

32nd Annual Conference of the German Classification Society
Joint Conference with the British Classification Society and
the Dutch/Flemish Classification Society –

AG BIB:

Subject Indexing 2008: Accept Progress!
Hamburg, July 16 – 17, 2008

Computer-aided Assignment of DDC Numbers

(Computergestützte Zuweisung von DDC-Notationen)

July 17, 2008

Ulrike Reiner

Verbundzentrale des GBV (VZG), Göttingen

Preface

Assignment of DDC* numbers to

- Bibliographic title records
- Non-DDC terms
- Atomic/molecular DDC numbers

Computer aid: DDC Search System

- Development status
- Continuation

[* DDC: Dewey Decimal Classification]

Preface (1)

AG BIB:

Subject Indexing 2008: Accept Progress!



“14.00 Uhr Werkstattbericht: DDC automatisieren
Dr. Ulrike Reiner, Göttingen (angefragt)”

[<http://www.ub.uni-dortmund.de/listen/inetbib/msg36527.html>]



Computer-aided Assignment of DDC Numbers

[<http://www.ub.uni-dortmund.de/listen/inetbib/msg36838.html>]

VZG Project Colibri/DDC (Research and Development)

- 025.4310285 Dewey Decimal Classification--
Data processing Computer applications
- 025.431072 Dewey Decimal Classification--
Research; statistical methods

Preface (2)



Quebec, QC, Canada to Kingston, ON, Canada - Google Maps - Mozilla Firefox

http://maps.google.de/maps?hl=en&tab=wl

Yahool Mail

Google fls 2008 Suche Lesezeichen PageRank Rechtschreibprüfung Übersetzen Senden an fls 2008 Einstellungen

Web Images Maps News Shopping Mail more

Google Start address e.g. "Erfurt" End address e.g. "Leipzig" quebec city, ca kingston, ca Get Directions

Search Results My Maps

Avoid highways [Get reverse directions](#)

From: Quebec, QC Canada [Edit](#)

Drive: 541 km – about 5 hours 43 mins

1. Head west on Côte D'Abraham toward Escalier de la Chapelle 0.3 km
2. Turn right at Rue de la Couronne 0.2 km
3. Turn left at Boulevard Charest E 4.8 km
4. Continue on AUT-440 2.1 km
5. Take exit 12 for Aut. Henri IV S./AUT-73 S 1.4 km
6. Merge onto AUT-73 S 6.8 km
7. Take exit 131-O to merge onto AUT-20 O/ Autoroute Transcanadienne O toward Montréal 223 km
8. Continue on AUT-25 N/Autoroute Transcanadienne O (signs for AUT-40/ Tunnel Louis-H. La Fontaine/AUT-25 N/ Aéroport Mirabel/Montréal) 7.8 km
9. Take exit 8-O on the left to merge onto AUT-40 O/Autoroute Transcanadienne O 48.3 km

Suchen: 850 [Abwärts](#) [Aufwärts](#) [Hervorheben](#) Groß-/Kleinschreibung

Fertig

Start 2 F... 2 W... Mic... 5 S... Nov... e-D... Lon... alex... Sum... DE 16:37

Preface (3)



“World Library and Information Congress:
74th IFLA* General Conference and Council

Libraries without borders:
Navigating towards global understanding
10-14 August 2008, Québec, Canada”

[* International Federation of Library Associations and Institutions,
<http://www.ifla.org/IV/ifla74/index.htm>,
http://www.ifla.org/IV/ifla74/2008ifla_logo.jpg]

Preface (4)

Fundy National Parc
25 May 2008 by Flo

VZG Project Colibri/DDC

Montréal, QC, Canada (ul, 15 May 2008)



VZG

Preface (5)

Fundy National Parc
25 May 2008 by Flo

VZG Project Colibri/DDC

*International Conference on Unconventional Computation
August 13 - 17, 2007
School of Computing, Queen's University
Kingston, Ontario, Canada*

UC'07



© Selim G. Akl 2006

[http://research.cs.queensu.ca/uc07/img/poster_big.jpg]

VZG

Proceedings of the UC 2007 in Kingston, CA



Unconventional Computation

6th International Conference, UC 2007, **Kingston, Canada**,
August 13 - 17, 2007, Proceedings

Series: Lecture Notes in Computer Science, Vol. 4618

Sublibrary: Theoretical Computer Science and General Issues

Akl, S.G.; Calude, C.S.; Dinneen, M.J.; Rozenberg, G.;
Wareham, H.T. (eds.)

2007, X, 243 p. with online files/update, softcover

ISBN: 978-3-540-73553-3

Keywords:

DNA computing, algorithms, ant colony optimization, approximation, authentication, biomolecular computing, cellular automata, chaos, computational models, computing theory, genetic algorithms, heuristic algorithms, local search, mebrane computing, meta-algorithmics, natural computing, neural network, optimization, quantum computing, quantum key distribution, theoretical computer science, theoretical informatics, theory of computation

[<http://www.springer.com/computer/foundations/book/978-3-540-73553-3>]

Bibliographic Title Record of the UC 2007 (1) (MAB2 format)



001 984632514

002a20070614

...

026 DNB984632514 ← Identification number

...

037beng

...

070 1145

070aDNB

070b9999

100bAkl, Selim G. ^a[Hrsg.] ^a

102a112655688

200bUC <6, 2007, Kingston, Ontario>

202a6517086-6

331 Unconventional computation

335 6th international conference ; proceedings

359 UC 2007, Kingston, Canada, August 13 - 17, 2007. Selim G. Akl ... (ed.)

410 Berlin ; Heidelberg ; New York

412 Springer

425 2007

425a2007

433 X, 241 S.

...

