A User Rights Concept for Semantic Media in Ambient Learning Spaces

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Abstract—**In our research project Ambient Learning Spaces (ALS), users interact with Semantic Media. Semantic Media consist of both plain media, such as still images, audio, video, text, or 3D objects, enriched by semantic relations and annotations describing content and inheritance structure of the media. These annotations allow classifying and arranging the media into semantic models. Semantic Media represent the information users create, collect and access, e.g., in the museum or school context of our research project. As media are accessed and used in various applications from the family of ALS applications, a user rights concept is required to manage access to these media. Usually such user rights have to be set explicitly.**

Keywords-Semantic Media; User Rights Concept; Implicit User Rights Setting;

I. INTRODUCTION

A single instance of plain media, such as a still image, audio, video, text or 3D object, represents information. Only when such media are integrated into meaningful information structures, these media become valuable in specific contexts [1]. We decided to build up such information structures as semantic models through semantic annotations. Thus, plain media enriched by semantic annotations will be referred to as *Semantic Media*. In our research project *Ambient Learning Spaces (ALS)*, body- and space-related human-computer interaction, as well as the concept of cross-device interaction (XDI) defines the conceptual foundation. For this purpose, we have developed a family of interconnected learning applications. Providing these applications we focus on self-directed learning with interactive media [2]. In our ALS environment, learners create and interact with such Semantic Media in school and museum contexts, using their own mobile devices [3]. In these contexts, users will typically be school students, teachers, museum visitors, staff, or curators. They interact with Semantic Media from mobile or stationary devices running applications from the ALS family, all interconnected through a framework of web-based services and a data repository, the *Network Environment for Multimedia Objects (NEMO)*. NEMO stores and handles all media within the ALS research project. The framework is running in multiple instances cloud-based, as well as on-site with our project partners, two schools and two museums. During their use of ALS applications, users' access to media is not limited to the media they create themselves. The philosophy of ALS is to share knowledge and engage in communicative and collaborative learning processes through these systems, where knowledge is expressed through Semantic Media [1]. This requires a user rights concept in order to manage access to these Semantic Media.

Apart from setting user rights explicitly, it appears that in a multi-device and multi-user ecology, like ALS is used in schools and museums, implicit settings of user rights are even more significant. In an initial approach, we develop a concept, as outlined below, in which, we use semantic annotations to equip each instance of Semantic Media with the required settings.

In Section 2 we regard related work, distinguishing our approach from those applying explicit user right. In Section 3, we outline a concept that focuses on the implicit setting of user rights, which reflects the users' contextualized use of the media in the context of its use. In Section 4, we conclude with a summary and outlook, as well as discussion stimuli.

II. RELATED WORK

Explicit user rights settings are required in various contexts and have been researched based on, e.g., inheritance, role hierarchies or in privacy-sensitive contexts, by Lu et al. [4]. User rights on media can be perceived similar to access permissions. Ferrara et al. [5] outline a concept to reduce annotation overhead by automatically inferring access permissions, which is also applicable to media, whereas Treu et al. [6] introduce a concept of granting implicit access to personal location information on basis of certain rules applied to the relations between users.

Distinguishing the concept presented in this contribution from the related work, we connect the user's explicit group-based user rights settings for each medium with implicit user rights. These user rights are derived from the users' utilization of the media in context of the applications, in which they create or interact with the media.

III. CONCEPT FOR IMPLICIT USER RIGHTS

To illustrate the concept for implicit user rights presented in this contribution for discussion, in the following we will use a school scenario. This is based on our concept of Semantic Media, which is annotated in NEMO (see Figure 1).

