

Chapter 8.13

The Interactive Computing of Web Knowledge Flow: From Web to Knowledge Web

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ABSTRACT

Web Knowledge Flow provides a technique and theoretical support for the effective discovery of knowledge innovation, intelligent browsing, personalized recommendation, cooperative team work, and the semantic analysis of resources on Internet, which is a key issue of Web services and Knowledge Grid/Web(Zhuge, 2007; Zhuge, 2005). In this chapter, first the authors introduce some basic concepts related to Web Knowledge Flow. Next they illustrate the concepts of interactive computing, including the Web interaction model, the implementation of interactive computing and the generation of Web Knowledge Flow. Finally, the applications of Web Knowledge Flow will be given.

1. WEB KNOWLEDGE FLOW

1.1 Concept of Web Knowledge Flow

Many efforts have been done on the knowledge flow area. Some researchers study knowledge flow based on the organization of workflow, which is about the knowledge demand of the logic relationship and the role between the tasks of workflow. It can be realized by the way of pushing (Zhao, 2001; Wolverton, 1997). Taxonomy model aims at providing an overall picture of grid workflow verification and validation (Chen, 2007). Chen and Yang develop a novel checkpoint selection strategy that can adaptively select not only necessary but also sufficient checkpoints (Chen, 2007). Spiral model proposed by Nonaka describes the knowledge flow

from epistemology to ontology. In the epistemology, knowledge flows from implicit knowledge to explicit knowledge, then from explicit knowledge to implicit knowledge. In the ontology, knowledge flows from person to group, and then from group to person (Nonaka, 1994; Nonaka, 1995). Based on Spiral model, Knowledge Flow Dynamic Model (*KFDM*) proposed by Nissen makes the knowledge flow over time explicitly. It can support a multi-dimensional representation that enables a new approach to analyze and visualize diverse knowledge flow patterns in enterprises (Nissen, 2002). Knowledge energy model proposed by Zhuge et al. takes knowledge energy as the driving cause to form an autonomous knowledge flow and explores the hidden principles (Zhuge, 2005). The principles of knowledge flow engaged in cooperative cognition are explored by Dou from the perspective of learning and cognition evolution (Dou, 2006). Textual knowledge flow proposed by Luo et al. aims to provide an effective technique tool and theoretical support analysis for the discovery and cooperation of knowledge innovation, intelligent browsing, and personalized recommendation in Web services and e-Science Knowledge Grid (Zhuge, 2002). Other knowledge flow models are peer-to-peer team knowledge sharing and management based model (Luo, 2008), agent based model (Nissen, 2004), and the trust based model (Guo, 2005), etc.

Definition 1 (Web Knowledge Flow, WKF):

Web Knowledge Flow (WKF) is a sequential link between topics with rich semantics, which is activated by user's demands and changes with the demands.

Compared with other multiple types of knowledge flow (Nissen, 2002; Zhuge, 2005), WKF has some special characteristics as follows.

- WKF reflects the flow of knowledge between topics on Internet;
- WKF contains rich semantics between topics, which leads to similar WKF, associated WKF, and causal WKF etc;

- WKF is activated by user's demands, in other words, WKF is a kind of service on demands;
- WKF changes with the change of user's demands.

When a user browses topics, a WKF is a browsing path of topics recommended to the user. When some browsing paths of topics are activated at the same time, one of them should be chosen and recommended according to user's demand.

As can be seen, Web knowledge flow provides a technique and theoretical support for the effective discovery of knowledge innovation, intelligent browsing, personalized recommendation, cooperative team work, and the semantic analysis of resources on Internet, which is a key issue of Web services and Knowledge Grid.

According to different relationship between nodes in Web Knowledge Flow, WKF can be classified into Association Web Knowledge Flow (Luo, 2008) and Similarity Web Knowledge Flow (Luo, 2008).

Definition 2: (Association Web Knowledge Flow, *AWKF*)

Associated knowledge flow is a sequential link with rich semantics between associated topics, which is activated by user's demands and changes with the demands.

Compared with other knowledge flows, *AWKF* has the following distinguished characteristics.

- *AWKF* can reflect the flow of knowledge between topics;
- *AWKF* can contain associated relation between topics;
- *AWKF* can be activated by users' demands, i.e., *AWKF* is a kind of service on-demand;
- *AWKF* can updates with users' demands.

When a certain user browses topics in the Web or an e-Science environment, *AWKF* is a browsing path of topics. When several browsing paths of

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