451 Lecture notes in computer science ; Vol. 4618

...

Name of 1st additional person involved

Title proper in descriptive or hybrid form

Remainder of title

Place(s) of 1st publication, printing, etc.

Name of 1st publisher, printer, etc.

1st series title in descriptive form

Bibliographic Title Record of the UC 2007 (2) (MAB2 format)

...

501 Literaturangaben

540aISBN 978-3-540-73553-3 kart. : EUR 48.15 (freier Pr.), ...

540aISBN 3-540-73553-4 kart. : EUR 48.15 (freier Pr.), ...

551a12088782

553a9783540735533

568 07,N28,0093

574 07,A48,0090

700 |004ÎDNB

705a□a006.3□c006.3□eDDC22ger

705a□a004.0151□c004.0151□eDDC22ger

902s 4196735-5 Theoretische Informatik

902f11|Kongress

902g11|Kingston <Ontario, 2007>

907s 4455833-8 Soft Computing

907f11|Kongress

907g11|Kingston <Ontario, 2007>

912s 4611085-9 Bioinformatik

912f11|Kongress

912g11|Kingston <Ontario, 2007>

917s 4190671-8 Zellularer Automat

917f11|Kongress

917g11|Kingston <Ontario, 2007>

ISBN formally (technically) valid

Notation of a classification system

DDC (Dewey Decimal Classification) analytical (a = Full edition)

Chain link of 1st subject heading chain (s = topical heading, f = form heading, g = geographical / ethnographical heading)

Chain link of 2nd subject heading chain

Chain link of 3rd subject heading chain

Chain link of 4th subject heading chain

Example of

- √ Bibliographic title record
- Non-DDC terms (notations, numbers or subject headings of other non-DDC classification systems)
- Atomic/molecular DDC numbers

Non-DDC Terms



Basisklassifikation (BK)	in PICA+
Theoretische Informatik (54.10)	[045Q]
Kettenglied einer RSWK-Kette	[041A]
Berechnung	
Einwelschlagwörter	[044K]
Zellularer Automat	
British Library Subject Headings (BLSH)	[044G]
Heuristic programming	
Library of Congress Subject Headings (LCSH)	[044A]
Heuristic programming	
Library of Congress Classification (LCC)	[045A]
QA76.9 (Computer programming)	

Example of

- √ Bibliographic title record
- √ Non-DDC terms (notations, numbers, or subject headings of other non-DDC classification systems)
- Atomic/molecular DDC numbers

Atomic/Molecular DDC Numbers



An **atomic DDC number** (**dno_atom**) is a semantically indecomposable string (of symbols) that represents a DDC class.

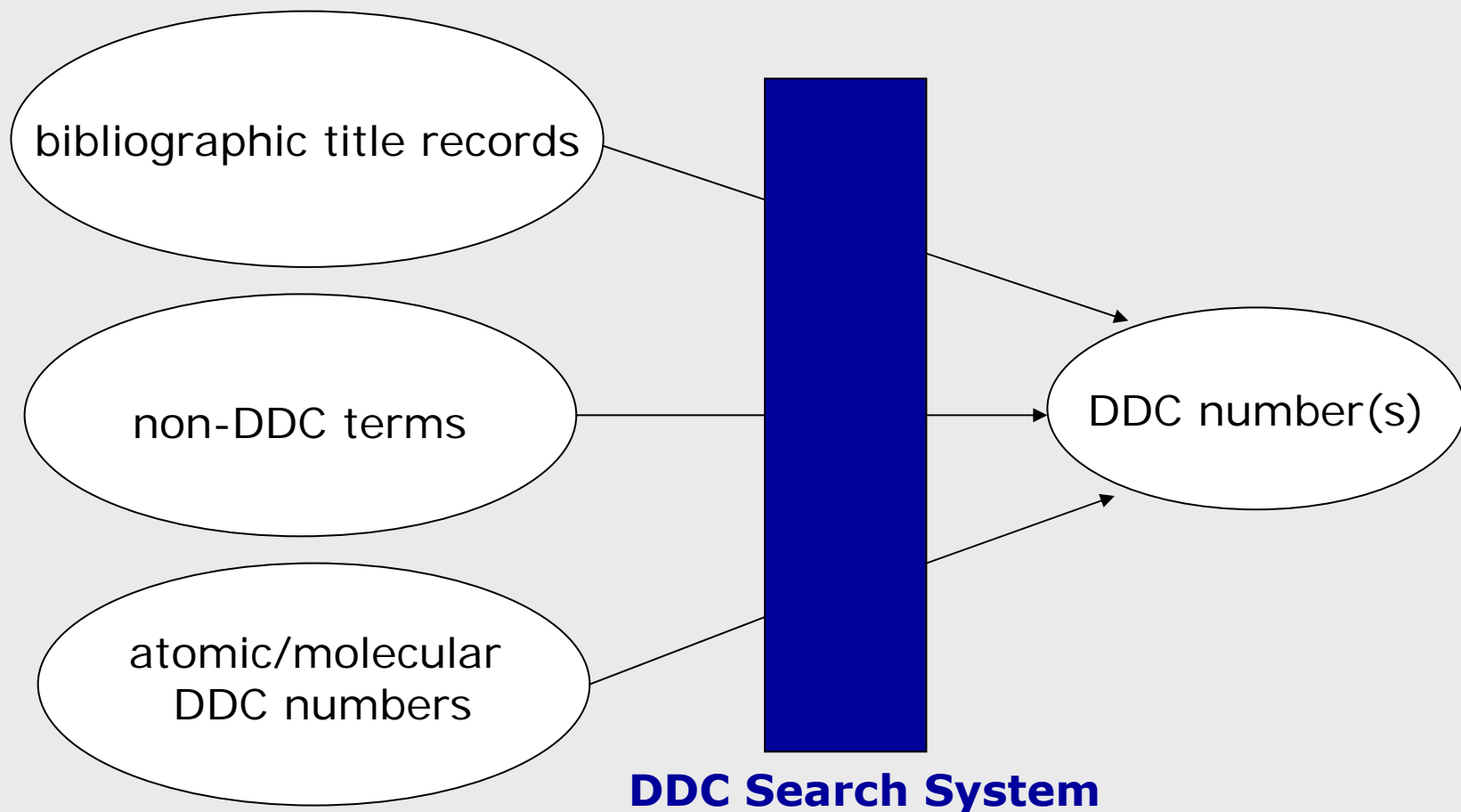
511.36 (Proof theory and constructive mathematics)

