Information organization for the union of computing related disciplines

Boots Cassel
Villanova University

Some indications of the problem

- Recent curriculum recommendations in five volumes: Computer Engineering, Computer Science, Information Systems, Information Technology, Software Engineering

- Other named programs exist, including Telecommunications, Network security, Interactive Multimedia, Information Science

- Benchmarking effort in Great Britain started with a survey of computing related programs of study in the UK: 2,400 and counting different names

Project Goals

- Produce an interactive structure for representation and exploration of the unified body of knowledge of all of the computing and information related disciplines
- Support development of new programs of study
- Assist with validation of programs of study
- Illuminate relationships among related disciplines
- Support development of interdisciplinary programs
- Classify research contributions
- Illuminate interconnections
- ...etc.

Desired outcomes

- Keep computing related disciplines as a single voice to maintain strength
- Maintain a current classification scheme for computing and information related work
- Address the challenges of updated curriculum recommendations
- Support curriculum development for creative new types of programs of study
- Ease the path toward accreditation for non-standard programs of study

Starting point

- Various ways to divide and combine topic areas:
  - ACM Computing Classification Scheme
  - Knowledge units of the CC2001 volumes (CS2001, IS2002, CE2004, SE2004, IT2005)
  - Computing Research Repository (CoRR)
  - others...
- Overlap and sometimes contradict each other in the way topics are grouped, organized.

The Vision

- A union of all computing related topic areas

- A representation of connections, dependencies among topic areas.

- A process for adding emerging topics.

- A process for changing links, groupings, etc.

- A process for associating topic areas and desired program outcomes. ☐

Not just for curriculum

- This is not just for curriculum development and comparison
- Research work is tagged with appropriate topic areas to facilitate groupings and support searching
- If well done, this project could lead to more effective categorization of related research

Problem discovery

- Early discussions to merge bodies of knowledge
    - The topics are only one part of the distinction
    - Different groups look at the same topics, use the same words, and mean different things
    - How to include them all in one scheme?

Basic elements

- What are we about?
  - Hardware
  - Software
  - Information
  - Human related aspects
- But that is not enough to describe all that concerns the computing and information related disciplines
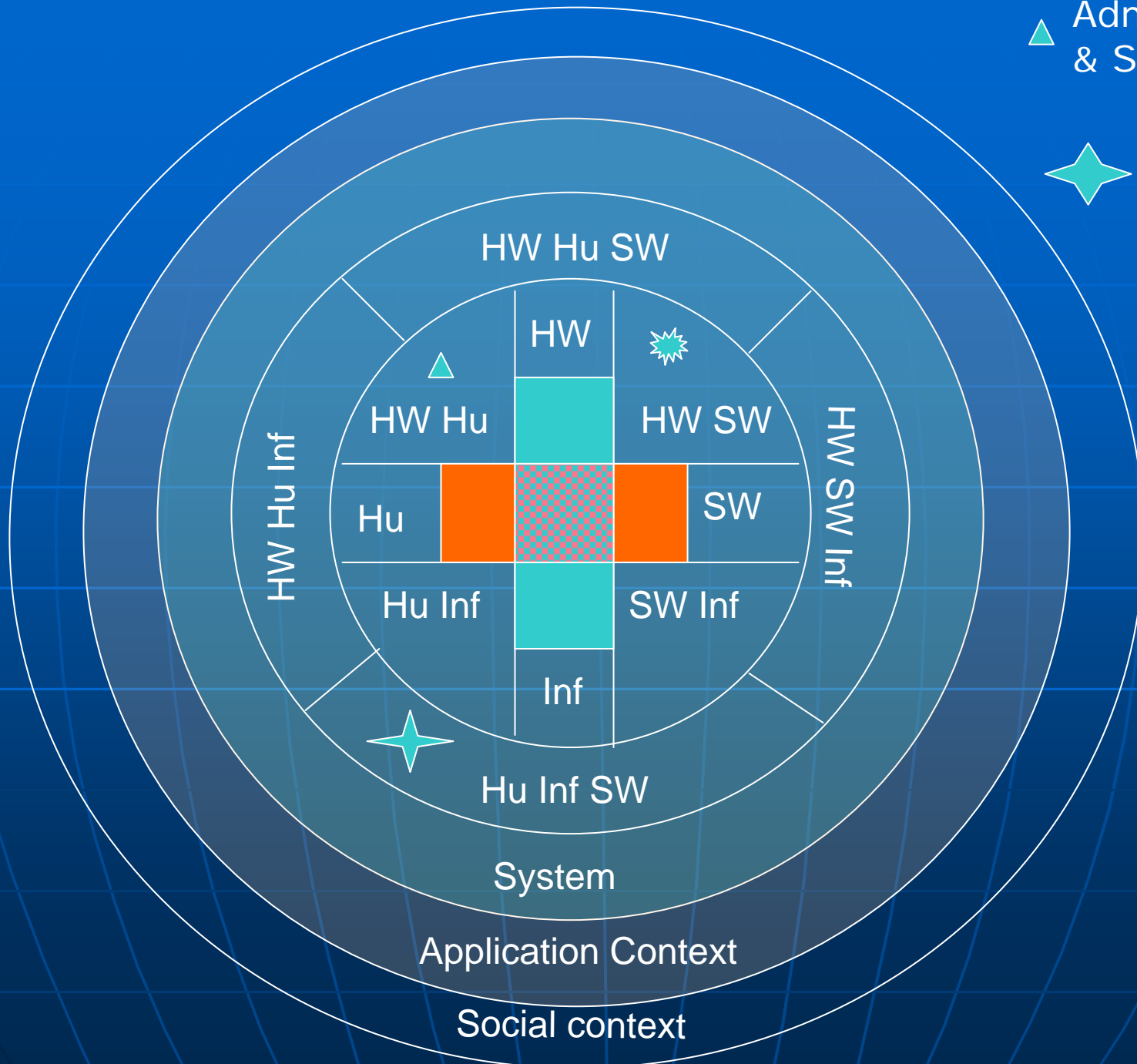
Topics of interest include all the core elements, and every possible combination of them
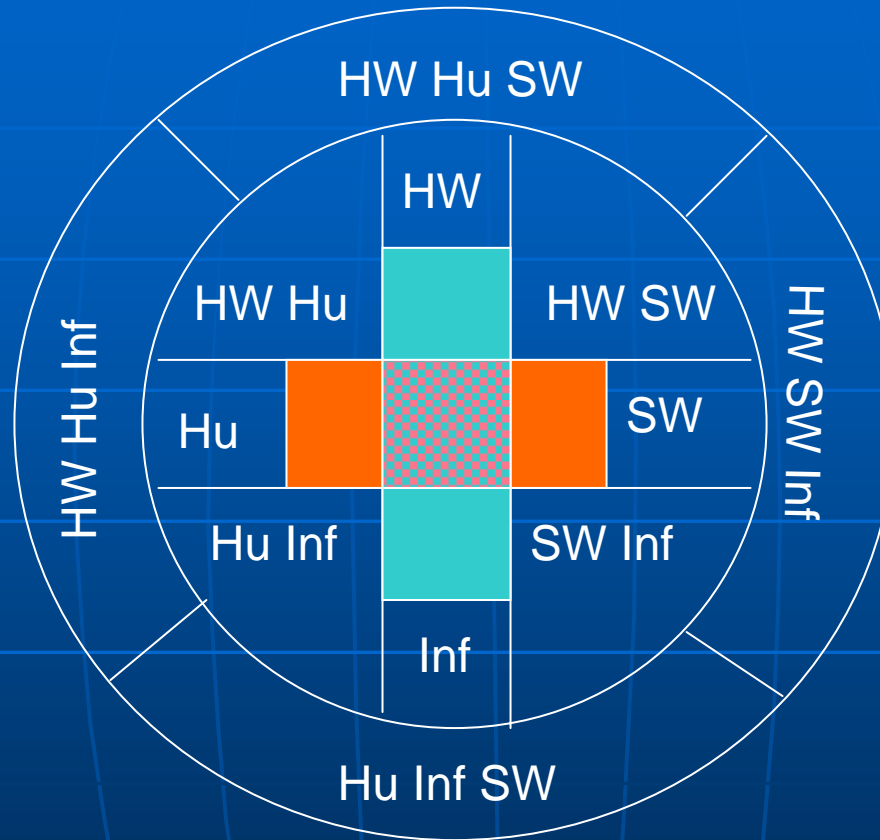
But, that does not tell the whole story either.

