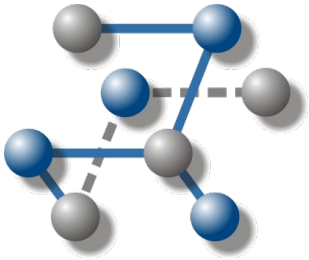
Searching Service Models



Outline

- Problem description / research goals
- Research questions
  - at a glance
  - in detail
- Thesis outline
- Publication plan

Problem description / research goals

- Growing number of models adds to the difficulty of
  - Organising models
  - Searching models

- Existing models are not reused
  - Developers will not reuse models, if it is more time-consuming to find, understand, and integrate existing models than to create new models.

- Existing knowledge is not reused
  - Engineering costs increase

- Simplify service development
- Establish holistic development process
- Foundation: Similarity Based Development

Research questions at a glance (old)

What is similarity in the domain of services?

How can matching services be found?

Which algorithms are applicable?

How can matching services be integrated?

Research questions at a glance (old)

What is similarity in the domain of services?

How can matching services be found?

Which algorithms are applicable?

How can matching services be integrated?

Audience opinion:
FOCUS!

Research questions at a glance (new)

What is similarity in the domain of services?

How do existing modelling approaches support the analysed similarity types?

What features needs a notation to fulfil analysed requirements?

What are the impacts on tooling?

Service similarity

What is similarity in the domain of services?

- Role based viewpoint
  - Customers
  - Providers
  - Intermediaries
- Life cycle based viewpoint
  - Aligned with service development phases

- Establish requirements for different similarity interpretations
- Questionnaire: conceptualise similarity

Service similarity: role based

- Customers
  - Technical details not interesting
  - Important: input (including price) and output factors
    - Similar input/output → similar service (output more important?)
- Providers
  - Depending on the life cycle phase
  - Similar activities? Similar outcome?
- Intermediaries
  - Yet unknown

Service similarity: life cycle based

- Different flavours depending on life cycle phase

- Design
  - Abstract Semantic Similarity
    - How did we achieve dependable transportation in the past?

- Construction
  - Concrete Semantic Similarity
    - How can we build a blue door?

- Execution
  - Structural Similarity
    - We need replacement parts.

Image Courtesy of: http://www.agileproductdesign.com/blog/acurate_estimate_red_herring.html

Existing modelling notations

How do existing modelling approaches support the analysed similarity types?

- Analyse service modelling notations
- PMC / CiI Paper: A comparative survey of business process similarity measures
  - Notation: simplified BPMN, focus on measures
  - Plug-in for ProM framework, API for similarity measures at SourceForge: prom-similarity

Existing modelling notations

	Similarity between V_0 and ...						
	V_1	V_2	V_3	V_4	V_5	V_6	V_7
Measures based on the correspondence of nodes and edges (not taking into account the control flow)							
Percentage of Common Activity Names [15]							
Label Matching Similarity [4]							
Similarity of Activity Labels [6]							
Feature-Based Activity Similarity [18]							
Percentage of Common Nodes and Edges [19]							
Node- and Link-Based Similarity [20]							
Measures based on graph edit distances							
Graph Edit Distance [4]							
Graph Edit Distance [22]							
Label Similarity and Graph Edit Distance [23]							
Label Similarity and Graph Edit Distance [10]							
Number of High-Level Change Operations [24]							
Comparing BPM Represented as Trees [26]							
Edit Distance Between Reduced Models [26]							
Measures that analyse causal dependencies between activities							
Comparing Dependency Graphs [32, 33]							
Comparing Dependency Graphs [34]							
TAR-Relationship [35]							
Causal Behavioural Profiles [36]							
Causal Footprints [4]							
State-Space as n-grams [40]							
Measures that compare state spaces or logs							
Longest Common Subsequence of Traces [42]							
Similarity Based on Principal Transition Sequences [43]							
Similarity Based on Traces [44]							