A **molecular DDC number** (**dno_mol**) is a string that is syntactically decomposable into atomic DDC numbers.

511.36028563 (Automatic theorem proving)

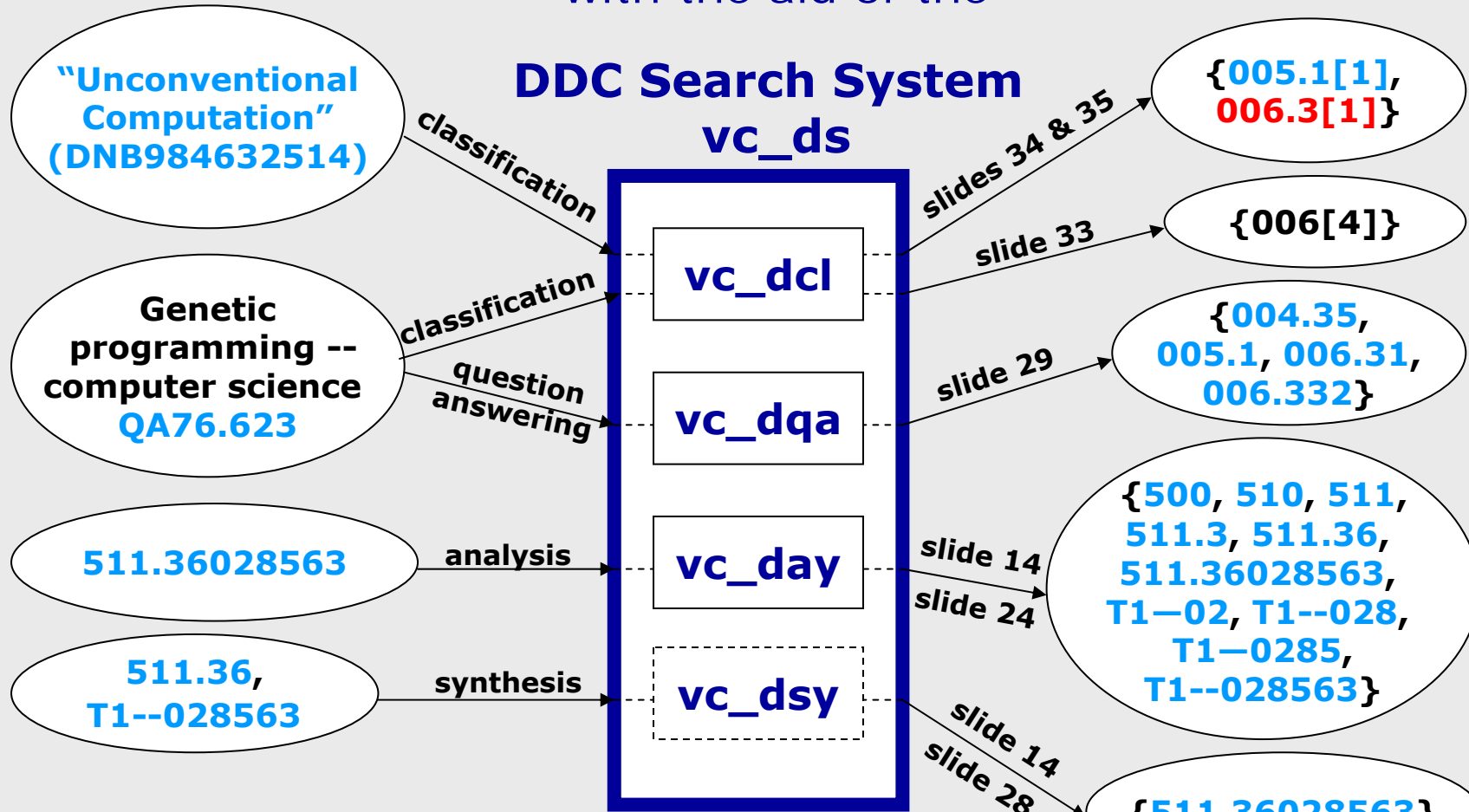
[511.36 (Proof theory ... mathematics),
T1--028563 (Artificial intelligence)]