Groupings

- Peter Denning Great Principles Project
- Mapping of our topic areas to his principles list:
  - Computation, Communication, Coordination, Recollection, Automation, Design, Programming Practice, Systems Practice, Modeling Practice, Innovating Practice, Other Practice

COMPUTATION
- algorithms complexity
- programming languages
- hardware organization
- Architectures
- Security
- theoretical foundations

COMMUNICATION
- Networks
- multimedia

COORDINATION
- distributed computing
- Security
- information system management
- human interface

RECOLLECTION
- information topics
- information system management

AUTOMATION
- intelligent systems

DESIGN
- software engineering
- maintenance

PROGRAMMING PRACTICE
- programming fundamentals

SYSTEMS PRACTICE
- software engineering

MODELING PRACTICE

INNOVATING PRACTICE

OTHER PRACTICE
- ethical-social
- administration

Topics and Outcomes

- In the Education domain
  - A comprehensive set of topics does not begin to solve all the problems we listed.
  - The topic space is a tool to be incorporated into applications that address these issues.
  - It does not stand on its own.

Proficiency and Competency

- Curriculum development moving toward an outcomes orientation.

- Don't tell me what topics you studied, tell me what you can do.

- Clearly, an organized study of subject areas contributes to gaining proficiency in some area.

- Imagine possibilities
  - Map a program of study onto the entirety of the disciplines.
  - Explore for the underrepresented areas.
  - Demonstrate the coverage of a planned curriculum.
  - Illustrate the distinctions and overlaps between existing and proposed specialties and related disciplines.

Other uses

- **Research classification**
  - Imagine possibilities:
    - Researcher submitting a work
    - Researcher with a new idea, looking for related work and gaps in the knowledge base
    - Graduate student looking for a good topic
    - ... etc.

- Classification not a static labeling, but an insertion into a dynamic environment.

- Search not just for a particular paper or author, but for what is around a topic area.

- Exploration for areas that are richly filled and others that are sparse.

Motivation

- As the computing disciplines coalesce into separate knowledge areas
  - Let's recognize our common goals
  - Let's work together to promote the computing disciplines
  - Let's make it easier to see who does what
  - Let's aid curriculum developers in innovation
  - Let's see what is getting left out
- Let's keep the family of computing disciplines in communication and cooperation.

Contributors

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- The Team: Boots Cassel (chair), Jim Cross, Gordon Davies, Reza Kamali, Eydie Lawson, Rich LeBlanc, Andrew McGettrick, Russ Shackelford, Bob Sloan, Heikki Topi

- Also contributing: Fred Mulder, and Anneke Hacquebard, Maarten van Veen

- Growing list of interested parties

- Follow our progress:

what.csc.villanova.edu/twiki/bin/view/Main/OntologyProject