

Collective Intelligence Approach for Formulating a BOK of Social Informatics, an Interdisciplinary Field of Study

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ABSTRACT

This presentation shows a collective intelligence approach for formulating a body of knowledge (BOK) of social informatics (SI), a relatively new interdisciplinary field of study, by implementing a BOK constructor based on Semantic MediaWiki.

Keywords

Social Informatics, Body of Knowledge, BOK, Collective Intelligence, Collaborative Document, Wiki, Semantic MediaWiki

1. INTRODUCTION

Body of knowledge (BOK) is a well-known approach that is used to describe a field of study. For example, CSBOK is a description of computer science (CS) in which details are provided by the joint task group of IEEE-CS and ACM [1]. CSBOK is organized hierarchically into three levels. The highest level is the area; it represents a particular disciplinary subfield. Areas are subdivided into units; these represent individual thematic modules within an area. Units are further subdivided into a set of topics; these are the lowest level of the hierarchy. Social informatics (SI) is a rather new interdisciplinary field of study that combines both social and computer sciences. To the best of the authors' knowledge, there has not yet been a consensus on the definition of SI. For example, although Wikipedia [2] states that "Social informatics refers to the body of research and study that examines social aspects of computerization [3]," it is difficult to determine the knowledge areas, units, and topics that should be covered by SI. In order to clarify the social informatics BOK (SIBOK), we focused on a collective intelligence approach, particularly a Semantic MediaWiki (SMW) based approach to construct a SIBOK as a collaborative document.

2. BOK Constructor Design

2.1 SIBOK Construction Principle

When constructing the SIBOK, we first presumed that a three-

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layered tree of SIBOK could be obtained easily. However, we found that this was not possible due to a crucial difference between CS and SI; CS is a relatively matured field of study while SI is not. Due to this difference, we decided to adopt a bottom-up approach rather than a top-down approach in the sense that we first collected teaching materials such as text books, handouts, PowerPoint (PPT) slides, and PDF files used in SI lectures to extract all the relevant keywords, some of which could then be used as the theme of an area, unit, or topic in SIBOK. We also found that it is difficult to ask teachers to specify which keyword represents an area, unit, or topic. Instead, we found that they could specify the conceptual hierarchy among keywords. By assembling such hierarchies, a BOK tree of arbitrary depth could be constructed. However, since we recognized that the area-unit-topic three-level hierarchy has a significant meaning to represent a BOK of a field of study, we reduced the tree having an arbitrary depth into a three-level tree using a BOK Editor function, a part of the BOK Constructor. The three-level tree could be a "view" of the original BOK tree of arbitrary depth. Figure 1 shows the BOK tree generation process.

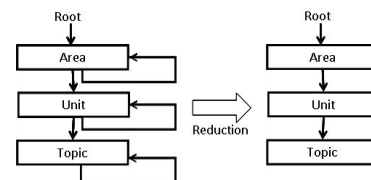


Figure 1. BOK Tree Generation Process

2.2 SIBOK Construction Dynamics

Figure 2 shows how SIBOK, documents, teaching materials, and keywords are related dynamically to construct a SIBOK.

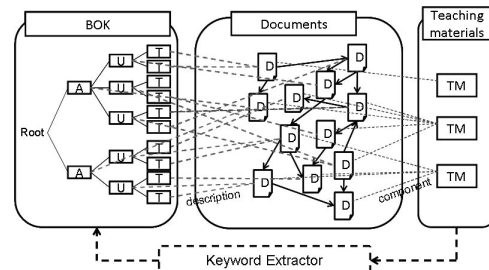


Figure 2. SIBOK Construction Dynamics

We extracted documents by analyzing teaching materials semantically so that a document could be a meaningful unit in

terms of an area, unit, or topic. Under the current prototyping, this analysis was performed manually using the BOK editing function.

2.3 SIBOK as a Reference Model

Since SI is a young and interdisciplinary field of study, it is envisioned that SIBOKs and curriculums constructed by different institutes may differ from each other due to the differences in institutional policy and scope. Therefore, if we could integrate such different SIBOKs into a single SIBOK, it could serve as the “Reference Model of SIBOK” in the sense that each institute’s SIBOK could refer to the reference model.