Computer-aided Assignment of DDC Numbers



Assignment of DDC Numbers (1)

with the aid of the

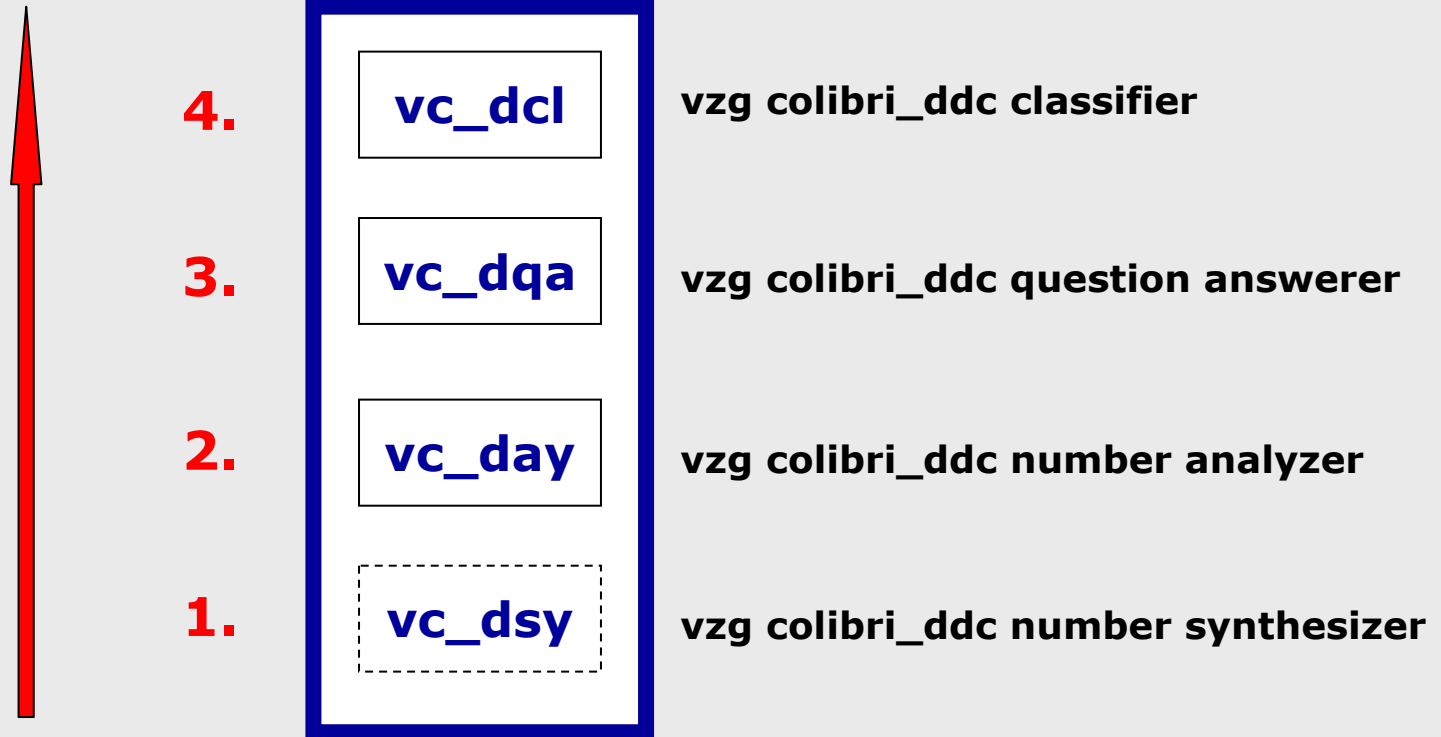


- vc_dcl** : vzg colibri_ddc classifier
 - vc_dqa** : vzg colibri_ddc question answerer
 - vc_day** : vzg colibri_ddc number analyzer
 - vc_dsy** : vzg colibri_ddc number synthesizer
- } **vc_ds components**

Assignment of DDC Numbers (2)

with the aid of the

DDC Search System vc_ds



DDC Notational Synthesis (1)

“The number of devices for synthesis and instructions for their use are so large that no one knows how many million useful DDC numbers can be composed. From an enumerative scheme of limited scope it has grown to be a sophisticated machine for number synthesis.” [1]

1,041,073,100 Potential classes (19th ed. of the DDC) [2]

7,705 Instructions (22nd ed. of the DDC) [3]

[1] M.P. Satija: The Theory and Practice of the Dewey Decimal Classification System. Chandos Publishing, Oxford, UK, 2007, p. 11

[2] Estimation by Francis L. Miksa in his book “The DDC, the Universe of Knowledge, and the Post-Modern Library”. Forest Press, Albany, New York, 1998, p. 24

[3] [http://www.gbv.de/vgm/info/biblio/01VZG/06Publikationen/2007/pdf/pdf_3024.pdf , p. 30]

DDC Notational Synthesis (2)



“WebDewey has many additional features, although so far there is no provision for any expert system for the automatic synthesis of numbers following *add to instructions*.” [1]

[1] M.P. Satija: The Theory and Practice of the Dewey Decimal Classification System. Chandos Publishing, Oxford, UK, 2007, p. 16

Development Status of **vc_dsy** (1) **vzg colibri_ddc number synthesizer**

First considerations on a computer-aided number synthesis

DDC number synthesis with the aid of components of the DDC search system (vc_ds**):**

vc_dsy: **user interface for DDC synthesis** (not implemented yet)

vc_dqa: **determining of **dno_atoms** (slides 26 & 27) and **dno_mols** (slide 28)**

vc_day: **testing the suitability or correctness of **dno_mol(s)** (slide 24)**

Development Status of vc_dsy (2) vzg colibri_ddc number synthesizer



Automatic DDC notational synthesis?

Main Title: Wisdom and compassion = Śes rab dan' sniñ' rje' i rol pa :
the sacred **art** of **Tibet** / Marilyn M. Rhie, Robert A.F.
Thurman ; **photographs** by John Bigelow Taylor.

