

Dissertation release

31 March 2015

Learning can be supported with conceptual networks of Wikipedia

Title of the dissertation Computer-Assisted Learning Based on Cumulative Vocabularies, Conceptual Networks and Wikipedia Linkage
(in Finnish: Tietokoneavusteinen oppiminen perustuen karttuviin sanastoihin, käsiteverkostoihin ja Wikipedian linkitykseen)

Contents of the dissertation In a new doctoral dissertation Lauri Lahti proposes that to support learning expressive and adaptive knowledge structures can be created with conceptual networks based on the structure of Wikipedia online encyclopedia. Already previous research has indicated structural similarities between Wikipedia, social networks and human brain networks. This refers to so called scale-free small-world properties that inherently emerge into collaboratively built Wikipedia, the world's largest encyclopedia.

The doctoral dissertation proposes new methods for computer-assisted learning based on cumulative vocabularies, conceptual networks and linkage of Wikipedia articles. Relying on conceptual networks gathered from students and Wikipedia along the research diverse methods have been developed and compared for generation of automatic guidance about useful learning paths. Experimentally it appeared that when browsing in the link network of Wikipedia the students could recall linked words they selected to traverse about 95 percent better than alternative but non-selected on average 2.85 linked words at each step. Experimentally it appeared that by guiding the students to traverse the shortest link paths between concepts the students could recall the sentences corresponding to these links even 15 percent better than when exploring these sentences in a randomized order. When observing the recall in respect to pairs of consecutive links the guidance about the shortest link paths enabled even 26 percent better recall of the sentences than in a randomized order of the sentences.

Experimentally it was found that conceptual networks of students, common language and Wikipedia inherently emphasize different themes that should be addressed when developing learning methods. Along the research conceptual networks corresponding to eleven different language ability levels were created from Wikipedia to enable guidance about learning paths for diverse students in respect to vocabularies of five first school years and reaching at most an about 3000-word vocabulary that has been estimated to be possibly sufficient for a reasonable reading comprehension. Corresponding to vocabularies of about 250–3000 words a set of conceptual networks of about 1000–25000 links were created from Wikipedia and for learning paths relying on them some computational features were identified.

New methods to support learning proposed in the dissertation are contrasted with a broad review about measures of human learning process and representation of knowledge.

Field of the dissertation	Computer Science and Engineering
Doctoral candidate	Lauri Lahti, Master of Science (born 1975 in Helsinki)
Time of the defence	Friday 10 April 2015 at noon
Place of the defence	Aalto University, Computer Science Building, lecture hall T2, Konemiehentie 2, 02150 Espoo, Finland
Opponent	Associate professor Piet Kommers, University of Twente, The Netherlands
Custos	Professor Jorma Tarhio, Aalto University School of Science, Department of Computer Science
Electronic dissertation	http://urn.fi/URN:ISBN:978-952-60-6164-1 (open access)
School of Science electronic dissertations	https://aaltodoc.aalto.fi/handle/123456789/52
Doctoral candidate's contact information	M.Sc. Lauri Lahti, lauri.lahti@aalto.fi, tel. +358 44 927 8269