

Flexible and Exploratory Learning by Polyscopic Topic Maps

Dino Karabeg, Rolf Guescini and Tommy W. Nordeng^(*)

Department for Informatics, University of Oslo, POBox 1080, 0316 Blindern, Norway

(phone: +47-2285-2702; fax: +47-2285-2401; e-mail: dino.karabeg@ifi.uio.no)

^(*)Cerpus AS, 8432 Alsvåg, Norway

(phone: +47-7611-9901; fax: +47-7611-9909; e-mail: tommy@cerpus.com)

Abstract

Flexible and active education calls for a comprehensive restructuring of the traditional university course format. Such restructuring can be done in a natural and coherent way by implementing Topic Maps in e-learning. In this paper we describe Polyscopic Topic Maps, an information structuring method which is being developed by the authors, a university course model called Flexplearn which is based on this approach, and a prototype Flexplearn course where our model is currently being implemented, used and tested. We also describe BrainBank Learning, a Topic Map-driven application, for learning of concepts and concept relations that we are implementing with Flexplearn.

Introduction

Topic Maps is a method for organizing, retrieving and navigating information. Along with Semantic Web, the Topic Maps method allows for creating a semantic layer on top of Internet resources, which allows for semantic and more efficient access [1]. The main concepts in Topic Maps are topics, associations and occurrences [2]. The associations specify in what way the topics are related with one another. By following an association, the search can move from a topic to the one which bears with it a desired semantic relationship.

Topic Maps method has been proposed as a remedy for information overload [3], but so far Topic Maps has not been utilized extensively for education and learning purposes. The first Topic Maps application for eLearning, BrainBank Learning [4] focused on bottom-up learning rather than education whereas TM4L (Topic Maps for Learning) [5] has been developed a framework supporting the development of ontology-aware repositories of learning materials.

Polyscopic Topic Maps

The main principles of polyscopic information structuring may be formulated as follows:

- Information exists on all *levels*. Both *high-level* and *low-level* views must be provided (*vertical abstraction*).
- Information has multiple *aspects*, some of which are subtle or hidden. The most relevant *aspects* must be provided (*horizontal abstraction*).
- Information is a function of the way of looking or *scope*. The *scope* is *coherent* if it represents a single level of detail and angle of looking (or intuitively, if it reflects a single viewpoint on the metaphorical mountain). Each information module must be associated with a single *coherent scope* (*coherence*).
- The knowledge of the *scope* is crucial for proper understanding (intuitively, one must know where on the metaphorical mountain one is standing when looking at a piece of information). Each information module must be associated with a clear and correct representation of the *scope* (*orientation*).
- The *scope* determines the *view* (intuitively, the *scope* is the control knob given to the reader to switch between *views*). The reader must given the capacity to select the *view* by changing the *scope* (*navigation*).

The Topic Maps provide a natural platform for polyscopic structuring of information. The instance/type and the subclass/superclass constructs allow for *vertical abstraction* and for implementing the *levels*. The scoping constructs allow for *horizontal abstraction* and for implementing the *aspects*. On the other hand, the Polyscopic Modeling methodology provides principles for structuring the Topic Maps in a polyscopic way.

A flexible learning environment

The notion of a *flexible learning environment* is central to the Flexplearn model. The purpose of a *learning environment* is to provide a variety of *learning resources*, and a rich and inspiring environment in which learning happens in a number of

ways, not the least by actively exploring a certain theme or themes of interest. The ID course provides a *flexible learning environment* for studying *information design*. Students learn from one another, from the instructors and from the online and other resources. The main role of the class instructor is to set up and coordinate the *flexible learning environment*. Standard tools such as a Wiki and a discussion forum are provided. Other tools are being designed and experimented with. BrainBank Learning [4] is a web—based Topic Map application for concept centered learning: Every student construct and maintain their own Topic Maps as they learn new concepts, understand concept relations (associations) or experience new concept scopes.

Whenever possible, the *learning resources* are made available online. A resource is made available by ‘placing it on the (ID course Polyscopic Topic) map’. The course Polyscopic Topic Map is where all the online *learning resources* can be found.

The course instructor has the role of the head designer, facilitating and coordinating the individual projects. The ID course Topic Map reflects the current status of our knowledge about *information design* (‘the world as we know it’). The students’ task is to organize an ‘expedition’, venture into a part of the ‘map’ of their choice, explore it and bring back knowledge and resources. Based on everyone’s findings, we supplement, refine and re-create the map for the next generation of students. Naturally, the ID course Polyscopic Topic Map provides also the ‘containers’ for the knowledge and the resources resulting from the student ‘expeditions’. By participating in projects, the students learn *information design* in two ways: by exploring a theme which is of interest for *information design*, and by presenting this theme by using *information design* methods and tools. The result of each student ‘expedition’ is a project website and its documentation.

Assessment

Educational practices are changing from being predominantly teacher-led to largely student-centered. But how can the students themselves be able to assess their position relative to a future learning environments consisting of a diverse set of learning activities from which learners somehow may take their pick? The learner’s history and goals define an entry position relative to the learning activities. A different entry position is likely to result in a different partition of the set of available activities in activities to skip and to complete. Different entry points will thus result in different paths through the set of relevant learning

activities. Computer supported positioning in learning networks could contribute to the formidable set of hurdles that arises in such a scenario. In fact, it assumes answers on a substantial number of the research questions that were recently proposed for intelligent information systems [6]. In this article we focus on how the learner’s history can be recorded and stored in electronic portfolios.

Concluding remarks

The Polyscopic Topic Maps are particularly suitable for multi-disciplinarity, inter-disciplinarity and trans-disciplinarity learning and research. They allow for overcoming the separation between the humanistic and the technical aspects of an issue, which needs to be encouraged [7]. Our Flexplearn course model is a result of a different approach where a completely new learning model is developed, which on the one hand exploits the advantages of the available technology, and on the other hand employs the known principles of good learning. The approach taken in the development of Flexplearn can be generalized and applied to other tasks [8].

References

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