3. BOK CONSTRUCTOR PROTOTYPING

3.1 SMW-based Approach

Since SI consists of various interrelated fields of study such as computer science, social science, and so on, many domain-specific specialists such as teachers in computer science, sociology, finance, and so on may need to collaborate to construct a SIBOK that is common to their institute. Further, since SI is a young interdisciplinary field of study, its structure may change over time. In addition, as shown in Figure 2, we plan to introduce a semantic network structure over the set of documents to make it more informative. Therefore, we decided to adopt an SMW-based approach to prototype a SIBOK Constructor.

3.2 BOK Constructor

Figure 3 shows the configuration of the SIBOK Constructor. It consists of four major components: BOK Editor, SMW, Uploader, and Theme Recommender. The BOK Editor is a wrapper for SMW through which editors, i.e., academic staff (teachers) of an SI institute, can interact with the system. The Uploader is required to store teaching materials. It may play an important role in decomposing teaching material into a set of documents with the help of editors. The Theme Recommender uses teaching materials to extract keywords and recommend them to editors for possible use as the themes of areas, units, or topics. The SMW is the kernel of this system. It stores Wiki pages and documents. Each Wiki page or article may refer several documents, and several Wiki pages may refer a document.

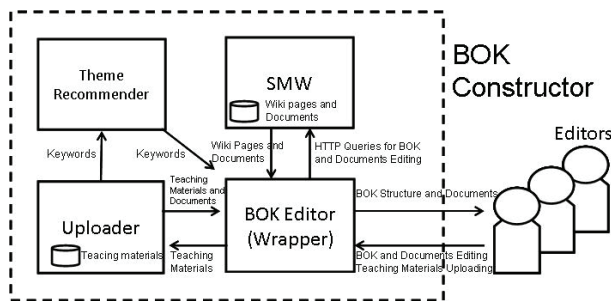


Figure 3. Configuration of SIBOK Constructor

3.3 BOK Editor

For editors to interact with SMW easily, a wrapper called BOK Editor is introduced. It has four functions: (1) constructing and editing a SIBOK tree on SMW by utilizing its semantic link capability; (2) assisting editors in uploading teaching materials to the Uploader and attaching a set of documents to a node (area,

unit, or topic node) of the SIBOK; (3) assisting editors in extracting keywords from teaching materials stored in the Uploader and using them as the themes of SIBOK nodes, i.e., Wiki pages or articles; and (4) assisting editors in decomposing teaching materials stored in the Uploader into documents and attaching them to SIBOK nodes. Note that these functions are not simply provided as SMW extensions, but they are in fact implemented as an integrated system that uses SMW partially.

In addition, the BOK Editor should have the following functions: (1) warn an editor when he/she defines an area, unit, or topic whose name already exists in the SIBOK; (2) assist in finding and defining homographs; (3) assist in finding and defining synonymous words; and (4) WYSIWYG editing capability to manipulate the hierarchical structure of SIBOK.

3.4 Prototyping

The SIBOK Constructor prototype is currently under development at the School of Social Informatics, Aoyama Gakuin University, Kanagawa, Japan. Since our system design principle is based on the bottom-up approach due to the nature of social informatics, we constructed a SIBOK based on a set of documents and keywords that were produced by analyzing a set of teaching materials. To attach a set of documents to a SIBOK node, we classified Wiki pages into three types: (1) a Wiki page representing a node of the SIBOK tree—this type of page has upper and lower links to represent the three-level hierarchy of SIBOK as well as the pointers to its documents; (2) a Wiki page representing a document; and (3) a Wiki page representing teaching material. We use Ruby to implement this system. MediaWikiAPI is used for editing MediaWiki.

4. CONCLUSION

In this presentation, we have shown how to define a body of knowledge (BOK) of social informatics (SI), which is expected to play an essential role in resolving the complex problems raised in the current so-called knowledge-based society. We propose a collective intelligence approach to formulate a SIBOK, and describe the design and implementation of the BOK Constructor. Although this paper focuses on the construction of a SIBOK, we believe that this collaborative bottom-up approach can be applied widely, for example, to high-level enterprise architecture modeling and domain modeling.

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