1	2	3	3a	5	6	7	8
ges							
yes	yes	no	no	yes	yes	yes	yes
yes	no	no	no	yes	yes	yes	yes
yes	no	no	no	yes	yes	yes	yes
yes	yes	no	no	yes	yes	yes	yes
yes	yes	no	no	yes	yes	yes	yes
yes	yes	no	no	yes	yes	yes	yes
yes	yes	yes	no	yes	yes	yes	yes
yes	yes	yes	no	no	no	yes	yes
yes	yes	no	no	yes	yes	yes	yes
yes	yes	yes	no	no	yes	yes	yes
yes	yes	no	yes	yes	no	n/a	yes
yes	yes	no	no	yes	no	yes	yes
yes	no	no	no	yes	no	yes	yes
ivities							
yes	yes	no	no	yes	no	yes	yes
yes	yes	no	no	yes	no	n/a	yes
yes	yes	no	yes	yes	no	yes	no
yes	yes	no	no	yes	no	yes	no
yes	yes	no	no	yes	no	no	yes
yes	yes	no	no	yes	no	yes	no
yes	no	no	no	no	no	yes	no
yes	yes	no	no	yes	no	yes	no
yes	yes	no	no	yes	no	yes	yes
yes	yes	no	no	yes	no	yes	yes

Developing a notation

What features needs a notation to fulfil analysed requirements?

- Expectation: none of the analysed notations fulfils all requirements
- Searching for functionality is difficult
  - Notations today focus on how not on what
- Developing a notation tailored for similarity
  - Foundation: KoProServ component model, enriched with attributes, KPIs etc.
  - Android approach from SD/TB: capabilities

Tooling

What are the impacts on tooling?

- Holistic tooling approach is necessary
- Analyse shortcomings of existing tools
- Develop new / extend existing tool suite

Thesis outline

1. Introduction
    1. Research questions, methodology, and contributions
2. Similarity of services
    1. Role based / life cycle based, requirements for notations
3. Service modelling
    1. Existing approaches, adherence to requirements
4. Developing a language focusing service similarity
5. Tooling
6. Use Case
7. Conclusions and future research

Publications: old plan

- 2010
  - ASE 2010 Doc Symposium – General Research
- 2011
  - ASE 2011 Short Paper or workshop – Similarity search over different notations or Characteristics of models in language-based comparison (abstract Apr. 25th, paper May 9th)
  - Services and Models (second half)
- 2012
  - Conceptualising models in the service domain
- 2013
  - Unified search in service models

Publications

- CiI, PMC: A comparative survey of business process similarity measures (with Ralf Laue)
  - PMC (Aug. 29th): questionnaire about process model similarity
- ISSS: Configuring services regarding service environment and productivity indicators (first sketch for querying services)

- RESER: Increasing service productivity by characteristics-driven recommendations for action (service characteristics as similarity measure?) - Aug. 13th
- 2011/2012 – Publications aligned with thesis chapters
  - Viewpoints on service similarity
  - Requirements for similarity modelling
  - Modelling approaches

Open questions

- Concentrate on similarity concepts?
- How can we justify established requirements?
- Is a complex approach really necessary?
  - *Characteristics of models in language-based comparison* says rather no.
    - Models are similar, if their text is similar regardless of any structure.
  - What are differences between human perceived and computed similarity (questionnaire).
- How can we measure increased service development efficiency?
  - Development time, innovativeness, complexity etc.

Backup

Thanks for your attention
Discussion

Image Courtesy of http://www.abendblatt.de/wirtschaft/karriere/article1023769/Einschlaefern-bei-Vortraegen-leicht-gemacht.html

Requirements for similarity measures for BPM

- Established in PMC / CiI paper
- Based on properties of metric spaces

1. Non-negativity: dist(M0, M1) >= 0
2. Symmetry: dist(M0, M1) = dist(M1, M0)
3. Equivalence: dist(M0, M1) = 0 ↔ M0=M1
    1. Trace equivalence: dist(M0, M1) = 0 ↔ Σ(M0) = Σ(M1)
4. Triangle inequality: dist(M0, M2)<=dist(M0,M1)+dist(M1,M2)
5. Respect commonalities and differences
6. Overall similarity bases on similarity between elements
7. Applicable on arbitrary BPM
8. Efficient calculation