

– Keynote Lecture –

Allow Knowledge to Prevail: Advanced Computing, Data, Experience, and the Universal Decimal Classification

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Introduction

Introduction and Motivation

- **Advances:**
Very little advances in . . .
computing,
data related disciplines,
documentation and reuse of experience, using classification and
related methods,
. . .
- **Common Views:**
Very loosely coupled perspectives, synonymously used terms and
concepts, little holistic understanding.
- **Awareness and Practice:**
Who is currently really practicing or considering all best practice,
standards, holistic views, and approaches together
in an integrated way?

Traditional Starting View

Questions

Content First.

But:

- How comes that everything is said to be “content”?
- If “data” is used as synonym for “content”, what does that mean?
- Considering the statement

*“If you torture the data long enough it will eventually confess.”
(Ronald Harry Coase),*

what can you do that “data” cooperates and supports you on a voluntary, constructive base?

- In what way do data, information, knowledge ... contribute?
- Why are data and content isolated from context, methods, ...?
- In what way does the startup view contribute to sustainability?

Entities in use

- **Data:**
Big data, research data, information, ...
- **Classification:**
Universal Decimal Classification (UDC), Library of Congress Classification, ...
- **Computing:**
Distributed Computing, High End Computing, High-Performance Computing, Supercomputing, programming ...-solution, Unified Modelling Language (UML), ...
- **Experience:**
Documentation, recommendation, learning processes, education, cognition, competence, ...
- ...

(Subjective impression: At first, implemented entities alone do not help a lot for understanding the essence of knowledge?)

Public Understanding

Knowledge today (Source: Merriam Webster Dictionary)

- 1 a (1): the fact or condition of **knowing something with familiarity gained through experience or association**
(2): acquaintance with or **understanding of a science, art, or technique**
- b (1): the fact or condition of being **aware of something**
(2): the range of one's information or understanding answered to the best of my knowledge
- c: the circumstance or condition of **apprehending truth or fact through reasoning**
- d: cognition: the fact or condition of having information or of being learned a person of unusual knowledge
- 2 a: the sum of what is known: the **body of truth, information, and principles** acquired by humankind
b: archaic: a branch of learning

...

Definition

Defining knowledge (Summit delegates and contributors)

- **“Knowledge is created from a subjective combination of different attainments as there are intuition, experience, information, education, decision, power of persuasion and so on, which are selected, compared and balanced against each other, which are transformed, interpreted, and used in reasoning, also to infer further knowledge. Therefore, not all the knowledge can be explicitly formalised. Knowledge and content are multi- and inter-disciplinary long-term targets and values. In practice, powerful and secure information technology can support knowledge-based works and values.”**

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Systematical View on Knowledge: FCPM Complements

Complements of Knowledge and Corresponding Sample Implementations:

- **Factual Knowledge** \Leftrightarrow **Data ...**
- **Conceptual Knowledge** \Leftrightarrow **Classification ...**
- **Procedural Knowledge** \Leftrightarrow **Computing ...**
- **Metacognitive Knowledge** \Leftrightarrow **Experience ...**
- ...

Factual Knowledge

Factual Knowledge Example: Data / Information

```

1 Vesuvius [Volcanology, Geology, Archaeology]:
2   (lat.) Mons Vesuvius.
3   (ital.) Vesuvio.
4   Volcano, Gulf of Naples, Italy.
5   Complex volcano (compound volcano).
6   Stratovolcano, large cone (Gran Cono).
7   Volcano Type: Somma volcano,
8   VNUM: 0101-02=,
9   Summit Elevation: 1281\UD{m}. ...
10  ...
11  Syn.: Vesaevus, Vesevus, Vesbius, Vesvius
12  s. volcano, super volcano, compound volcano
13  s. also Pompeji, Herculaneum, seismology
14  ...
15  compare La Soufrière, Mt. Scenery, Soufriere
16  ...
17  %%IML: UDC: [911.2+55] : [57+930.85] : [902] "63" (4+37+23+24)
    =12=14
18  %%IML: GoogleMapsLocation: http://maps.google.de/maps?hl=
    de&gl=de&vpsrc=0&ie=UTF8&ll=40.821961,14.428868&spn
    =0.018804,0.028238&t=h&z=15

```


Conceptual Knowledge

Conceptual Knowledge Example: Universal Decimal Classification

The Universal Decimal Classification (UDC) is a general plan for the knowledge classification. UDC is a hierarchical decimal classification system that divides the main knowledge fields into 10 main categories (numbered from 0 to 9). Each field is in turn divided into 10 subfields, each subfield is in turn divided into 10 subsubfields, and so on. A more extensive classification code in general describes a more specific subject. "Facetted" and "multi-disciplinary" is synonym to the UDC, <http://www.udcc.org>.

