A Multi-Player Educational Game for Story Writing

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ABSTRACT
In this short paper, a multi-player interactive game called STORYWORLD BUILDER is described. The game enables children to collaboratively build a virtual "story world" and then role-play characters in that world. The educational purpose of the system is to motivate children to write better stories, by providing them with a collaborative, interactive, computer game-like environment in which stories can be enacted. We are interested in whether such a system can improve children's story writing skills.

Categories and Subject Descriptors
K.3.1 [**Computer Uses in Education**]: Collaborative Learning

General Terms
Design, Experimentation, Human Factors.

Keywords
Game, Education, Drama, Narrative, Collaboration.

1. INTRODUCTION
Can multi-player networked games be used for educational purposes? To date, there has been a veritable wealth of educational games, both commercial (e.g. the Reader Rabbit™ series) and research-oriented (e.g. intelligent tutoring systems [3] with a gaming element to motivate users). Some educational titles adopt the constructionist philosophy advocated by Seymour Papert [1,4,6], which holds that learning is most effective when it is centred around the construction of concrete objects (e.g. a city in Sim City™ or a network of widgets in Widget Workshop™).

Most of these games, however, are directed at the single-player market. Something that currently has not been widely investigated in the context of games and education is what the multi-player networked game can offer. Mass multi-player games are enormously popular at present, and it is reasonable to assume that if applied to education, they have considerable potential. Two general benefits stemming from a playing in a networked, online environment spring immediately to mind.

The first is the notion of a "virtual community". Players in an online game can collaborate with each other and gradually progress towards some educational goal. In this type of community, novices can learn from more experienced players in an apprenticeship-type model. This often occurs in existing non-educational networked games as new players learn the rules and peculiarities of a game by "attaching themselves" to established, more experienced players. No explicit teachers or tutorial systems are needed in such a system.

Another significant benefit of a networked game is the idea of participants being able to share meaningful artefacts. This is the notion of distributed constructionism [6]. In this context, an artefact is any object that a player can build, and this may be the primary focus of the game. For example, suppose a child creates a virtual dungeon. If other children participating in the environment can go and visit the virtual dungeon, and give feedback to the creator as to what works and what doesn't work, and how it can be improved, then the dungeon can be considered to be an artefact that is meaningful to its creator. Meaningfulness derives from the fact that the creator can obtain a level of status or recognition in the community of players. In turn, desire for recognition and feedback from others can lead a player to build more sophisticated artefacts than they would have done if they were playing the game alone. This is a significant motivating factor because it makes the environment authentic [5].

We have built a prototype system for investigating these ideas called STORYWORLD BUILDER, which is focused on supporting children to write creative stories. The game is inspired by the online role-playing game genre of interactive entertainment, in which players adopt virtual personas and travel about in a vast, virtual world, encountering and interacting with other players in the process.

However, the key difference between STORYWORLD BUILDER and the typical networked role-playing game is that the emphasis in STORYWORLD BUILDER is on building the virtual world that the players inhabit, rather than exploration or puzzle solving in a pre-existing world. That is, there is no objective "winning condition" that can define a player's success. Instead, the virtual places that the player design become the meaningful artefacts of STORYWORLD BUILDER, and players engage in the process of building them.

In the present version of the system, the children design the virtual places to be settings for a story that they make up. Once the places are all built (and this can be done either alone or collaboratively in real-time), they role-play out the story. A transcript of the session is saved locally, and each child subsequently uses the transcript as the starting point for writing their own stories.

We plan to test the idea that this type of gaming system actually enhances a child's story-writing skills.

In the next section, STORYWORLD BUILDER is described in more detail. Section 3 discusses our plans for formative and

summative evaluations of the system, and places this work in the context of others' work. Section 4 concludes the paper.

2. STORYWORLD BUILDER: AN OVERVIEW

STORYWORLD BUILDER is a collaborative, networked environment for virtual world building and role-playing. In this section, a pertinent issue relating to the difference between educational and non-educational games is discussed, and STORYWORLD BUILDER is described in more detail.

