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Panel CONTENT/PATTERNS

Visual and Semantic Paradigms for Content Mining and Understanding

Panel

- **Moderator**
  Hans-Werner Sehring, T-Systems Multimedia Solutions GmbH, Germany
- **Panelists**
  René Berndt, Fraunhofer Austria, Austria
  Dan Tamir, Texas State University, USA
  Alexander G. Mirnig, Christian Doppler Laboratory for “Contextual Interfaces” HCI & Usability Unit, ICT&S Center, University of Salzburg, Austria
  Wen-Hsing Lai, National Kaohsiung First University of Science and Technology, Taiwan

TEXAS STATE UNIVERSITY
SAN MARCOS

Visual and Semantic Paradigms for Content Mining and Understanding

Dan Tamir

Texas State University
San Marcos, Texas

May 26, 2014

Dan Tamir, Associate Professor, Computer Science, Texas State University

- **Education:**
  - BS & MS-EE (BGU), PhD-CS (FSU)
- **Professional experience:**
  - Florida Tech, Motorola/Freescale, TX State
- **Areas of Interest:**
  - Incremental classification of Big Data
  - Disaster & Pandemic preparedness & mitigation via anomaly detection,
  - image processing,
  - usability

Dan Tamir, Associate Professor, Computer Science, Texas State University

- **Recent funding:**
  - Automating bridge inspection-feasibility study (TxDOT)
  - Power aware Task Scheduling (Semi-conductor Research Consortium)
  - Pinpointing of Software Usability Issues (Emerson – Process Control)
  - Laser lithography on non-flat surface (NSF)
  - Introducing parallel processing early in the curriculum (NSF)

Issues

- Low level image processing / recognition is still a challenging objective
  - Image segmentation
  - Image alignment
- Challenges include
  - Complexity
  - Scaling
  - Robustness
  - Perception concerning the complexity of the low level operation

- Evaluating the overhead and The uncertainty problem
- Ignoring the fact that adaptive systems might go out of control
- Simulation accuracy vs. speed

Christian Doppler Labor
Contextual Interfaces

Patterns & Paradigms

IARIA 2014 Panel CONTENT/PATTERNS

Visual and Semantic Paradigms for Content Mining and Understanding

Mag. Alexander G. Mirnig

28.05.2014

UNIVERSITÄT SALZBURG

ICT&S Center

AUDIO MOBIL

infineon

Christian Doppler Labor

Contextual Interfaces

HCI & Usability Unit

ICT&S Center, University of Salzburg

Background:

General Philosophy of Science and Neuroscience

Interdisciplinary Workgroup *Neurosignaling*, Department of Zoology, University of Salzburg

Main topics:

Interface Evaluation (Usability and User Experience), Definitions and formal approaches in HCI, (Car) User Interface Design Patterns, Theories of Consciousness

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1 Scientific Paradigms

Thomas Kuhn

- **Incommensurability between Scientific theories**
- **Regular vs. revolutionary science**
- **Scientific revolution -> paradigm shift**
- **1962, 1970 (2nd ed.), *The Structure of Scientific Revolutions*, Chicago: University of Chicago Press**