Subjects: Art, Buddhist--China--Tibet.
Buddhist art and symbolism--China--Tibet.
Art, Tibetan

Note: ... an **exhibition** organized by the
Asian Art Museum of **San Francisco** in conjunction with
Tibet House, **New York**

=> Common knowledge and DDC knowledge

[<http://gso.gbv.de/DB=2.1/CMD?ACT=SRCHA&IKT=1016&SRT=YOP&TRM=ppn+113549423>,
<http://lccn.loc.gov/90046899>]

Development Status of vc_dsy (3) vzg colibri_ddc number synthesizer

Tibet =>

Historical, geographic, persons treatment
Tibet Autonomous Region (Xizang Zizhiqu)

dno_atoms

T1--09

T2--515

exhibition =>

Museums, collections, exhibits

T1--074

San Francisco, New York =>

United States

T2--73

the sacred art of Tibet ... photographs =>

Arts

700

Iconography

704.9

Other religions

704.9489

Tibetan =>

Tibetan Buddhism (Lamaism)

294.3923

[red: terms of the bibliographic title record; turquoise: terms of the DDC System]

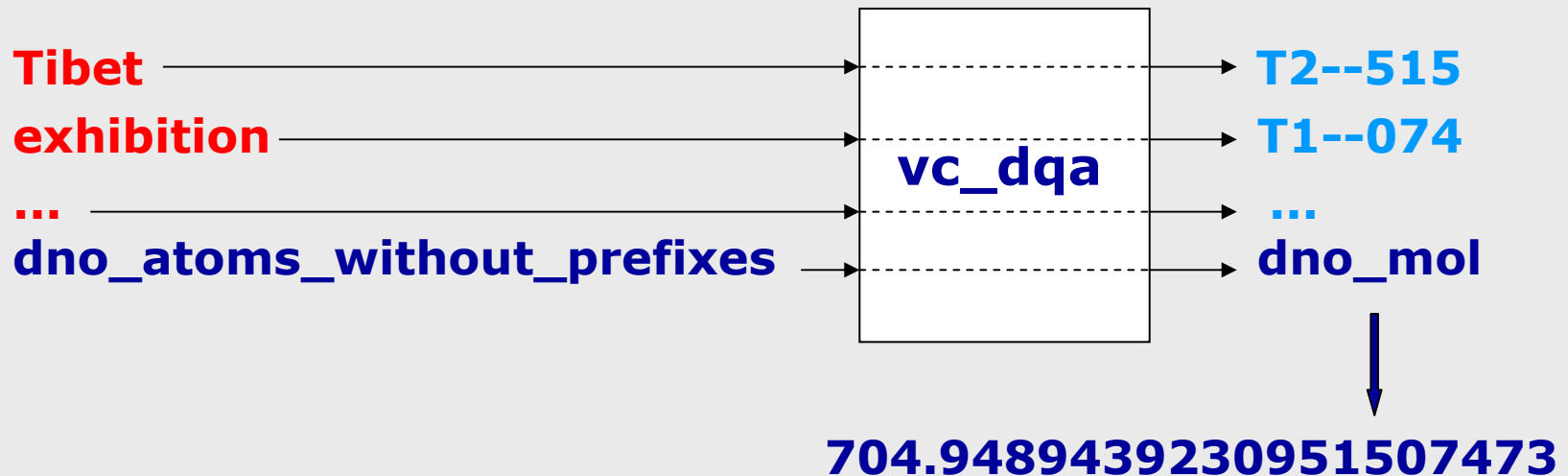
Development Status of vc_dsy (4)

vzg colibri_ddc number synthesizer

dno_atoms := set of atomic DDC numbers

dno_mols := set of molecular DDC numbers

=> **dno_atoms: {T1--09, T2--515, T1--074, T2--73,
704.9489, 294.3923}**



Development Status of vc_day (1) vzg colibri_ddc number analyzer

Analysis Diagram of a DDC number (in_liu_417)

```

704.9489439230951507473 <liu_417_to_analyze; length: 23>
7----- Arts & recreation <hatzen>
70----- Arts <hatzen>
704----- Special topics in fine and decorative arts <hat>
704.9----- Iconography <hat>
704.94----- Specific subjects <hat>
704.948----- Religion <hat>
704.9489----- Other religions <hat>
704.94894----- Indic religions--art representation <hatien>
704.948943----- Buddhism--art representation <hatien>
---.----4----- Religions of Indic origin <nalr1:294>
---.----43----- Buddhism <nalr1:294.3>
---.----439----- Branches, sects, reform movements <nalr1:294.39>
---.----4392----- Mahayana Buddhism (Northern Buddhism) <nalr1:294.392>
---.----43923----- Tibetan Buddhism (Lamaism) <nalr1:294.3923>
---.-----09----- Historical, geographic, persons treatment <T1--09>
---.-----095----- Treatment by specific continents, countries, localities;
extraterrestrial worlds <T1--095>
---.-----5----- Asia OrientFar East <ba4r2span:T1--093-T1--099:T2--5>
---.-----51----- China and adjacent areas <ba4r2span:T1--093-T1--099:T2--51>
---.-----515----- Tibet Autonomous Region (Xizang Zizhiqu)
<ba4r2span:T1--093-T1--099:T2--515>
---.-----07----- Museums, collections, exhibits; collecting objects
<ba4r2span:T1--093-T1--099+07>
---.-----074----- Museums, collections, exhibits <ba4r2span:T1--093-T1--099+074>
---.-----7----- North America <ba4r2span:T1--093-T1--099+074:na4r2:T2--7>
---.-----73----- United States <ba4r2span:T1--093-T1--099+074:na4r2:T2--73>

```


Development Status of vc_day (2) vzg colibri_ddc number analyzer



Presentation

GfKI 2007, Librarian Workshop, Freiburg

[http://www.gbv.de/vgm/info/biblio/01VZG/06Publikationen/2007/pdf/pdf_2835.pdf]