A significant design decision taken when STORYWORLD BUILDER was in its conceptual stages concerned the type of virtual world the participants would be allowed to build. Typically, multi-player role-playing games depict the environment with either an overhead isometric view or a 3D view. Older games often use a 2D view, simply because the hardware around at the time they were written lacked the facility to render more sophisticated graphics in real-time. By-and-large, however, there is a preference towards more realistic, detailed graphics in games.

This present a conundrum when one wants to let the participants design the virtual world. The conundrum is this: how much effort should a player spend designing the virtual world? If the world is rendered in 3D, then the player will be expected to construct 3D models, place them in the environment, view the environment from different angles in order to get it "just right", and so on. In effect, the player becomes a 3D designer.

This is acceptable if 3D modelling is the sole purpose of the game. However, if the world building is only a part of the game's purpose, then there needs to be a compromise in order to reduce the risk that the other objectives (i.e. the educational side of the software) are not ignored or become peripheral. And clearly, sophisticated design may well be beyond some users (e.g. only the brightest 10 year old could be expected to produce a realistic 3D model of a castle).

Therefore, the significant decision taken was to make the graphics of STORYWORLD BUILDER as simple as possible. A basic 2D tile-based graphics approach is used. Participants build virtual places by laying out tiles on a large, shared 2D map. It takes a matter of minutes, for example, to draw a house, cave, lake, or whatever is appropriate for the story. In order to keep the design as simple as possible, the actual types of tiles available are fixed and cannot be edited. Consequently, players have more time to spend on the other primary activity of role-playing their stories

One can argue that for educational games in general, there should be a preference for simpler, less realistic graphics (e.g. a preference for 2D instead of 3D). The argument is basically that the more "underdetermined" the artefacts are, the more the child must project subjective properties onto the artefact. In other words, there are more onuses on the participants to use their imaginations. For example, in the Story Mat system [2], objects such as stuffed animals are all generic and it is up to the child to use his or her imagination to individualise the object.

Taking this to the extreme, Bruckman's MOOSE Crossing system [1] is MOO-based and therefore entirely textual. Children create worlds solely by the written (or typed!) word, and are also able to program interactive textual objects. While this has produced fascinating results, it may be that children with a visual learning style may not benefit as much as other children with this type of system. Specifically, it has been shown that a visually-rich learning style improves the writing of visual learners [10].

STORYWORLD BUILDER, therefore, can be thought of as a compromise between the two poles of text-only virtual reality and total 3D realism, in that it offers a simplistic style of graphics that encourage the use of imagination without foregoing them entirely.

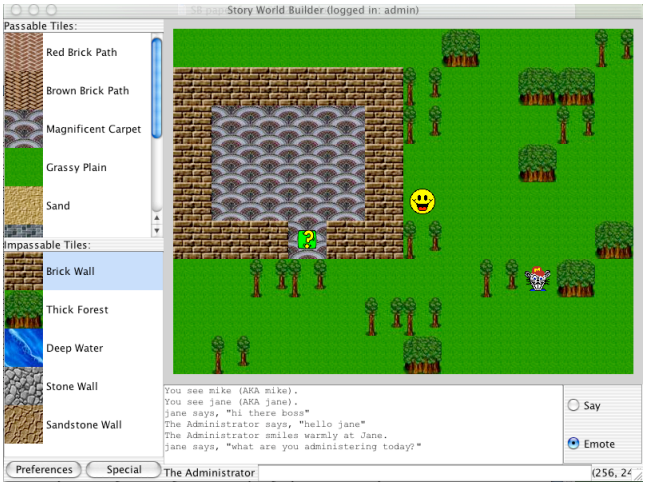

Figure 1: STORYWORLD BUILDER main interface.

With this in mind, the main interface of STORYWORLD BUILDER is depicted in Figure 1. The main view, occupying most of the screen space, depicts the virtual world in 2D tiled graphics. The player, who is represented by an avatar, appears in the centre of the screen. Other players' avatars (for example, the gopher to the south-east of the player) may also appear on the map if there are other players nearby.