1 Scientific Paradigms

Phase 0: Pre-paradigmatic phase

Phase 1: New paradigm is accepted

Phase 2: Regular science is conducted

Phase 3: Anomaly is discovered

Phase 4: Crisis of the current paradigma

Phase 5: Scientific revolution

… Repeat

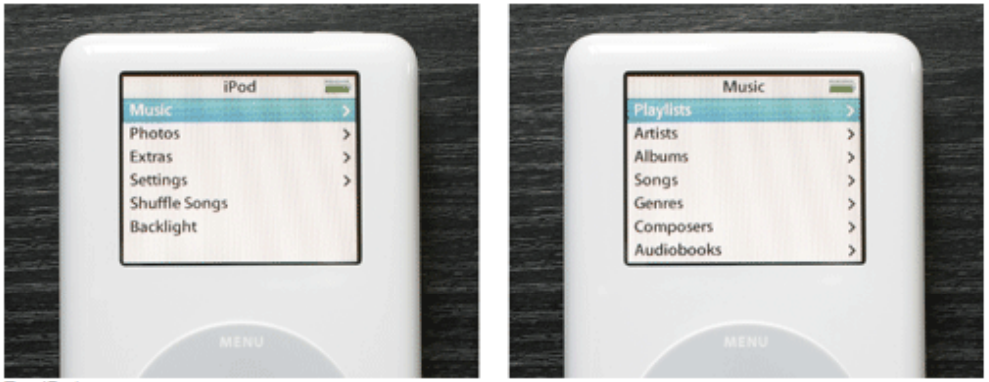
1 Scientific Paradigms

However:

- **Scientific progress is gradual, changes in methods, accepted doctrines, etc. happen over longer time periods**
- **Scientific practices can vary wildly even within one discipline (different countries, sub-communities, etc.)**
- **Moderate notion of paradigms (one of many): A number of scientific doctrines accepted by a certain (sub-)community at a certain point in time or over a certain time period**

2 Patterns – an Example

One-Window Drilldown



Two iPod menus

What: Show each of the application's pages within a single window. As a user drills down through a menu of options, or into an obj

Use when: Your application consists of many pages or panels of content for the user to navigate through. They might be arranged linea Address books, calendars, web-based email readers, and other familiar applications often use this pattern.

One or both of these constraints might apply to you:

- You are building for a device with tight space restrictions, such as a handheld (see above), a cellphone, or a TV. On impractical because there just isn't enough room to use them well. Traversing from one panel to another on a TV scr
- Even if you build for a desktop or laptop screen, you may have a complexity limit. Your users may not be habitual co or they may not deal well with complex screens or fiddly input devices. Users of information kiosks fall into this categ

Why: Keep it simple. When everything's on one screen or window, the options at each stage are clear, and users know they don't

* © Jennifer Tidwell; http://designinginterfaces.com/firstedition; retrieved 2014

3 Patterns & Paradigms

- The functions of a paradigm are to supply puzzles for scientists to solve and to provide the tools for their solution.

- Pattern: Structured, documented solutions to reoccurring problems.

Coincidence?

Yes, which makes this all the more fascinating!

3 Patterns & Paradigms

- A well-structured and comprehensive pattern collection can tell the reader how a certain community solves its problems (and which these are), which fits well into a more moderate notion of paradigms.
- In addition, different pattern languages dealing with similar problems or several editions of the same pattern language, might even fit Kuhn's original notion of incommensurability.

Have the individual sciences solved a problem of General Philosophy of Science without knowing it?

Quite possibly.

* Contact

Christian Doppler Labor
„Contextual Interfaces“

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May 28th, 2014

Foto: Katrin Binner / TU Darmstadt

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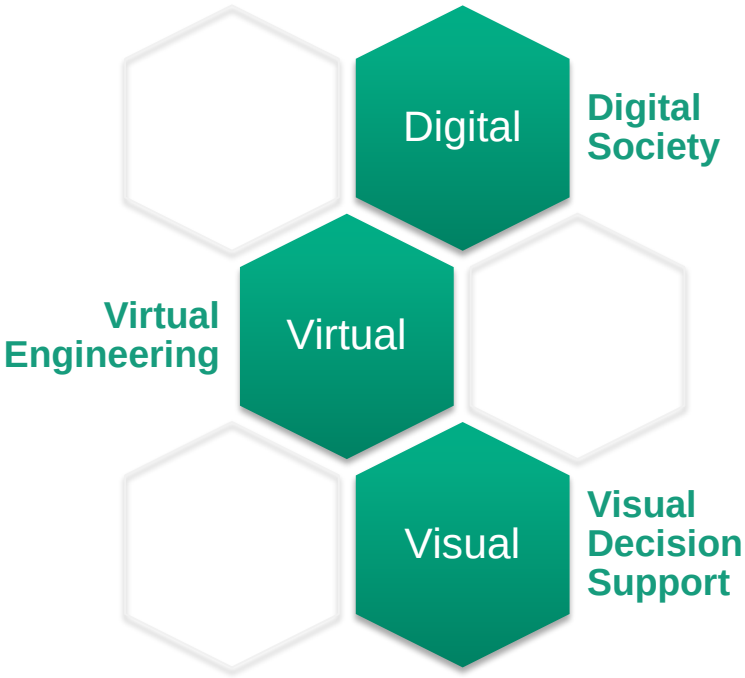
Fraunhofer Austria Research GmbH
Geschäftsbereich Visual Computing

