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Ontological subscription and blocking system that alleviates information overload in social blogs

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ABSTRACT

This work develops a novel Ontological Subscription and Blocking System (OSBS), an ontology-based system, that helps users of social blogs specify policies for subscription and message blocking in social blogs to eliminate information overload. This system uses ontology, metadata, and rules to deliver subscribed posts, block unwanted posts, and detect policy conflicts. A laboratory experiment is conducted to assess the effectiveness of the OSBS in alleviating information overload. Experimental results indicate that the OSBS eliminates information overload.

1. Introduction

Social media sites allow surfers to create and exchange user-generated content via social networks using Web 2.0 technology [13]. When many surfers use, say, blogs, information overload becomes a serious problem [19]. Information overload means that readers receive a massive amount of information that cannot be processed appropriately by readers within a specific period [7]. When information overload is encountered, users may have the feeling of losing control [4]. Therefore, a mechanism that eliminates information overload is needed.

Two approaches, subscription and blocking, are commonly used to mitigate online information overload. Readers use a subscription mechanism to express their message needs and publishers deliver content to readers who have specified an interest in this material [11,17]. Author name lists are typically used to subscribe to content in social media. With a blocking approach, readers decide which message types are unwanted and are therefore not delivered.

Ontology is defined as human-created knowledge and in a format that represent shared conceptualization [9,8]. Ontology can provide meanings and semantics for an automation mechanism [3,12].

To effectively mitigate information (post) overload in social blogs, this work applies a novel Ontological Subscription and Blocking System (OSBS). The OSBS oversees incoming posted messages from social blogs using to reader's preferences and detestation. Ontologies, social relation, collaborative verb, and resource ontology, and rules are essential elements in the OSBS. The OSBS mechanism uses these ontologies, subscription delivery rules, and information blocking rules to automatically provide appropriate messages and block undesirable messages. The OSBS uses automatically these ontologies and conflict detection rules to identify and resolve conflicts between policies. This work also assesses experimentally the effectiveness of the OSBS in terms of information overload alleviation, ease of use, and usage intention.

The remainder of this paper is organized as follows. Section 2 summarizes related work. Sections 3–6 outline the OSBS design and scenarios for demonstrating how the OSBS works. Section 7 reports experimental results. Finally, Section 8 gives conclusions.

2. Related work

Table 1 summarizes studies addressing online message subscription and blocking. Most use mechanisms to control access to sensitive data. That is, existing solutions focus on data security and privacy protection, and few studies have focused on management of information overload.

Facebook provides a mechanism that users can deploy to block incoming messages and add-friend requests. However, Facebook does not currently offer a mechanism to manage all incoming messages according to content characteristics. Two studies in Table 1 used ontologies to control access and hide information, while no

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Table 1
Related works about information subscription and blocking.

Approach	Goal and applied context	Strength	Drawback
Husain et al. [10]	Providing cross-organizational interoperability of control access in geo-spatial domain	Using ontology to achieve interoperability in access control	Do not tackle the information overload issue
Jafarpour et al. [11]	Deliver heterogeneous content according to information needs, user profiles, and device characteristics	Processing heterogeneous content format	Do not considers social relationships
Bao et al. [1]	Protect customers' shopping private data in electronic commerce	Protecting online customers' privacy	Do not tackle the information overload issue
Pingley et al. [15]	Hiding location information depends on context in mobile device context	Protecting location privacy	Do not tackle the information overload issue
Cho et al. [5]	Hide location information in ubiquitous computing	Protecting location privacy	Do not tackle the information overload issue
Benevenuto et al. [2]	Detecting advertising spammers for online video in social networks	Emphasizing spammers detection	Do not provide subscription approach
Noh et al. [14]	Find emergent knowledge from annotated blog posts based on ontologies	Using ontology to summarize information according blog posts	Do not provide subscription and blocking approach
Cho et al. [6]	Prohibit inappropriate people to read articles in Web 3.0 environment	Using ontology to block articles for privacy protection	Do not tackle policy conflict detection problem
Information Subscription and Blocking in Facebook	Users use subscribe button to follow new posts by specific persons	Using friend ontology to providing both subscription and blocking approaches	Collaboration and resource ontologies are no revealed
	Unsubscribe posts form a specific friend. Prohibit inappropriate people to read my contact details, send message to me, and request me to add a friend. Prohibit an application to send message to me.		The subscription and blocking functionality based on collaboration and resource characteristics is not provided
Ranjbar and Maheswaran [18]	Block community-centric information in social web	Blocking information from inappropriate users	Do not provide subscription approach

