KnowWE – Community-based Knowledge Capture with Knowledge Wikis

Joachim Baumeister, Jochen Reutelshoefer and Frank Puppe
Institute of Computer Science, University of Würzburg, Würzburg, Germany
baumeister/reutelshoefer/puppe@informatik.uni-wuerzburg.de

ABSTRACT

This paper presents a collaborative knowledge engineering approach based on the widespread wiki technique. The interface of a standard wiki system is extended to allow for the capture, the maintenance and the use of knowledge systems.

Categories and Subject Descriptors: I.2.1 [Applications and Expert Systems]: Miscellaneous

General Terms: Management, Documentation.

1. INTRODUCTION

We give a system description of the knowledge wiki KnowWE (Knowledge Wiki Environment) that enables domain specialists and experienced users to build knowledge–based consultation systems collaboratively on the web. Consultation systems can be used for recommendation and selections tasks. Knowledge wikis extend classic wiki systems by an explicit knowledge markup, that is formalized together with the normal text within the edit pane of the wiki. Entered knowledge is interpreted and maintained by an additional knowledge wiki engine. The user can then browse the knowledge wiki using the normal web links but is also able to activate an interactive problem–solving process using the explicit knowledge. The distributed and open nature of a knowledge wiki may help to weaken important issues of the knowledge engineering bottleneck: 1. The total knowledge acquisition and maintenance costs of single developers, 2. the dependency of single domain specialists, and 3. the complexity of building and maintaining large knowledge bases. In the following, we sketch the two main aspects of the proposed approach: first, how to formalize knowledge within a knowledge wiki, and second, how to consume the captured, distributed knowledge. The presented work is illustrated with examples taken from a sports consultation system, that recommends appropriate forms of sport according to given user inputs.

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2. KNOWLEDGE CAPTURE

The acquisition and maintenance of knowledge is done within the edit pane of the wiki, i.e., by entering and changing text. The knowledge is embedded "in–text" and is jointly edited together with the textual content of a wiki page, which requires a textual representation of the actual knowledge.

Explicit Problem–Solving Knowledge We distinguish 1) terminological knowledge for the (hierarchical) definition of user inputs and derivable system outputs, and 2) problem–solving knowledge to derive solutions for given inputs. For both, KnowWE provides textual representations to be entered through the classic wiki interface. Usually, the terminology is defined manually using a predefined wiki syntax shown in Figure 1(a). Here, the user inputs are defined as questions, e.g., "Social Interaction" (as a one–choice question). The possible answers of these questions are denoted below the particular questions. Similarly, the hierarchy of solutions can be also defined in a wiki-like way. For the definition of problem–solving knowledge KnowWE provides (heuristic) rules, decision trees, and set–covering models. The example in Figure 1(b) shows a screenshot of the edit page of "Swimming" included in a knowledge wiki of a sports recommendation system. Here, some text is given as classic wiki text, i.e., "The evolution of swimsuits. . . ". Thereafter, explicit knowledge is surrounded by a special *Kopic* tag (for *k*nowledge t*opic*); a set–covering model for the solution "Swimming (professional)" is given, i.e., typical requirements/findings whose observation would derive this solution.

Semantic Annotation Already defined user inputs can be used to annotate text phrases in the normal wiki text. In its general form, this concept is already known in semantic wikis, e.g. [3], where text phrases are typically annotated by properties of the concept describing the particular wiki page. In contrast to semantic wikis we use the annotation in knowledge wikis for interactive problem–solving. An extract of the edit pane for a sports consultation wiki is shown in Figure 1(c). The text describing the sports form "swimming" is anno-

