Visual Map Comparison

in the Project of Advancing Diagnostic Skills Training in the Undergraduate Technology and Engineering Curriculum

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http://diagnosticskills.org/

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Project overview

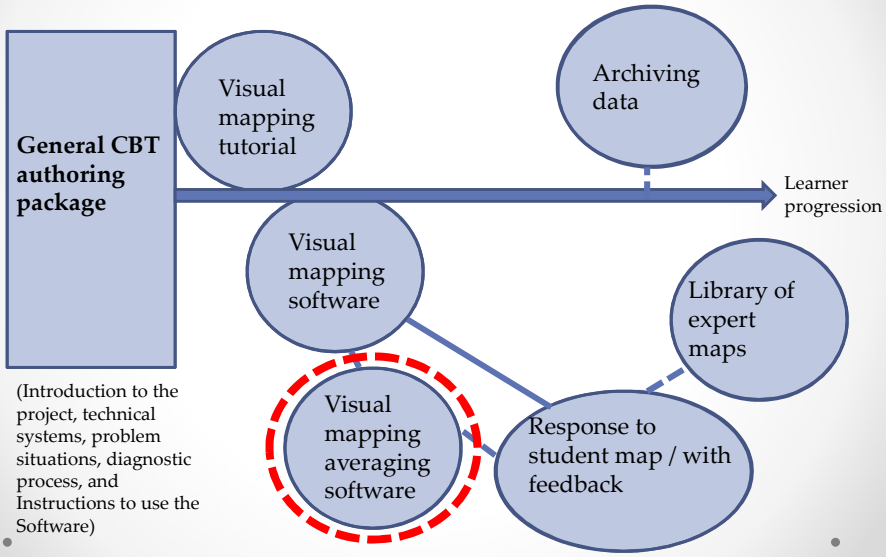
- Goal

  The primary goal is to advance the diagnostic skills of technology and engineering students engaged in trouble-shooting and solving technical problems.

- Methods

  Develop interactive software based on instructional design and test with juniors and seniors. Learners will use visual mapping to create diagnostic strategies to identify problems in complex technical systems. These plans will be compared to expert strategies for feedback to learners.

Instructional Process – Software Interaction



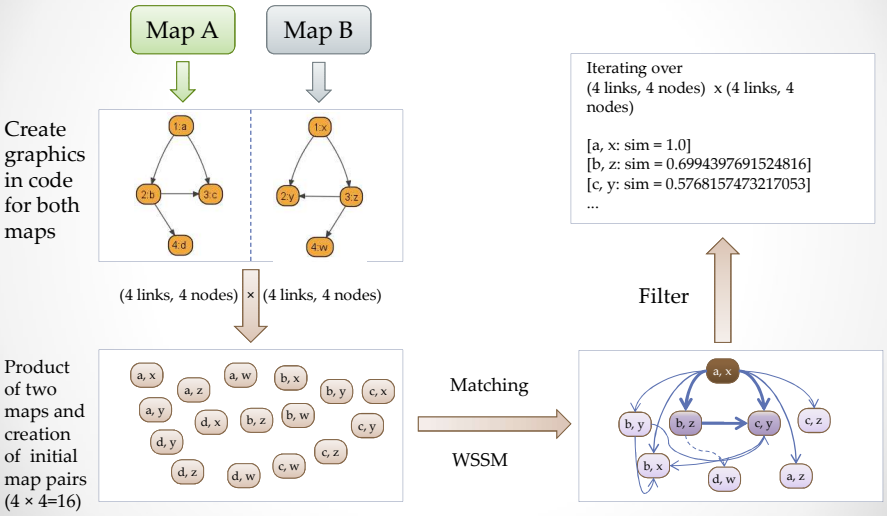
Overview of Approaches

- **Visual Map**
  - **Concept Map – to describe a concept of a system/sub-system**
  - **Process Map – to describe a plan of diagnostic process**
- **Visual Map Tool**
  - **Visual Understanding Environment (VUE) [1]**
- **Similarity Flooding Algorithm (SFA)**
  - **match the nodes based on their relationship (Melnik, Garcia-Molina, & Rahm, 2002)**
- **WordNet®[2] based semantic similarity measurement (WSSM)**
  - **measure the similarity of content of paired nodes (Simpson & Dao, 2010)**

1. VUE is a visual map authoring tool, an open source project from Tufts University. http://vue.tufts.edu/

2. WordNet® is a database of English words, an open source project from Princeton University. http://wordnet.princeton.edu/wordnet/

The Process of SFA

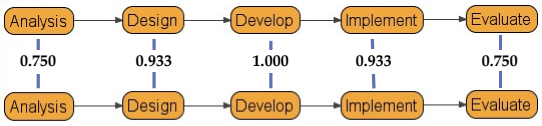


Database Schema Example

(Melnik, Garcia-Molina, & Rahm, Erhard, 2002)