study has developed an ontology-based approach for blocking messages.

Three of these studies focus on subscription mechanisms. Facebook's subscription function allows users to subscribe to a Facebook user's new posts. Jafarpour et al. [11] delivered content in an appropriate format to subscribers via a novel subscription system. Noh et al. [14] used semantic rules to find emergent knowledge (*e.g.*, top 20 most discussed books on blogs). Only one mechanism allows users to search for posts using keywords. Conversely, the proposed OSBS uses ontologies to subscribe to "interesting" posts, block inappropriate posts, and detect automatically policy conflicts.

Table 1 shows the strengths and drawbacks of existing approaches. Studies on information access [10,1,15,5] focused on privacy protection and mechanism interoperability and did not tackle the information overload. Although Jafarpour et al. [11] handled information overload, they did not use the social media context.

Table 1 also list several approaches used to deal with information overload issue in social media. Benevenuto et al. [2] focused on advertising spam in online videos and did not develop a subscription approach. Noh et al. [14] only summarized blog posts to generate an information-based ontology. Cho et al. [6] used social relationship and content ontology to block inappropriate content. However, few studies have discussed the subscription issue and no study has discussed policy conflict detection [6]. Ranjbar and Maheswaran [18], who provided an approach for blocking information from inappropriate users, did not provide a subscription approach. In the practice, Facebook uses a social relationship ontology as a mechanism that includes subscription and blocking approaches. However, collaboration and resource ontologies are not included, limiting Facebook's subscription and blocking functionalities. In summary, these studies did not adequately provide a subscription and blocking mechanism for social media. Therefore, this work develops a subscription and blocking system based on social relation, collaboration verb, and resource ontologies. A policy conflict detection mechanism is also proposed.

3. OSBS system design

3.1. OSBS overview

Generally, the OSBS detects conflicts and delivers posts after analysis using 13 elements: subscription policy; blocking policy; ontology; policy conflict detection rule; blocking policy with conflict; subscription policy with conflict; blocking policy with resolved conflict; subscription policy with resolved conflict; post with collaborative information; subscribed post delivery rule; post blocking rule; subscribed post; and new post. Fig. 1 shows these elements and their relationships.

The subscription policy and *blocking policy* (Fig. 1) start the OSBS. *Policy form* is a format for representing *policy content*. Fig. 4 shows the format of subscription policy (Section 3.2). Fig. 6 shows the format for blocking policy. A user refers to the ontology to complete the policy forms that indicate policy content. Therefore, *policy content* in the subscription policy (in Fig. 1) consists of social relation, collaborative verb, and resource. Additionally, *policy content* of the blocking policy consists of adverb, collaborative verb, and resource.

Ontology represents domain knowledge that consists of concepts and relationships. Several ontologies are necessary in this work: social relation; collaborative verb; and resource ontologies. Fig. 2 shows the collaborative verb ontology.

The OSBS generates blocking policy with conflict according to the blocking policy, ontology, and policy conflict detection rule. The OSBS mechanism also generates subscription policy with conflict according to the subscription policy, ontology, and policy conflict detection rule. Table 3 shows the policy conflict detection rules, which are described in Section 3.2.

A user prioritizes inconsistent policies; this list is then used to resolve conflicts. After this list for inconsistent policies is given, the OSBS obtains *blocking policy with resolved conflict* and *subscription policy with resolved conflict*.

A user receives the subscribed post by the OSBS according to subscribed post delivery rule, post with collaborative