Publication

Automatic Analysis of Dewey Decimal Classification Notations

[<http://www.springerlink.com/content/I044082243v1I7u6/>, pp. 697-704]

Development Status of vc_dqa (1) vzg colibri_ddc question answerer

Searching for dno_atoms (1)

```
mysql> select * from dno_kb where (dno like "t%" and descr_val
      like "%tibet%");
```

```
+-----+-----+-----+
| dno      | descr | descr_val |
+-----+-----+-----+
| t2--515  | <hat> | tibet autonomous region (xizang zizhiqu) |
| t5--954  | <hat> | tibetans |
| t6--9541 | <hat> | tibetan |
| t6--954  | <hat> | tibeto-burman languages |
| t6--95   | <hat> | languages of east and southeast asia      sino-tibetan languages |
+-----+-----+-----+
5 rows in set (0.07 sec)
```

```
mysql> select * from dno_kb where (dno like "t%" and descr_val
      like "%exhibit%");
```

```
+-----+-----+-----+
| dno      | descr | descr_val |
+-----+-----+-----+
| t1--074  | <hat> | museums, collections, exhibits | | | | | |
| t1--0753-t1--0755 | <hat> | [organizing and preparing collections and exhibits, service to patrons] |
| t1--08+074 | <ba5> | museums, collections, exhibits|<na4r2>|074||t2--4-t2--9| |
| t1--0901-t1--0905+074 | <ba5> | museums, collections, exhibits|<na4r2>|074||t2--4-t2--9| |
| t1--0901-t1--0905+07 | <ba5> | museums, collections, exhibits |
| t1--093-t1--099+074 | <ba4r2> | museums, collections, exhibits|<na4r2>|074||t2--4-t2--9| |
| t1--093-t1--099+07 | <ba4r2> | museums, collections, exhibits |
+-----+-----+-----+
7 rows in set (0.07 sec)
```

[for dno_kb (DDC knowledge base), <hat>, <ba5>, ... see p. 29 and p. 32

http://www.gbv.de/vgm/info/biblio/01VZG/06Publikationen/2007/pdf/pdf_3024.pdf]

Development Status of vc_dqa (2)

vzg colibri_ddc question answerer

Searching for dno_atoms (2)

**dno_atoms : {T1--09, T2--515, T1--074, T2--73, 704.9489,
294.3923} (slide 22-24 & 26)**

```
mysql> select * from dno_kb where dno="704.9489";
```

```
+-----+-----+-----+
| dno      | descr  | descr_val  |
+-----+-----+-----+
| 704.9489 | <hat>  | other religions | | | | | | | |
| 704.9489 | <na1r1> | |704.9489|292-299|29| | | | |
| 704.9489 | <ri>   | hell      |
+-----+-----+-----+
```

```
3 rows in set (0.07 sec)
```

stands for

“Add to base number 704.9489 the numbers following 29 in 292-299”

cross-check by

```
mysql> select * from dno_kb where dno="294.3923";
```

=> no rules!

[for the knowledge representation of DDC facts and rules, see p. 32
http://www.gbv.de/vgm/info/biblio/01VZG/06Publikationen/2007/pdf/pdf_3024.pdf]

Development Status of vc_dqa (3)

vzg colibri_ddc question answerer

Searching for dno_mols*

```
mysql> select * from dno_db where (dno like "%73%" and dno like "%515%" and dno like "%43923%" and dno like "704.9489%" and dno like "%09%" and dno like "%074%");
```

dno	descr	descr_val
704.9489439230951507473	<001A>	02003
704.9489439230951507473	<003@>	0113549423
704.9489439230951507473	<021A>	compassion
704.9489439230951507473	<021A>	wisdom
704.9489439230951507473	<022A>	france
704.9489439230951507473	<022A>	south
704.9489439230951507473	<028A_da>	marylin m.#rhie
704.9489439230951507473	<028C>	john bigelow#taylor
704.9489439230951507473	<028C>	robert a. f.#thurman
704.9489439230951507473	<033A>	<033A>-royal academy of arts@london
704.9489439230951507473	<044A_a>	art, buddhist
704.9489439230951507473	<044A_a>	art, tibetan
704.9489439230951507473	<044A_a>	buddhist art and symbolism
704.9489439230951507473	<044A_z>	china
704.9489439230951507473	<044A_z>	tibet
704.9489439230951507473	<045A>	N8193.T5
704.9489439230951507473	<145Z_a>	lh 65990
704.9489439230951507473	liu_417_to	length: 23

18 rows in set (0.02 sec)

[Pica+ tags: <http://www.gbv.de/vgm/info/mitglieder/02Verbund/01Erschliessung/02Richtlinien/01KatRicht/inhalt.shtml>,
* unique dno_mols in GVK: 590,120 (January 2008), 466,134 (July 2004); approx. 3,000 dno_mols/month]

Development Status of vc_dqa (4) vzg colibri_ddc question answerer

Searching for dno* with Non-DDC terms

```
mysql> select * from dno_db where descr like "<044A%" and descr_val like "genetic programming%computer science";
```

dno	descr	descr_val
004.1	<044A_s>	genetic programming computer science
004.35	<044A_a>	genetic programming computer science
005.1	<044A_a>	genetic programming computer science
006.31	<044A_a>	genetic programming computer science
006.31	<044A_s>	genetic programming computer science
006.332	<044A_s>	genetic programming computer science
006.3	<044A_a>	genetic programming computer science
006.3	<044A_s>	genetic programming computer science
332.015118	<044A_s>	genetic programming computer science
621.381	<044A_s>	genetic programming computer science

10 rows in set (0.00 sec)

