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BORGS: A System That Supports Synchronized Surfing

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Abstract

The Broadcast Over Remote Guide System (BORGS) is a web based system that supports teachers to synchronously broadcast the global web pages and other electronic files to students.

1. Introduction

Scenario: Alyssa, a Biology teacher, brings her students to the National Museum of Marine Biology and Aquarium. The students can observe “real” marine and aquatic life and their living environment at a close distance. Alyssa has prepared a printed handout which includes information about marine and aquatic life she thought to be useful for the students and gave everyone a copy beforehand. While watching the belugas, a brief introduction about the creatures is provided by the museum. One student comes up a question: “The belugas come from the Arctic Ocean. Is there any other kind of whale that lives in the Arctic Ocean, too? Do they look similar to the belugas?” Alyssa thinks these are good questions that she would like to provide further information including texts, pictures, videos, or audios to the class at this moment. However, the information is not included in the handout she prepared but on her personal teaching website. Alyssa has no problems to connect to her website. The question is how she can show these web pages to all the students at the same time so that they can read and discuss the materials together in that place at that time.

There were systems designed based on the ideas that users can distribute and display information remotely to other people in real-time via web browser for guiding purpose [1,2]. An application was also designed for students to receive PowerPoint slides from their teacher and to make and share notes collaboratively within a group in real-time [3]. However, with the variety of the web page designs and the complexity of the multimedia materials, neither of these systems can accomplish all the tasks that are required in today’s instructional activities. There are also important teaching and learning supports needed by users that can not be fulfilled by these existing systems. These supports include the supplements of teaching materials, the environment and function that can simulate real class discussion and note taking, and so on. Therefore, the BORGS integrate the ideas of synchronous web browsing along with group communication and note taking to make the best practice of it.

The Broadcast Over Remote Guide System (BORGS) is designed to provide teachers and students an easy, convenient, and efficient way to synchronously broadcast web information or local files to students and to ensure that other people do “see” what they are expected to read at certain moment. The BORGS also provides the function of adding supplements to global web pages that allows teachers to give content-dependent guidelines for students to read the information on the web pages. Moreover, the BORGS allows teachers and students to discuss in real-time with the whole class or within a group as well as to take personal notes while discussing.

2. What is BORGS

The architecture of the BORGS is composed of three layers: interaction layer, information layer, and communication layer (Figure 1).

The interaction layer represents the users’ activities of teaching and learning such as lecturing, question asking, and group discussing. The information layer illustrates the teaching materials and supplements provided by teachers or students through the system. Teaching materials cover from online web pages to local files saved in teachers’ or students’ computers. Supplements are additional information edited by teachers or students and saved in the system that are corresponding to the teaching materials; they could be further explanations, footnotes, guiding questions, outlines, assignments, learning notes, and so on. The communication layer is in charged of information exchange and interactions between the information layer and the interaction layer.
These three layers consist of five components including BORG Application Server, Supplement Database, plug-in Modules, Message Center, and Information Rebuild Server.

The Message Center is the core of the system that processes all the messages exchanged in the BORGs. The Message Center can extend its function with plug-in modules. Currently, three modules have been developed including User State Module, Synchronous Module, and Discussion Module. The User State Module is in charged of user management including status indication and control right administration. The Synchronous Module is to perform sync activities. The Discussion Module provides communication mechanism along with note taking function. Three communication mechanisms are provided including public, group, and private discussion. Note taking can be personal activity or product of discussion; this function can be executed under every mechanism.

The Supplement Database stores supplementary information that is corresponding to particular teaching materials. Users can add and edit supplements to provide further information or to guide other people reading through the materials without change them. This gives users the flexibility and the convenience of giving guidance of browsing especially when the materials are not produced by themselves. Users can decide whether the supplement is public or private when they add it. If a supplement is defined as public, everyone will see this supplement when the user who creates it becomes a presenter (i.e., who has the right to carry out sync activities). The supplements can be updated in real time so that everyone can see the newest version of the supplement immediately after a presenter modifying his/her public supplement.

The Information Rebuild Server (IRS) is similar to a HTTP proxy server. The main function of the IRS is to support automatic sync activities that users can browse web pages as usual by clicking hyperlinks and all the pages will be shown synchronously on other users’ browsers. The IRS contains three components: URL-Reporter Factory, Supplement Binder, and Page Catch. The URL-Reporter Factory and Supplement Binder are responsible for modifying the webpage content so that the BORGs window on the presenter’s computer can send the synchronous command to the system and require it to change the web pages in other users’ windows immediately. The Page Catch is in charge of caching data so that any materials that ever go through the server can be retrieved and read by users when they are off-line.

3. How to use BORGs

In this section, the use of the BORGs in the scenario stated at the beginning is demonstrated as an example.

Before going to the museum, Alyssa can prepare teaching materials including web pages or other forms of electronic files (e.g., text files, pictures, and video files) and put them on her website or in her computer.
These materials can be made by teachers or come from other websites. Alyssa can add the supplementary information to each web page and saved in the BORGs beforehand. Alyssa sets the supplements that she wants students to read as public one ( ). The information that she writes only for herself is set as private supplements ( ).

In the museum, when students come up with the questions “Is there any other kind of whale that lives in the Arctic Ocean, too? Do they look similar with the belugas?”, Alyssa thinks that providing photos and additional information of the belugas and other whales will help students get more ideas than just telling them orally. So, she asks all her students use web browser to connect to the BORGs.

After Alyssa and her students login the BORGs, everyone can see a BORGs window on their screens like Figure 3. Students who login the BORGs successfully is marked with purple color in the User State Unit. After everyone is ready, Alyssa connects to her website by typing the address in the Control Unit. Her web site is displayed in the Synchronous Unit. She clicks the links directly on her web site and broadcasts a web page to the students synchronously. Along with the web page, the corresponding public supplement that has been added by Alyssa is displayed in the presenter’s area ( ) of the Supplement Unit to guide the students reading through that page. While Alyssa is giving a short lecture, students can discuss in small groups or take notes in the Discussion Unit as well as edit their own supplements. A student sends a private message to Alyssa and says that he would like to share his public supplement to the classmates. Alyssa then assigns the control right to that student because teachers are always presenters who hold the rights to perform sync activities and to decide who else can be the presenter. After the student gets the control right, his public supplement will be shown following the teacher’s supplement. This student and Alyssa can both broadcast the materials to the class as long as Alyssa does not release the control right of that student.

4. Future BORGs

The BORGs is designed to disseminate the teaching materials timely and efficiently to the students and to assure that the right information is received by everyone in the group. The BORGs can meet the needs of the teacher and the students in the scenario stated previously and can also support teaching and learning activities in other educational context because it has three main characteristics. First, the ideas embedded in the BORGs are to take advantages of the global web pages (i.e., the convenience and rich resources) and to disseminate these pages and added supplements synchronously to learners to support their learning. Second, students can fully control their learning activities (e.g., note taking, discussion, and reading) during synchronous broadcasting which can not be accomplished by traditional computer broadcast hardware. Third, the BORGs integrates important functions and environments of instructional activities that it can simulate instructions as in real classroom and support and enhance teaching and learning tasks.

The future of the BORGs will be focused on knowledge construction by extending and integrating the function of discussion, note taking, and supplement support. By doing that, all the information recorded in the system will be able to be reconstructed and become valuable knowledge.

References