In ALS, users create new media with the *Mobile Learning Exploration System (MoLES)* [1], an ALS application for mobiles. In a typical setting, MoLES is used collaboratively by a group of 3-4 school students. On a field trip, multiple groups create and annotate media using MoLES in order to answer questions. These media are transferred to and stored inside NEMO. After the field trip
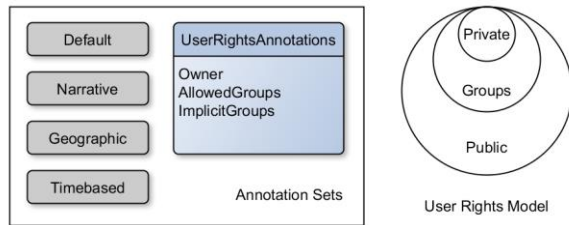
Figure 1. Left: NEMO annotation sets for Semantic Media.
Right: Groups of the user rights model for ALS.

and back in school, the students prepare a presentation of their findings using the media they created previously. They discuss their findings and share media among each other and across their groups defined previously. When they finished their work, they showcase their presentation, at first in class. They can afterwards decide, whether to show their presentation (media) on displays in a public space in school.

The scenario illustrates the use of media in tasks like creation, collaborative usage, and sharing. As the scenario outlines, no user explicitly sets user rights to their media. Instead, they simply interact with the media through ALS applications. Through this interaction, they implicitly set the user rights on their Semantic Media.

This concept relies on a group-based model with three types of access permissions: *noaccess*, *read*, and *write*. These are sufficient for all ALS scenarios. At first, the users are explicitly assigned into *groups*, e.g., depending on classes, or school projects. They are also implicitly assigned to a group, e.g., when a group of students use MoLES together. Whenever a user in ALS creates media, NEMO applies a default *private* setting to protect the media from access of others (see Figure 1) by setting all users except the owner to *noaccess*. Depending on the application's context the media was created in, this setting is adjusted. As our scenario outlines, the media was created with MoLES collaboratively. Thus, the media is implicitly shared among users using MoLES together, giving the group members *write* access implicitly. Together, they work on their presentation and engage in discussions with other students. Depending on their location, they share media during discussions, implicitly setting *write* access. When show-casing the presentation in the classroom, the media becomes available to the members of the class, who implicitly gain *read* access. Also, the decision to show the presentation on public displays in school extends the group of users having access to those media. As ALS considers body- and space-related interaction, using and displaying media on displays in a public space implies sharing media *public*ly.

To complete this model, the owner can override implicit settings by setting them explicitly at any time.

In general, our concept of implicitly setting user rights relies on (1) reasonable defaults, which are set upon media creation, (2) the users' interaction with Semantic Media with ALS applications, through which user rights are set implicitly, and (3) explicit user rights, the users may set when necessary. Consequently, using ALS apps in certain *contexts* or in certain *locations* implies certain use cases,

which implicate user rights. These are mapped to the user rights model shown in Figure 1. The key issue here is to identify contexts and locations and the effect they are supposed to have, also in the users' affordance when using ALS apps.

All settings for user rights are stored in NEMO in form of semantic annotations (see Figure 1), extending the sets of annotations of Semantic Media. This results in annotation overhead. As every request for Semantic Media is directed to NEMO computing whether a user has access to that media, the overhead produces constant effort. Thus, the user rights settings stored in NEMO through any ALS app have an effect on the accessibility of the media for all the ALS apps connected to NEMO. By this, Semantic Media will also preserve user rights settings when being moved.

IV. CONCLUSION AND OUTLOOK

This article outlines the concept for implicit user rights with regard to the users' interaction with Semantic Media for ALS. Based on a reliable explicit user rights concept, implicit user rights are deduced from the context, in which the media is used, and set through NEMO. The user rights are stored as semantic annotations for each medium and thus are a supplement to explicit user rights. From observations from our research project, we deduct that implicit user rights in many cases replace the necessity of defining explicit user rights. Reciprocally, explicit user rights may overwrite implicit user rights. Although the user rights model presented is sufficient for our research, an extension might be subject for discussion for the use in other contexts. Setting user rights implicitly may presents a security risk, which should be subject of further consideration and could result in new requirements for the user's interaction concepts, e.g., to create awareness when interacting with media. We will continue our observations upon experimental deployment of this concept in NEMO and set up studies to see how well it corresponds with users' needs and expectations.

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