„Smart Solutions im Bereich des Visual Computing“



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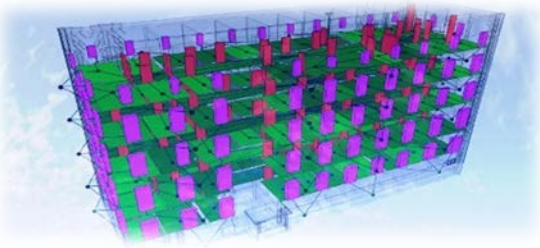
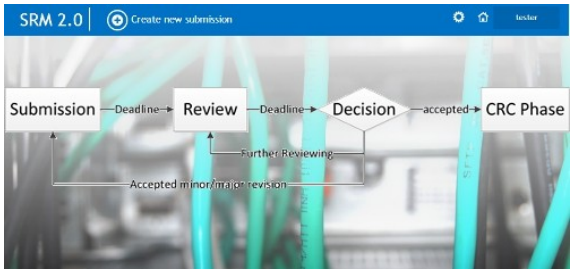
- Digital Libraries
- Generative Modeling
- Cultural Heritage





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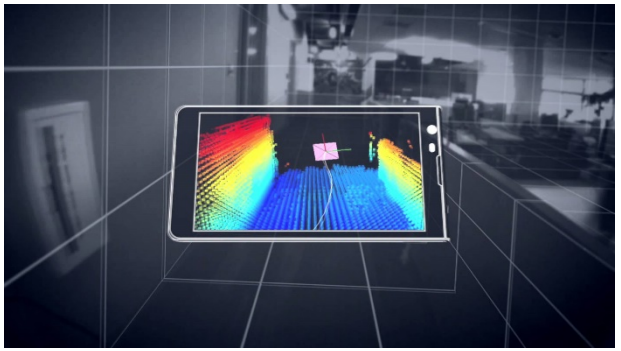

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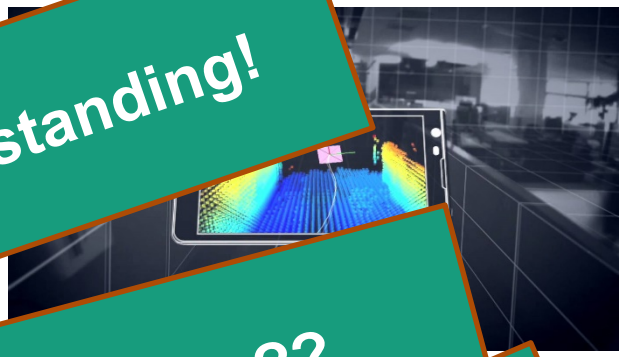
Visual and Semantic ... Content Mining ... nding



Just pure unstructured data!

Requires Semantic for Understanding!

Question: How to add Semantic??

What is the Semantic of a Shape anyway??