UDC Standard Operation / Symbols (besides place, time, nationality, language, form, and characteristics)

Addition	"+"	Subgrouping	"[]"
Consecutive extension	"/"	Non-UDC notation	"*"
Relation	":"	Alphabetic extension	"A-Z"

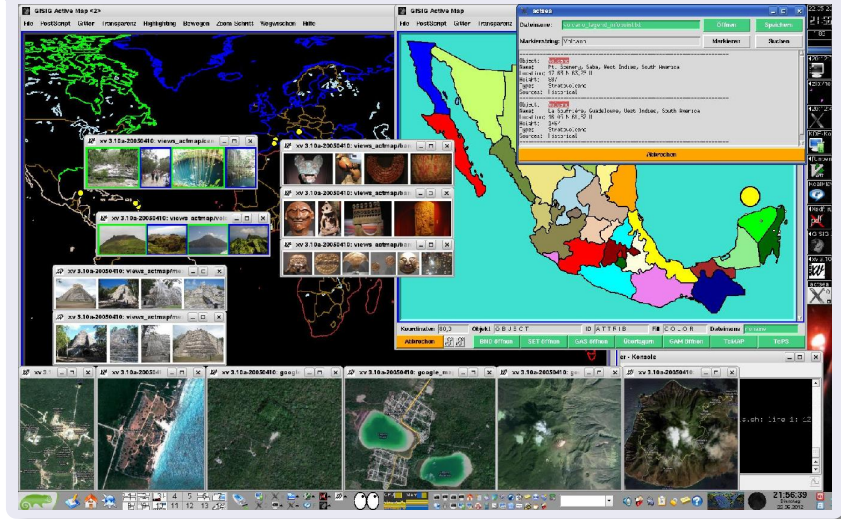
Simple UDC Examples – consistent due to UDC releases / editions

1	(0.02/.08)	Special auxiliary subdivision for document form
2	=1/=8	Natural languages
3	=9/=93	Artificial languages
4	59+636	Zoology and animal breeding
5	(7):(4)	Europe referring to America
6	311:[622+669](485)	statistics of mining and metallurgy in Sweden

Here, all small unsorted excerpts of the knowledge resources objects only refer to main UDC-based classes, which for this part of the publication are taken from the Multilingual Universal Decimal Classification Summary (UDCC Publication No. 088) released by the UDC Consortium under the Creative Commons Attribution Share Alike 3.0 license (first release 2009, subsequent update 2012).

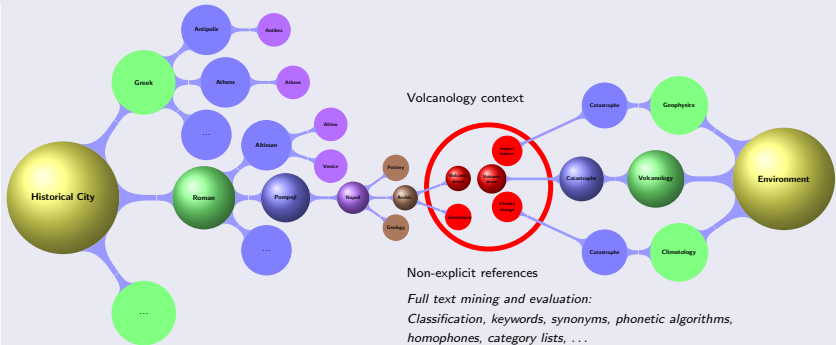
Procedural Knowledge: Integrated Information and Computing System

Program / Workflow Code (© CPR / LX / GEXI)



Knowledge Discovery Example: Computing object carousel connections

Historical city and environment object carousels, trees with computed references



Carousel links, calculated via non-explicit references of comparable objects (red) from knowledge resources within trees. Starting topics are identified by large golden bullets. The two fitting lines within the object carousels are `Historical City : Roman : Pompeji : Napoli : Architecture : Volcanic stone` and `Environment : Volcanology : Catastrophe : Volcanic stone`. Fitting object term for historical city and environment is `Volcanic stone`. Excerpt of associated multi-disciplinary branch level objects: `Limestone, Impact feature, Climate change`.

