About me

• Architect
  • CAD, databases for structural components
• Information Scientist (PhD Thesis 2013, HU Berlin)
  • 3D Metadata model, Linked Data

• Library context since 2006 (TIB Hannover)
  • Non textual materials
    • 2D, 3D, AV
    • Content based indexing, auto classification
    • Projects DFG, EU
• eScience
  • TIB Open Science Lab, WGL Science 2.0
  • teaching eScience (Univ. of Appl. Sciences Hannover)
Challenges for Libraries
- Facing the 21st Century

- Increasing information volume

- New data / media formats, e.g. 3D models

- Document aggregations, enhanced publications, increasingly hybrid, need for data exploration

- WWW: extending search space (instead catalog silos), affecting scientific communication and publication (eScience)
DESCRIPTIVE OR PRESCRIPTIVE MODELS REQUIRE DIFFERENT CONTEXT
Models

„Essentially, all models are wrong, but […]“

George E. P. Box and Norman R. Draper,

- are used for understanding complex contexts in real world
- can be
  - Image and presentation models
  - Semantic models (put ideas, concepts in order)
  - Technical models
    … sometimes even substitute reality

- Context of application (Stachowiak):
  - Didactic, experimental, theoretic, operational (design assistance)

- Types:
  - Descriptive, prescriptive
    → affect later contextualization (relevant context e.g. built work, place or event, corporate)
Descriptive digital 3D models
Documenting present (and history) in a rapidly changing world

- Reconstruction
- Preservation of the real
- Information integration
- Re-contextualization
- Interactive experienceability
- Access at any time from any location

Sources: LU Hannover (IKG), 3D COFORM
Prescriptive digital 3D models
Shape and structure of things to come

- Generation of design visualizations
- Generation of data for calculation
- Rapid Prototyping
- Production of building parts

Sources: LU Hannover (AIDA), Graphisoft, UN Studio
ENRICHMENT WITH METADATA OF DIFFERENT SEMANTIC LEVELS: DATA- AND DOMAIN-SPECIFIC EXTRACTION METHODS
What’s inside?

- no explicitly available information (few well defined entities like in textual data) → need for metadata, but
- poor metadata annotation available, therefore
  → Need for **indexing and classification algorithms**
  (tailored to domain data and community requirements)
Digging for semantics
Extracting implicit information in model structure

- Technical + content based metadata
  - Total number of floors → building type
  - Amount of windows, doors, ...
  - Floor area
  - ...

Automatic cutting into floors, extraction of room structure

Representation as attributed graph: rooms as nodes, connection as edges

PROBADO 3D joint research with University of Bonn
Automatic extraction of „high level“ metadata

- Classification of Structures (floor plans)
- Classification of shapes (Schemes according to Form or Function)

...for labeling/tagging

PROBADO 3D joint research with University of Bonn
ACCESS TO 3D DOCUMENT AGGREGATIONS: CONTEXTUALIZATION ENABLING EXPLORATIVE SEARCH
Searching
„Nobody understands me :(“

- User knows neither object nor desired information exactly
- does not know necessary query for the so-called "known-item"
- Request cannot be formulated exact, only fuzzy

"I remember my mom telling me that her grand-grand ma once went to this nice place in Europe to visit the world's fair. People spoke French and she saw this huge tower made of steel. Mom told me the name of the architect, but I can't remember it."

→ Suitable search query?

- Relations between entities that are relevant to the information object
- allow exploratory search, browsing and search suggestions.
Explorative search and browsing must try to face and tackle the challenges posed by the brain – Human minds are able to link 1) everything, 2) everywhere, and in 3) any time period...

...chain of associations between

- Objects
- Places
- Actors
- Events
- Concepts
  - Form / geometry
  - Function
  - Material
  - Usage / purpose
  - ...
- Aggregated documents
- Contained data

Sources: LU Hannover (AIDA), Bundesarchiv
Graph based modeling
Towards mapping human associations

Using
- RDF/RDFS
- SKOS, DC, DCterms, FOAF
- FRBRoo/CIDOC-CRM, alternative EDM
- + few arch.-related datasets
• Similarity as key point for the generation of suggestions
• Cannot be considered isolated from context, more simply: "Similarly, with respect to which aspects?"
• different similarity contexts may lead to completely different suggestions

Classification might use AAT Getty Vocabulary, DBPedia Ontology, ..
More challenges + discussion

- Need for improving coherence and alignment of existing (domain related) ontologies towards a unified knowledge graph.
- Need for reliable information about content, provenance, availability, data types contained in or temporal evolution of distributed datasets.

→ *Role for Libraries*: curation of dataset catalogs containing meaningful metadata about domain related datasets (independent of their original intention).
  - Facilitate selection of schemes for *auto classification* to gradually enrich models with semantics.
    - Some tasks go better with *crowdsourcing* or *NER of textual context* – let’s combine!
  - Enabling humans to explore suitable data.
• **Towards an automatic multi-label classification of 3D architectural models**
  Ina Blümel, Raoul Wessel and Reinhard Klein
  Proceedings of *Workshop on Classification and Subject Indexing in Library and Information Science*, July 2013

• **Metadatenbasierte Kontextualisierung architektonischer 3D-Modelle**
  Ina Blümel
  Dissertation, HU Berlin 2013 (*published soon*)

• **3D @Technische Informationsbibliothek (TIB)**
  Ina Blümel, Irina Sens
  in *Unimagazin, Ausgabe 1|2-2012 "WebScience"*, Präsidium der LUH (Hrsg.), Juni 2012, p 16ff

• **Efficient Retrieval of 3D Building Models Using Embeddings of Attributed Subgraphs**
  Raoul Wessel, Sebastian Ochmann, Richard Vock, Ina Blümel, Reinhard Klein
  Proceedings of the *20th ACM Conference on Information and Knowledge Management (CIKM 2011)*: Glasgow, UK, Okt. 2011

• **Supporting Planning through Content-Based Indexing and 3D Shape Retrieval**
  Ina Blümel, René Berndt, Sebastian Ochmann, Richard Vock and Raoul Wessel

• **A 3D Shape Benchmark for Retrieval and Automatic Classification of Architectural Data**
  R. Wessel, I. Blümel and R. Klein
  *EUROGRAPHICS 2009 Workshop on 3D Object Retrieval*, March 2009

• **The Room Connectivity Graph: Shape Retrieval in the Architectural Domain**
  R. Wessel, I. Blümel and R. Klein
Thank you for listening!

Questions?

Ina Blümel, TIB Hannover
ina.bluemel@tib.uni-hannover.de