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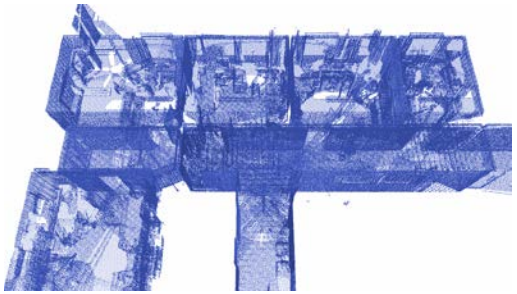
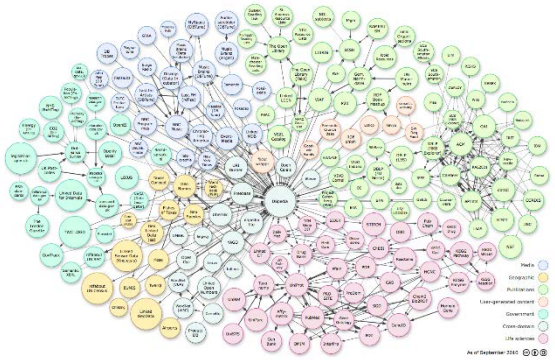
Visual



Semantic



Data

Low Level Features

Semantic Gap

High Level Features

Human Intelligence

- FileSize
- Resolution
- Color
- Texture

- Keywords
- Description
- Classification
- Ontologies

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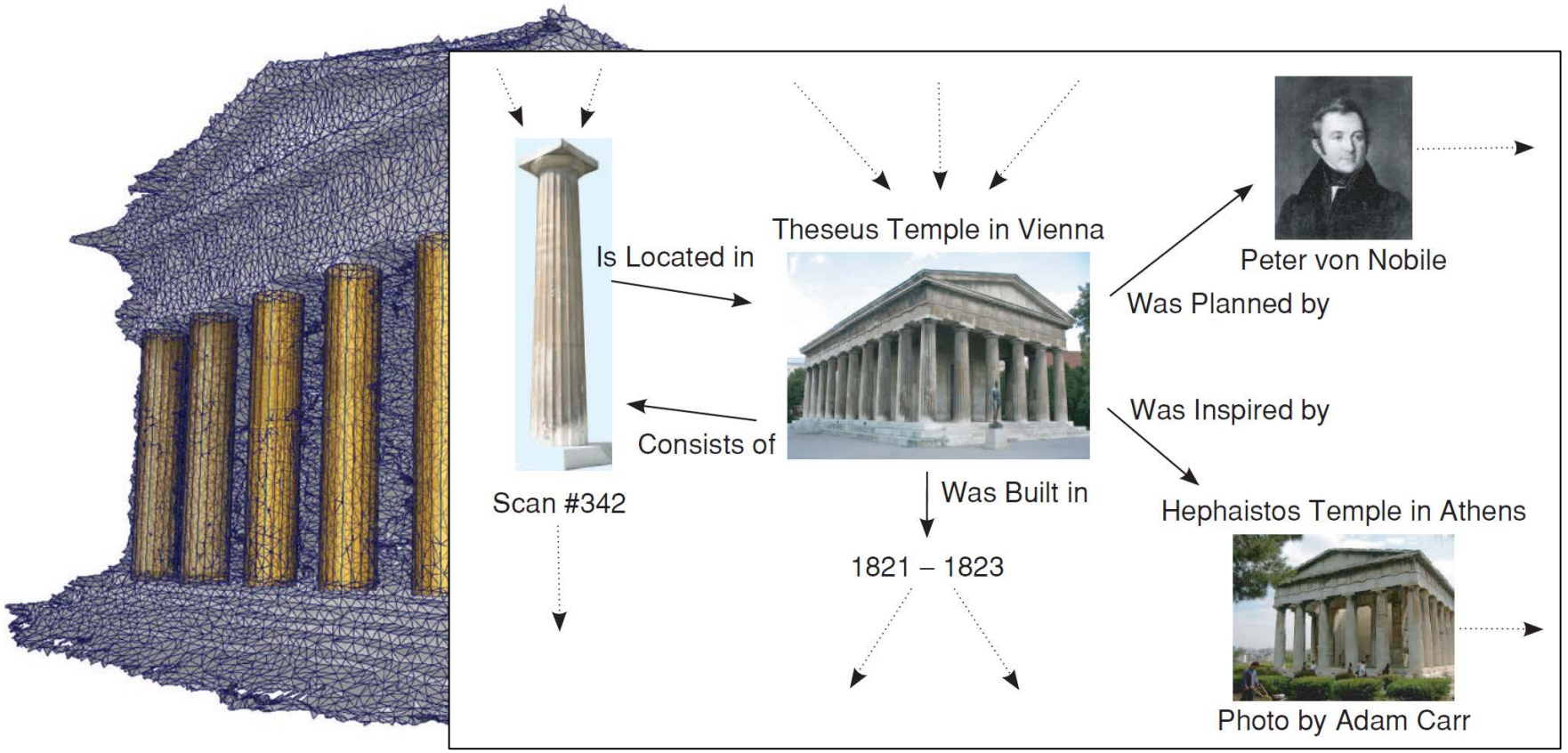
What does UNDERSTANDING mean?