LCSH (Library of Congress Subject Headings)

```
mysql> select * from dno_db where descr like "<045A%" and descr_val="qa76.623";
```

dno	descr	descr_val
004.35	<045A>	QA76.623
005.1	<045A>	QA76.623
006.31	<045A>	QA76.623
006.332	<045A>	QA76.623

* dno: DDC number

4 rows in set (0.00 sec)

LCC (Library of Congress Classification)

Development Status of vc_dcl (1) vzg colibri_ddc number classifier

Automatic classification

- DDC database **vc_DB**
- DDC knowledge base **vc_KB** } **vc_DB_PLUS** (intellectual basis)
- vector product*
as similarity measure
$$S_{uc} = \sum_{i=1}^l u_i c_i$$
 between the terms of
DDC-unclassified title records **u** (elements of in_dnb_ABH**) and DDC-classified title records **c** (elements of vc_DB_PLUS)
- two heuristic functions: **cutoff_val_dyn**, **cutoff_val_stat**
- two methods to calculate DDC class candidates: **calc1**, **calc2**

[* Gerard Salton: Automatic Information Organization and Retrieval. McGraw-Hill, New York, 1968, p. 237

** input test data (25,653 bibliographic title records) from the German National Library (Deutsche Nationalbibliothek DNB)]

Development Status of vc_dcl (2) vzg colibri_ddc number classifier

Evaluation of the automatic classification

- automatic evaluation

two (automatic) correlation measures:

correlation pattern CP, e.g., **110.xxx xxx xxx xxx**

correlation number CN $\in [0,1]$, e.g., **0.666667, 1**

- (first) intellectual evaluation of vc_dcl (July 3, 2008)

- 11 DNB experts evaluated Sample1*
- "Colibri ist derzeit für eine automatische Klassifizierung von Publikationen insbesondere Netzpublikationen nicht einsetzbar ... Eine Modifizierung des Colibri-Systems vor einem erneuten Testlauf wäre wünschenswert." **

[* 1,000 automatic DDC-classified title records of in_dnb_ABH by vc_dcl)

** Yvonne Jahns; Elisabeth Mödden: Colibri-Test Juni 2008. Automatisches Klassifizieren_DDC_Colibri. L2/F2 AG Netzpublikationen. 3. Juli 2008]

Development Status of vc_dcl (3)

vzg colibri_ddc number classifier

Accuracy of vc_dcl (cf. slide 28)

```
dl385-122 colibri/ul-test> vc_dcl_cli < vc_DB/in_ppn_113549423
number of ddc-classified title:      2
identifier (dno,schedno):            113549423 (704.9489439230951507473,704.948943)
Data of LoC:                          704.9489439230951507473
calculated cutoff value:              40
title:                                Wisdom and compassionfÃ¸Ses rab dan sÃ¸nnin rjeÃ¸i
rol padthe sacred art of TibethMarylin M. Rhie; Robert A.F. Thurman
considered descriptor values:         |12| {<028A_da>-marylin m.#rhie[6], <028C>-robert
f.#thurman[16], <028C>-john bigelow#taylor[24], <021A>-wisdom[1830], <021A>-
compassion[274], <033A>-<033A>-royal academy arts@london[47], <044A_a>-tibet[786],
<044A_a>-buddhist art symbolism[40], <044A_a>-china[4756], <044A_a>-art
tibetan[20], <044A_a>-art buddhist[44], <045A>-N8193.T5[2]}
matched descriptor values:            |6| {N8193.T5, marylin m.#rhie, john
bigelow#taylor, art tibetan, robert f.#thurman, buddhist art symbolism}
max. match value of matched descriptor values: |6|
calculated1 ddc classes (subdiv):     |1| {704.948943}
calculated1 ddc classes (sections):   |1| {704}
calculated1 ddc classes (main):       |1| {700}
calculated2 ddc classes (subdiv):     {704.948943[1]}
calculated2 ddc classes (sections):   {704[1]}
calculated2 ddc classes (divisions):  {700[1]}
calculated2 ddc classes (main):       {700[1]}
correlation (113549423,704.948943):  111.111 111 xxx xxx (1)
```

Sorted list of frequencies

111 [FUCUTVAL] S_list: 2-6-16-20-24-40-44-47-274-786-1830-4756

Development Status of vc_dcl (4) vzg colibri_ddc number classifier



Assignment of DDC numbers to non-DDC terms by vc_dcl

```
dl385-122 colibri/ul-test> vc_dcl_cli < vc_DB/in_ul_gfkl08_FICTIVE
number of ddc-classified title:      1
identifier (dno,schedno):            FICTIVE (XXX,X)
Data of ????:                        XXX
calculated cutoff value:             11
title:                               Unconventional computation
considered descriptor values:        |1|{<331>-genetic programming computer
    science[11]}
matched descriptor values:           |1|{genetic programming computer science}
max. match value of matched descriptor values: |1|
calculated1 ddc classes (subdiv):    |11| {004.1, 004.35, 005.1, 006.3,
    006.31, 006.32, 006.332, 332, 620.00113, 621.3, 621.381}
calculated1 ddc classes (sections):  |3| {004, 005, 006}
calculated1 ddc classes (main):      |1| {000}
calculated2 ddc classes (subdiv):    {004.1[1], 004.35[1], 005.1[1],
    006.31[1], 006.32[1], 006.332[1], 006.3[1]}
calculated2 ddc classes (sections):  {006[4]}
calculated2 ddc classes (divisions): {000[7]}
calculated2 ddc classes (main):      {000[7]}
correlation (FICTIVE,X): xxx.xxx xxx xxx xxx (X)
```