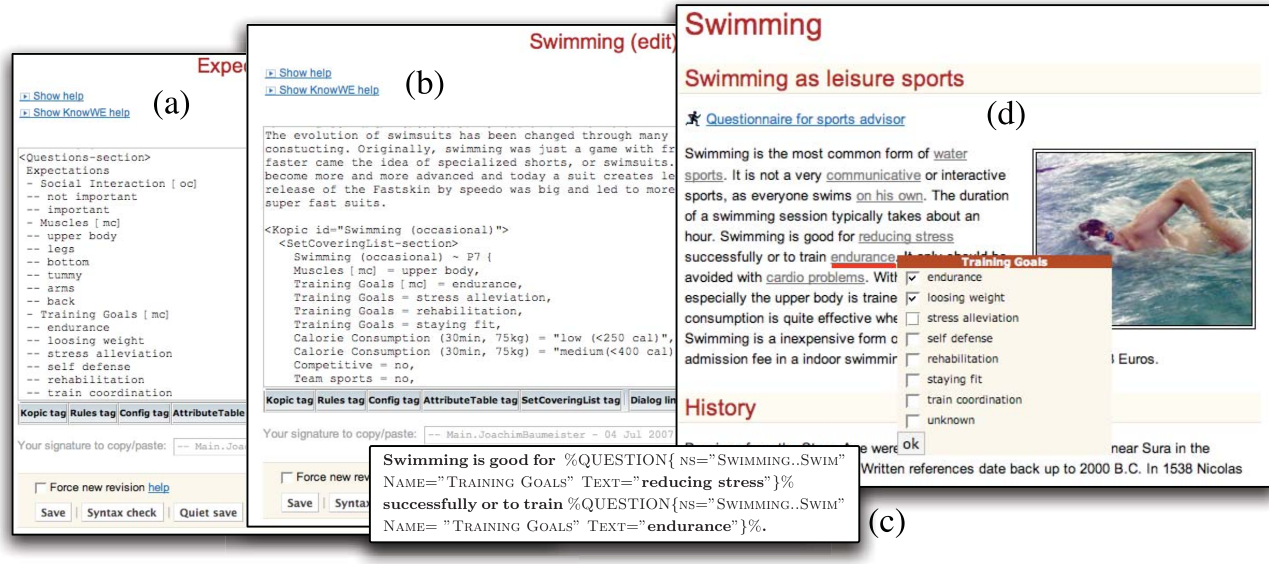

Figure 1: Example for defining "Training Goals" as ontological concept (a), using the concept in a set–covering model (b), using it in a semantic annotation (c), and serving as an in–place answer (d).

tated by concepts from the corresponding knowledge base. Here, text phrases are annotated to represent inputs, i.e., questions, of the knowledge base "Swim" in the wiki page "Swimming", i.e., the namespace. For example, the first annotation links the wiki text "reducing stress" with the user input "Training Goals".

3. KNOWLEDGE CONSUMPTION

When saving the edited content and knowledge, respectively, the knowledge wiki engine is extracting the knowledge parts from the wiki text. The textual representation of the knowledge is then translated into an executable knowledge base and stored in a knowledge repository together with its namespace, i.e., the wiki page it occurs in. Solutions and user inputs in different knowledge bases but with identical names and identical structure are aligned automatically. More complex alignments can be defined by specific alignment rules. Compiled knowledge can either be used by starting a structured dialog with the user or by using the in–place answering technique provided by the knowledge wiki. Structured questionnaires are generated by the manually defined user inputs and help to present a list of questions in a standardized way. In–place answering is available when the text of the wiki was annotated semantically. Then, pop–up menus are provided at the place of the annotated phrases that enable the user to answer questions during reading the text. For example, in Figure 1(d) the click on the text phrase "endurance" activates a pop–up asking for the "Training Goals" of the user, where "endurance" is a possible answer. Any user input entered into the system – either by a standardized questionnaire or by in–place answering – is given to the reasoning engine of the knowledge wiki. The automatic alignments of the different knowledge bases allow for a notification of all observing knowledge bases. Active (derived) solutions are displayed in the wiki next to the presented wiki page.

4. CONCLUSIONS

The presented paper introduced a knowledge–based extension of a wiki system that enables domain specialists and experienced users to collaboratively build consultation systems. In general, community–based knowledge formulation on the web was proposed by many approaches, e.g., [1, 2]. The feasibility and usefulness of the approach was demonstrated in a case study where 45 students built a larger wiki system for different recommendation tasks, e.g., movie recommendation and meal selection. In this evaluation project 689 knowledge bases including more than 7000 set–covering relations were formalized in about 4 weeks counting more than 2200 user edits of the developed knowledge bases.

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