Settgast V., Ullrich T., Fellner D.W.. *Information Technology for Cultural Heritage*. In IEEE Potentials, Vol.26(4), pp.38-43, 2007

Visual and Semantic Paradigms for Content Mining and Understanding

With a sculpted surface there's really no difference between a spoon shape and a chair shape; it's all a matter of positioning the control points in the right places. But a spoon shape has an inner logic, shared by all spoons – and that logic is completely different from that of a chair.

(James Kajiya)

Havemann S.. *Generative Mesh Modeling*. PhD Thesis, Technische Universität Braunschweig, 2005.

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Visual and Semantic Paradigms for Content Mining and Understan

How describe/formalize the inner logic?

With a sculpted surface t… …ference between a spoon shape and… …all a matter of positioning the control… …places. But a spoon shape has an inne… …l spoons – and that logic is completely different from that of a chair.

(James Kajiya)

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Generative Surface Reconstruction (Transfering Semantics)

Havemann S.. *Generative Mesh Modeling*. PhD Thesis, Technische Universität Braunschweig, 2005.

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Ponte di Rialto, photograph, Wikipedia, , viewed 28 May 2012, <http://de.wikipedia.org/wiki/Rialtobr%C3%BCcke>.

Thaller W., Krispel U., Zmugg R., Havemann S., Fellner D. W.. *Shape grammars on convex polyhedra*. In Computers & Graphics, 37/6: 707 - 717, 2013.

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Visual and Semantic Paradigms for Content Mining and Understanding -

The Role Audio Processing Played on Data Mining and the Problems Encountered

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Audio Mining

- Advances in multimedia acquisition and storage technology have led to tremendous growth of multimedia files on internet or in databases, especially user generated content.
- Automatically analyze and search audio content or audio content in video becomes important.
- integrated mining of visual features, speech features and semantic patterns
- Intelligent User Interfaces (an intuitive way beyond pure text-based search): speech recognition & synthesis, humming recognition

Speech Mining

- Speech & Speaker Recognition, Sentiment Analysis
- Multilinguality, language mixing, accents
- bad audio conditions in different recording environment: noise, background sound, channel (e.g. cell phone)
- unconstrained spontaneous speech, disfluences (hesitations, repetitions and corrections)
- large variety of speakers

Music Information Retrieval

- the extraction and processing of patterns and knowledge from musical audio
- Query by text, humming/singing/playing, emotional conception
- Perception of music is highly subjective and are grounded in cultural context. Representing musical content is hard and important

- Features of human music perception [Schedl]: Music content, music context, user context
- music content: features can be extracted from the audio signal itself (e.g. rhythm, timbre, melody, harmony)
- music context: cannot be inferred directly from the signal (e.g. meaning & background)
- user context : relate to the listener himself (e.g. taste, musical knowledge and experience)
- Source segregation (Singing and accompaniment): segregating the audio signal into complementary signals belonging to separate sources.

Thank you!