Communication between players follows the standard methods of communication employed in a MOO or MUD: players can speak and they can perform virtual gestures (emoting). The mode of communication is selected in the bottom right hand corner of the screen. Again, in order not to limit the flexibility of the system, speech and actions are specified using a text string, so in effect anything that can be described in words is possible. For example, if a user named `john` clicks on *emote* button and then types `jumps up and down with his hands on his head`, then all players whose avatars are nearby will see `john jumps up and down with his hands on his head`. Similarly with the say button, except that the typed text is preceded by `john says` and is enclosed in speech marks. This gives children practice at writing and reading in two contrasting modes: direct speech (via the *say* button) and descriptive (via *emote*).

The panels on the left hand side of the main interface are used for virtual world building. There are two basic types of tiles: passable tiles, such as sand and wooden flooring, over which an avatar can move, and impassable tiles, such as brick walls and ocean, which an avatar cannot pass over.

In addition, any normal passable tile can be made into a "special" tile that contains textual descriptions that appear whenever an avatar moves onto it. Special tiles can be used to add descriptive richness to a virtual place by augmenting the graphics with text. For example, in Figure 1, there is a place

that looks like a house. A special tile is located in the entrance-way to the house (denoted by the question mark) and therefore, whenever an avatar enters the place, the player controlling the avatar sees a textual description of what lies inside. Like the two modes of communication, special tiles simply give the participants an opportunity to practice their writing and reading skills.

The preferences button at the bottom right-hand corner of the window allows a player to change his or her screen name, avatar icon and the textual description of the player that appears when another player click's one's avatar.

The current version of STORYWORLD BUILDER is implemented on the Java 2 platform. Network communication is achieved using the Elvin content-based messaging system [9] to ensure scalability to larger numbers of users in future iterations of the software.

3. EVALUATION PLANS

We plan to evaluate STORYWORLD BUILDER in a classroom. In fact, an initial formative evaluation has already begun with a small number of children from a local primary school. The purpose of the formative evaluation will be to detect any bugs in the current version of the software so they can be corrected, iron out any usability problems, and determine possible improvements from feedback garnered from teachers and students.

A summative evaluation will be carried out after the formative evaluation. We aim to test the hypothesis suggested by Robertson [7] that children writing stories as a consequence of using a collaborative role-playing system actually write better stories than those involved in a traditional creative writing lesson. Robertson came to this conclusion after running an experiment in which an experimental group used her collaborative software called Ghostwriter and wrote stories from their transcripts, and a control group had a traditional creative writing lesson. She applied a metric for the narrative complexity of stories to the results, and was able to show an improvement in the experimental group.

The Ghostwriter system [7,8] is an immersive 3D environment in which children take on the roles of characters and role-play a story. Considerable effort was expended on obtaining the 3D graphics for the systen. For example, the UNREAL game engine was licensed and actors were even hired to generate the 3D character models. This is clearly an expensive undertaking and is not likely to be feasible for the average school. It also explains why Ghostwriter implements only a single story scenario that users are unable to alter.

We are therefore interested in investigating the question firstly of whether the sophistication of the graphics correlates to the complexity of the resulting stories. In other words, is it possible to obtain the same measurable improvements that Ghostwriter obtains using a system with much simpler and underdetermined graphics such as STORYWORLD BUILDER?

The second question we plan to explore concerns the effect of collaboration. In both Ghostwriter and STORYWORLD BUILDER, children collaborate across a computer network. However, in the control group of Robertson's experiment, children were presumably not collaborating at all when they participated in the traditional creative writing lesson. Therefore, an interesting question would be to allow children in the control group to write stories collaboratively using pen-and-paper, and compare the products of those children to the computer-mediated experimental group.

And finally, a third interesting question is how players with different preferred learning styles would play the game. For example, would players with a visual learning style prefer the graphical tiles over the special tiles? And is the converse true for players with a non-visual learning style?

4. CONCLUSION

To conclude, an initial working version of STORYWORLD BUILDER has been produced. The system allows children to create a virtual story world, role-play stories in it, and write the stories from the resulting transcript. Some of the design decisions underlying STORYWORLD BUILDER have been discussed. Currently, we are in the process of conducting a formative evaluation, and are planning a summative evaluation in the near future.

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