Metacognitive Knowledge

Metacognitive Knowledge Example: Experience / Documentation

- **Metacognitive knowledge:**

Metacognitive knowledge can relate to any of factual, conceptual, and procedural knowledge.

- **Cognition:**

cognitio(-), from cognoscere (Latin) :: get to know.
The mental action or process of acquiring knowledge and understanding through thought, experience, and the senses (Source: Oxford dictionary).

- **Analogy:**

ἀναλογία, analogia (Greek) :: proportion.
A cognitive process of transferring information or meaning from a particular subject (the analogue or source) to another (the target).

- ...

Benefits and Drawbacks

Benefits and Drawbacks

- Knowledge is supported on a **more holistic base**.
- **Quality** of data can be improved.
- **Natural complexity** of knowledge **can contribute** to solutions.
- **Tasks** (creation, provisioning, consumption etc.) can be served **on non-technical data-centric level**.
- **Systematic application** of methods.
- **Long-term use** is supported.
- **Multi- and interdisciplinary** creation and work are supported.
- ...
- **Further efforts** needed.
- **Education and learning** processes required.
- **Appropriate (best) practice** required.
- ...

Allow Knowledge to Prevail . . .

Allow Knowledge to Prevail in most cases means . . .

- Knowledge is made up from the **complements of computing, data, experience, classification, . . .**
- The complements should be **preserved** (e.g., with long-term resources and research data management).
- The holistic knowledge view should be **trained**.
- The holistic knowledge view should be **fostered**.
- The holistic knowledge view should be **'funded'**.
- Believe in tools and technology without working on 'knowledge' and 'data' is rarely a great achievement.

Conclusions

Lessons Learned and Conclusions

- Any 'knowledge' can be handled in an **appropriate** way.
- Data, computing, ... should **not be seen isolated**.
- With a systematical view there are **options for priorities**.
- **Research Data (Knowledge) Management** is a target.
- **Education** is a target.
- **Long-term documentation** (which does not necessarily mean textual papers only) is required.
- **Long-term projects** are targets.
- **Long-term funding** (of researchers) is 'reasonable'.

What we should live means:

**Not being restricted to do what tools can do
but being able to do what is possible!**

Knowledge First!

Networking

A photograph of a grand, ornate interior space, likely a library or a historical building. The scene is dominated by a wide, carpeted staircase leading upwards. The walls are highly decorated with intricate carvings, murals, and classical architectural elements like columns and arches. Several large, glowing chandeliers provide warm, ambient lighting. The overall atmosphere is one of historical grandeur and elegance.

Thank you for your attention!

References

References and acknowledgements, see:

- ⇒ C.-P. Rückemann, "Comparative Analysis of Data Entities: Knowledge Mining Objects," in *Proceedings of The Seventh International Conference on Advanced Communications and Computation (INFOCOMP 2017), June 25 – 29, 2017, Venice, Italy*. XPS Press, 2017, ISSN: 2308-3484, ISBN-13: 978-1-61208-567-8, URL: <http://www.thinkmind.org/index.php?view=instance&instance=INFOCOMP+2017> [accessed: 2017-06-24], <http://www.iaaria.org/conferences2017/ProgramINFOCOMP17.html> [accessed: 2017-06-24].
- ⇒ "UDC Online," 2017, URL: <http://www.udc-hub.com/> [accessed: 2017-02-05].
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- ⇒ "Creative Commons Attribution Share Alike 3.0 license," 2012, URL: <http://creativecommons.org/licenses/by-sa/3.0/> [accessed: 2017-02-05].