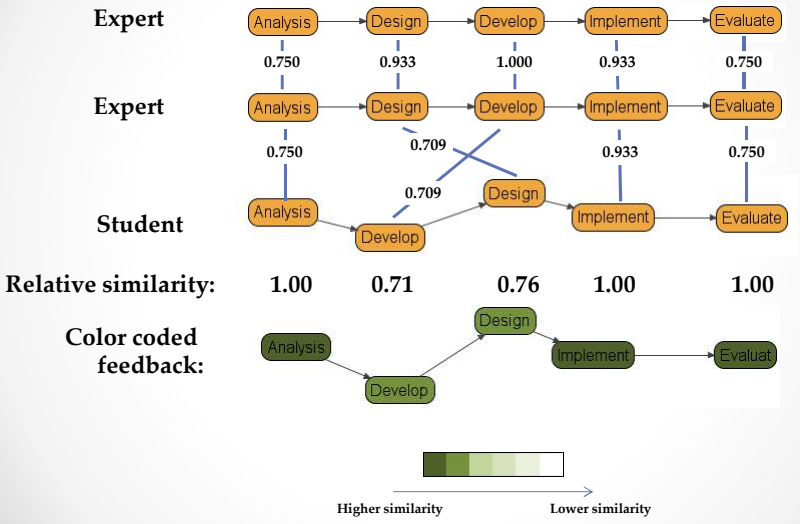
Employee	Personnel	Similarity
ColumnType	ColumnType	0.662
Column	Column	0.604
Dept	**DeptNo**	**0.536**
Date	Date	0.516
table	table	0.512
PK	PK	0.503
Personnel	**Employee**	**0.500**
Pname	**EmpName**	**0.360**
Pno	**EmpNo**	**0.410**
BornDate	**Birthdate**	**0.369**

ADDIE Process Example

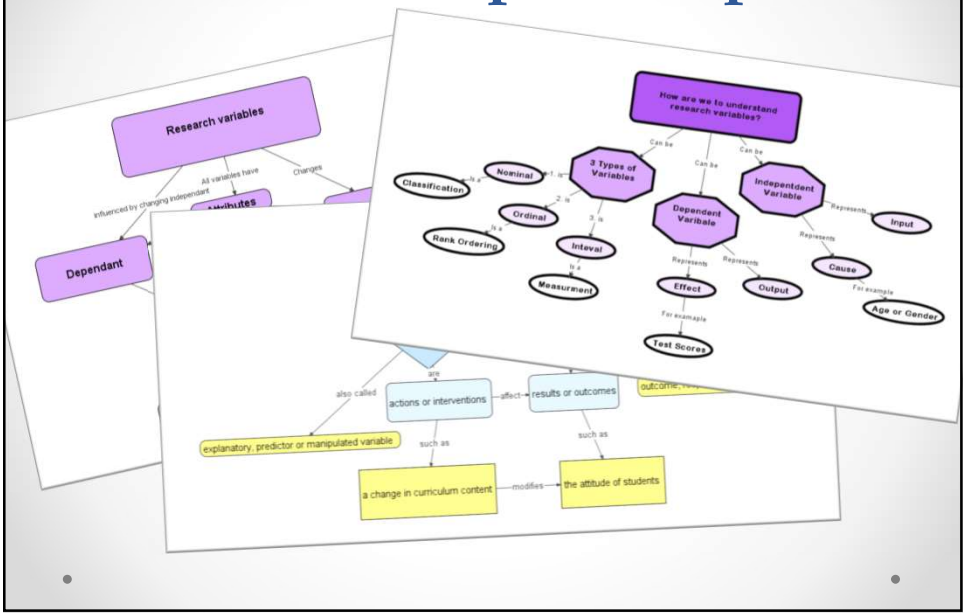


- Nodes with more similar links appear higher similarity
- Even the same map cannot get all notes paired at full (1.0) similarity
- Our solution:
  - Make the expert vs. expert result as a reference similarity
  - Compare the absolute result with the reference similarity, and get a relative similarity for each pair of nodes.

ADDIE Process Example



More Complex Maps



Limitations

- **Generality is chosen over performance.**
- **The mapping suggested by the tool may be incorrect or incomplete.**
- **Unable to detect complex relations between elements**
- **Differences between maps can be detected, but it is difficult to be explained by computer**

Progress of the Project

- **Created procedures for developing CBT w/Lectora & VUE software**
- **Developing first technical problem – Power Grid System**
- **Preparing small group test for evaluating CBT software with feedback**

Q & A

Thanks

References

Melnik, S., Garcia-Molina, H., & Rahm, E. (2002, March 1). *Similarity flooding: A versatile graph matching algorithm and its application to schema matching.* Retrieved from Stanford InfoLab Publication Server: http://ilpubs.stanford.edu:8090/730/

Simpson, T., & Dao, T. (2010, Feburary 8). *WordNet-based semantic similarity measurement.* Retrieved from Code Project: http://www.codeproject.com/Articles/11835/WordNet-based-semantic-similarity-measurement