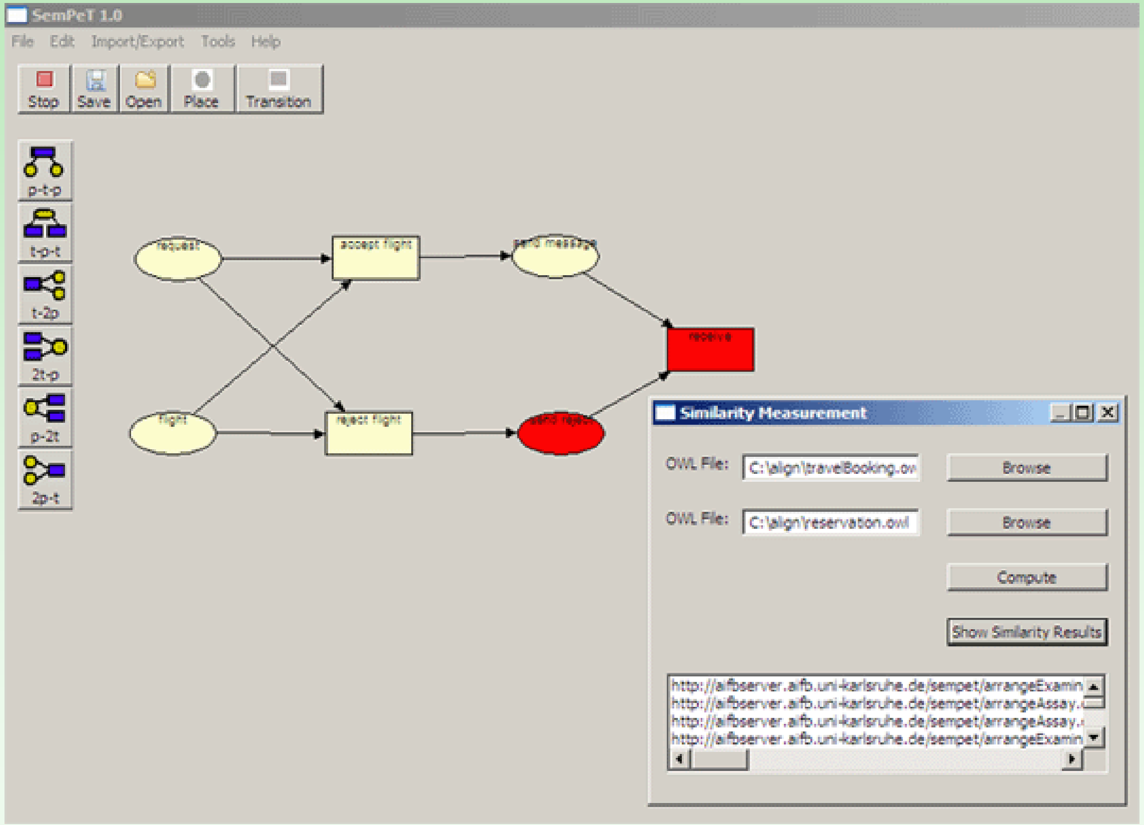
  Neural Nets: learn a threshold for combined similarity – instead of using a threshold with fixed value

  Information Filtering: generate and compare user-profiles, which help to categorize users

  Content-based Information Filtering: combined similarity of process template elements can be used to rank the recommendations

Implementation

http://aifbserver.aifb.uni-karlsruhe.de/sempet/index.htm



OWL File: C:\align\travelBooking.ow

OWL File: C:\align\reservation.owl

```
http://aifbserver.aifb.uni-karlsruhe.de/sempet/arrangeExamin
http://aifbserver.aifb.uni-karlsruhe.de/sempet/arrangeAssay.
http://aifbserver.aifb.uni-karlsruhe.de/sempet/arrangeAssay.
http://aifbserver.aifb.uni-karlsruhe.de/sempet/arrangeExamin
```