Development Status of vc_dcl (5) vzg colibri_ddc number classifier

Classification of "Unconventional computation" by vc_dcl (1)

```

number of ddc-classified title:      9131
identifier (dno,schedno):           DNB0984632514 (004.0151,004.0151)
DNB DDC notation (MAB2 field 700)  {004}
calculated cutoff value:           393
title:                              Unconventional computation
title (remainder):                 6th international conference ; proceedings
title (series):                    Lecture notes in computer science ; Vol. 4618
considered descriptor values:       |18| {<100b>-selim#ak1[0], <331>-
unconventional[393], <331>-computation[306], <335>-proceedings[12003], <335>-6th[801],
<335>-international[12911], <335>-conference[6787], <412@410>-<033A>-
springer@berlin[750], <451>-computer[2601], <451>-science[7828], <451>-vol.[3], <451>-
lecture[1875], <451>-notes[4125], <540a>-3-540-73553-4[0], <902s>-theoretische
informatik[62], <902g1>-902g11|kingston <ontario 2007>[0], <907s>-soft computing[74],
<907g>-907g11|kingston <ontario 2007>[0]}
matched descriptor values:          |4| {theoretische informatik, unconventional, soft
computing, computation}
max. match value of matched descriptor values: |4|
calculated1 ddc classes (subdiv):   |4| {004, 005.1, 006.3, 511.3}
calculated1 ddc classes (sections): |3| {004, 005, 006}
calculated1 ddc classes (main):     |1| {000}
calculated2 ddc classes (subdiv):   {005.1[1], 006.3[1]}
calculated2 ddc classes (sections): {004[1], 005[1], 006[1]}
calculated2 ddc classes (divisions):{000[3]}
calculated2 ddc classes (main):     {000[3]}
correlation (DNB0984632514,004.0151: 111.000 0xx xxx xxx (0.428571)

```

Programming (points to 005.1 and 006.3)
Artificial Intelligence (points to 005.1 and 006.3)
Special computer methods (points to 005)
Computer programming, programs, data (points to 006)
Data processing (points to 004)
Computer science (points to 004)
Computer science, information, general works (points to 000)

Development Status of vc_dcl (6) vzg colibri_ddc number classifier



Classification of "Unconventional computation" by vc_dcl (2)

```

number of ddc-classified title:      9506
identifier (dno,schedno):           DNB0984632514 (006.3,006.3)
DNB DDC notation (MAB2 field 700):  {004}
DDC notation (MAB2 field 705):      {006.3,004.0151}
calculated cutoff value:            260
title:                              Unconventional computation
title (remainder):                  6th international conference ; proceedings
title (series):                     Lecture notes in computer science ; Vol. 4618
considered descriptor values:        |19| {<100b>-selim#akl[0], <331>-
unconventional[394], <331>-computation[311], <335>-proceedings[12058], <335>-6th[808],
<335>-international[12948], <335>-conference[6840], <412@410>-<033A>-
springer@berlin[750], <451>-computer[2627], <451>-science[7870], <451>-vol.[3], <451>-
lecture[1883], <451>-notes[4163], <540a>-3-540-73553-4[0], <912g11>-kingston[260],
<902s>-theoretische informatik[62], <912s>-bioinformatik[51], <907s>-soft
computing[74], <917s>-zellularer automat[21]}
matched descriptor values:           |5| {kingston, theoretische informatik, soft
computing, bioinformatik, zellularer automat}
max. match value of matched descriptor values: |4|
calculated1 ddc classes (subdiv):    |3| {004, 006.3, 511.3}
calculated1 ddc classes (sections):  |2| {004, 006}
calculated1 ddc classes (main):      |1| {000}
calculated2 ddc classes (subdiv):    {006.3[1]}
calculated2 ddc classes (sections):  {004[1], 006[1]}
calculated2 ddc classes (divisions): {000[2]}
calculated2 ddc classes (main):      {000[2]}
correlation (DNB0984632514,006.3):  111.1xx xxx xxx xxx (1)

```

Development Status of vc_dcl (7) vzg colibri_ddc number classifier

Automatic classification obstacles (1) (extract of *)

- **“A subject may occur in almost any discipline. ... Thus there is theoretically no single class number for any subject.”**
- **“Determination of the specific subject of a given document is an art which machines cannot do.”**
- “The specific subject of a document may be determined by ... title, subtitle, blurb, preface and table of contents, and scanning through the text ... The institutional affiliation of the author, the index at the back of the book, the series and cited references ... published reviews or consult some reference tools ... a subject expert.”

[* M.P. Satija: The Theory and Practice of the Dewey Decimal Classification System. Chandos Publishing, Oxford, UK, 2007, pp. 39; 51; 52]

Development Status of vc_dcl (8) vzg colibri_ddc number classifier



Automatic classification obstacles (2) (following *)

- **“... there is too much ambiguity and complexity in the world of publishing and the DDC ...”**
 - a title could be incomplete, fanciful, or vague
 - a title could contain redundant words
 - it could be a new subject that has not yet been given a place in the DDC
 - obscure subjects, e.g., “travels in transoxiana”
 - different terminology, e.g., “German Bundestag”, “US Congress”
 - the terminology for some concepts differs even between countries with the same language, e.g., gas station (US) - petrol pump (UK)

[* M.P. Satija: The Theory and Practice of the Dewey Decimal Classification System. Chandos Publishing, Oxford, UK, 2007, pp. 59]

Continuation

Fundy National Parc, NB, Canada (ul, 25 May 2008)

Advancement of the DDC Search System

DDC analysis: classes 800 und 900

DDC classification: improvement

DDC question answering:
ready to use, easily expandable

DDC synthesis: occasionally

Thank you for your interest in the VZG Project Colibri/DDC!