[O19.2]
Generating adaptive collaborative learning activities for multitouch tabletops
E. Martin[1], P.A. Haya*[2], D. Roldán[1], M. García-Herranz[2]
[1]*Universidad Rey Juan Carlos, Spain,* [2]*Universidad Autónoma de Madrid, Spain*

Nowadays, many teachers use computers, digital backboards, tablet PCs, etc. as everyday tools in their classrooms from kindergarten to University. Likely, in the last years, the use of multitouch surfaces has increased in our society. We guess that multitouch surfaces, specifically multitouch tabletops, will be inside the classrooms in the next few years. Multitouch tabletops provide an environment where students can interact performing different activities by means of direct manipulation. When students are interacting with multitouch tables, they stay around them. They interact through natural gestures using their fingers. For example, they can press over the object selected to click the object or drag and drop it. Non-adaptive applications to multitouch tabletops have already been developed and tested [1] (see figure 1). We use FLING (*Flash Library for Interpreting Natural Gestures*) [2] to capture the users' gestures while they are interacting with the tabletop.
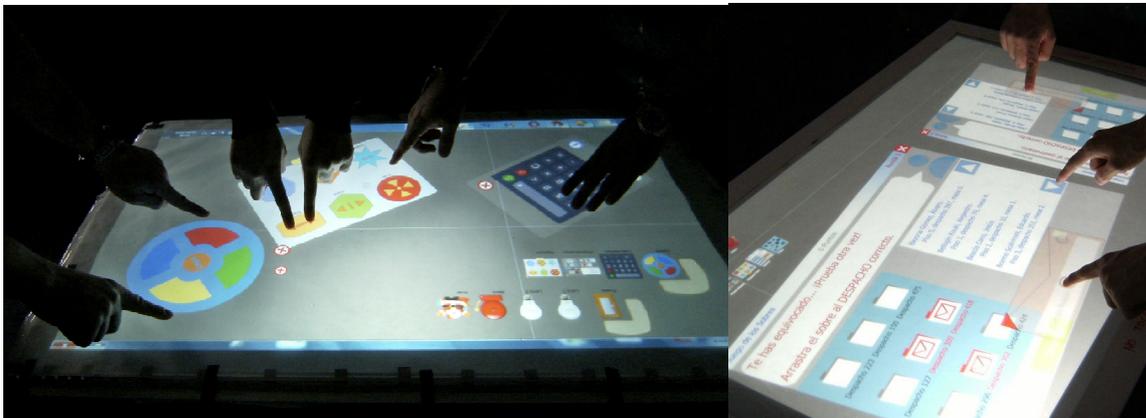

Figure 1. Example of educational activities developed for multitouch tabletops.

However, not all students have the same needs, goals and interests. The students' interactions, the personal features of the students, the goal and the nature of the own activities can influence in the development of them. The users' interactions should be different depending on the nature of the activity or its goal. Other relevant aspects are the number of the users, their physical location around the table, their level of knowledge, their actions, the number and the size of the objects over the table, etc. In this way, it is necessary to bear in mind these aspects to adapt the activities to the student needs. A user model is a representation of information about an individual and is essential for adaptive systems to provide adaptation, i.e., to behave differently for different students [3]. Different personalization methods and techniques have been used since the early 90's [4].

Developing learning environments for activities that can be adapted to students and workspaces can be generated on the fly according to users' needs can become an impossible task for some teachers, and frustrating for others. At present time, teachers use special authoring tools such as Hot Potatoes [5] and JClic [6] to create interactive learning activities. The use of these authoring tools is successfully thanks to their visual and intuitive interface and their use easiness for teachers without technical background.

There is not, however, any authoring tool to help teachers to create learning activities for multitouch tabletops which can be adapted to the student's needs. With this goal in mind, as well as to manage all the information, an authoring tool has been developed. This tool allows teachers to: i) create

collaborative and competitive learning activities to be performed in multitouch tabletops, ii) specify different adaptation features in order to adapt the learning activities presented to students, iii) define the adaptation capabilities specified by means of adaptation rules, and iv) provide different versions of multimedia material (e.g. texts, pictures, sounds, etc.).

The activities are adapted on the fly taking into account the personal features of the students around the table, their previous interactions, and the nature of the activity. The adaptation is based on the adaptation mechanism used by CoMoLE (*Context-based adaptive Mobile Learning Environments*) system [7]. It is fed on i) the specification of the information about users and groups (user and group models), ii) the description of the activities that can be performed (activity model), iii) the rules describing adaptation capabilities (adaptation model), iv) the most suitable multimedia contents, and v) the information about previous interactions with the system.

Summarizing, we have developed and test an authoring tool for creating adaptive and collaborative learning activities that students will perform in multitouch tabletops. There are a few educational applications already developed that support the accomplishment of learning activities using this type of devices due to multitouch tabletops are emerging in our society. This tool arose from the synergy of adaptive hypermedia and human-computer natural interaction research. It was motivated by a collaboration with teachers that works with Down syndrome people.

[1] ShareIT Project: http://www.shareitproject.org/

[2] Flash Library for Interpreting Natural Gestures (FLING): http://amilab.ii.uam.es/fling

[3] P. Brusilovsky and E. Millan, "User Models for Adaptive Hypermedia and AdaptiveEducational Systems," in The Adaptive Web, LNCS 4321, pp. 3–53, 2007.

[4] P. Brusilovsky, "Methods and techniques of adaptive hypermedia". User Modeling and User-Adapted Interaction, vol. 6, no. 2-3, pp. 87–129, 1996.

[5] http://hotpot.uvic.ca/

[6] http://clic.xtec.cat/es/index.htm

[7] Martín, E.,Carro, R.M.: Supporting the Development of Mobile Adaptive Learning Environments: A case study . IEEE Transactions on Learning Technologies, vol. 2, no.1, pp. 23-36, Jan-March 2009.