A Visual Domain Specific Language for the Creation of Educational Video Games

Introduction

Educational video games and serious games are becoming more and more relevant as a complement to traditional instructional approaches. However, several barriers are in the way of the general adoption of this technology, such as the high cost or the integration of the games in the learning flow. At the <e-UCM> group at the Complutense University of Madrid we have developed the <e-Adventure>[1] platform for the creation of educational video games that addresses some of those problems. The current version of <e-Adventure> allows for the rapid creation of custom *point-and-click* adventure video games with low development costs [1].
In some cases, using COTS (*Commercial-Off-The-Self*) video games could solve at least partially some of these problems, but usually the available alternatives are very limited (e.g. using Civilization to teach History). When no COTS alternatives are found, a custom development is needed, but most educational professionals lack the necessary budget, tools and technical background. Using the <e-Adventure> platform allows educators to produce games without programming, but it is still perceived as too complex by many. According to our direct experience with educators at different levels, one of the most problematic issues is the difficulty to plan and develop a story using the system. In an effort to reduce this perceived complexity, we are creating a VDSL (Visual Domain Specific Language) to complement and enhance the creation of <e-Adventure> video games. This new approach provides a way to create games focusing first on the story behind them, which can potentially increase their educational value, as a strong narrative is one of the best game elements to support learning [2]. This story-based editor allows an educator to go from the game story flow to a working educational game without requiring technical knowledge.

Description of the Language

The new VDSL will represent the story using a graph-like structure, where the nodes represent different “points in the story” and the transitions indicate the flow. In video games, the flow of the story is driven by the interactions (i.e. actions in the game) of the user, and therefore they are represented as the transitions of the graph. The basic elements are based on the underlying <e-Adventure> model, but this approach could be applied to other tools and game genres. Many representation enhancements are used to reduce unnecessary complexity in the graph. The actions can also have consequences in the game world that do not alter the game flow and are added as properties of the graph (this includes mechanisms for tracking the performance of the students for later assessment).

[1] http://e-adventure.e-ucm.es

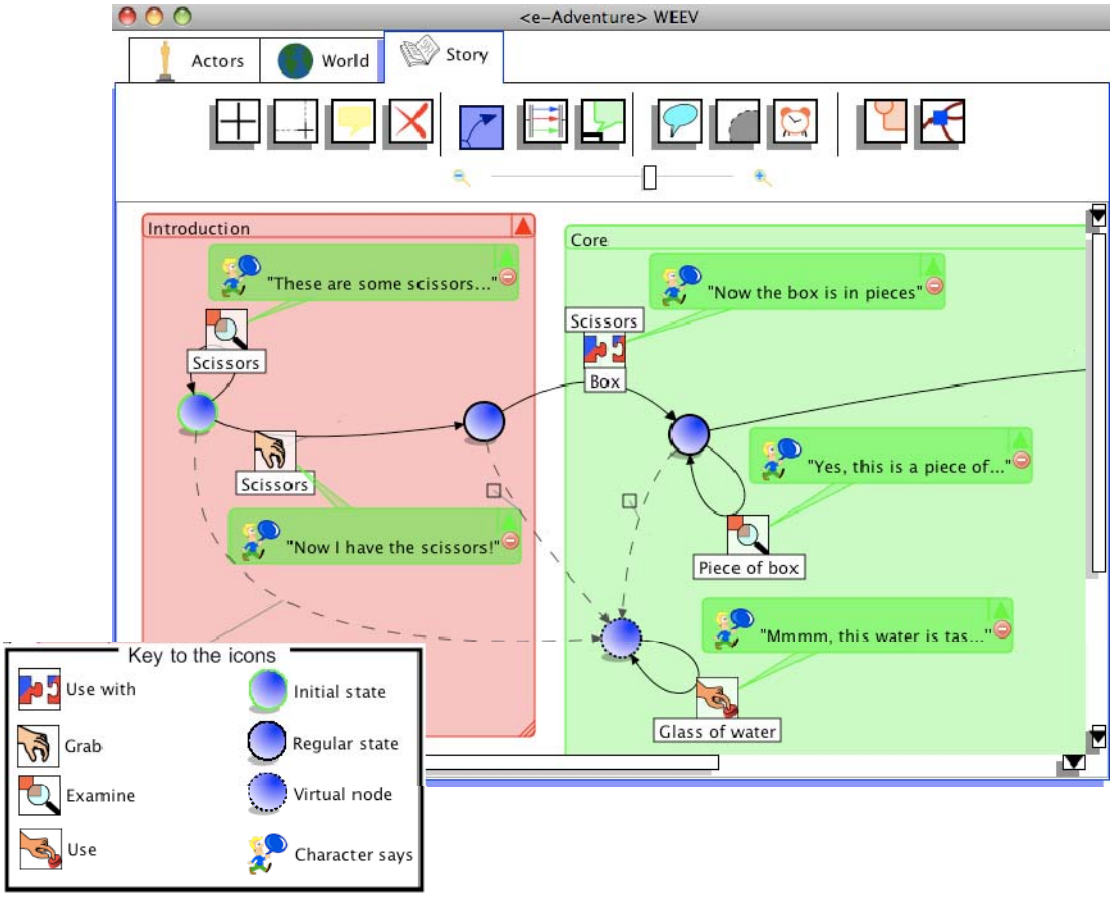

Figure 1: View of the story-flow editor, showing part of a game where the player has to grab some scissors and cut a box using them. The player can also choose to drink a glass of water at any time. Feedback is provided for the actions.

This new system is created with the idea that a graphic representation, lacking some of the most complex elements of <e-Adventure>, can help teachers to acquire a better understanding of the games and increase their involvement in the development process. Applying a similar criterion, the new system is tailored into a "wizard", where all the basic information needed to create an educational video game is included so that novel users are guided though all the necessary steps.

The game design process used in the wizard is based on research and real experiences on the field [3]. Besides, it borrows concepts from story writing; structural schemas will be used as a guide, to facilitate the development of the story in a meaningful way. Creating a good story is fundamental to achieve a high level of students' engagement and motivation. Even though we have no way to completely ensure a high quality of the story, this system will allow the authors to focus on its design by simplifying the rest of the development, which is a great advance.

Figure 2: Some steps of the wizard

Using a graphic representation has some other additional benefits over the traditional representation of the <e-Adventure> games. One of them is the possibility to generate recommendations for the user. These recommendations can cover the structure of the story (e.g. more o less branching, as needed) or its educational value (e.g. more assessments or more instructional content).
Besides, the new system will still have all the advantages found in the <e-Adventure> platform as the games created will be fully compatible and can be further edited using its advanced tools. These includes the possibility to export the game as Learning Objects [4] in compliance with the SCORM 1.2 or SCORM 2004 specifications.

Conclusions and Future Work

We expect that this system will simplify the development of custom educational games for novices in the field and allow developers to focus on the story. We intend to have a working version along 2010 and test it to determine if it really eases the development process in a controlled environment. After that, the new system will be included as part of the <e-Adventure> platform in future releases and distributed as open source software.

References

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