Teaching English as a Second Language Utilizing Authoring Tools for Interactive Digital Storytelling

Wolfgang Müller[1], Ido Iurgel[2,3], Nuno Otero[3], and Ute Massler[4]

[1] University of Education Weingarten, Media Education and Visualization Group,
Leibnizstr. 3., 88250 Weingarten, Germany
[2] Centro de Computação Gráfica (CCG), Campus de Azurém,
4800 Guimarães, Portugal
[3] Universidade do Minho, DSI System Information Dept. and EngageLab,
Campus de Azurém, 4800 Guimarães, Portugal
[4] University of Education Weingarten, English Language Department,
Kirchplatz. 2, 88250 Weingarten, Germany
mueller@md-phw.de, Ido.Iurgel@ccg.pt,
nuno.otero@dsi.uminho.pt, massler@ph-weingarten.de

Abstract. This paper presents first results from an ongoing research initiative to develop an interactive storytelling application to support teaching English as a second language for children in schools. Considering the necessity to accommodate to both students' and teachers' needs, we provide a summarized review of relevant systems and discuss the envisioned challenges concerning the specific aim we are addressing. Furthermore, we present different usage scenarios closely related to the concept of role playing and its application within this problem space.

Keywords: Interactive storytelling, virtual actors, authoring, e-learning.

1 Introduction

Interactive Digital Storytelling (IDS) couples dramatic narrative with users' active participation and even creation that in most cases enables high levels of engagement. It also connects game-elements with stories, utilizing inherent structural elements of both domains. IDS has also been applied in the educational domain, but technologies and concepts still need refinement in order to be effectively used in mainstream classroom settings.

In this paper we explore the possibility that second language learning can be facilitated with dedicated digital storytelling tools and applying "teaching through role-playing" methods. These are closely related to simulations and drama techniques in the Communicative Approach. All these techniques "give students an opportunity to practice communicating in different social contexts and in different social roles" [12] thus providing a genuine context for communication and making the target language more real. Research suggests that there are many benefits of using role play. Furness [11] stated that a child can enjoy and profit from a role play experience "in terms of

improved communication skills, creativity, increased social awareness, independent thinking, verbalization of opinions, development of values and appreciation of the art of drama". Studies in using drama in English as a foreign language (EFL) teaching indicate that drama seems to foster students' language skills: speech acts [15], pronunciation and intonation [13], and discourse strategies [14].

However, the adaptation of teaching methods to new technical opportunities is a challenge, as well as the development of age appropriate user interface (UI) solutions. Our specific goal is to develop tools and concepts that would be clearly useful for second language teaching at schools. The main idea is that students will be able to develop dialogues, and possibly even storylines for virtual actors in English language utilizing an IDS framework with animated 3d characters, text-to-speech support, and corresponding authoring tools.

This paper presents our current understanding of the problem space and explores a set of different use cases, explaining the corresponding requirements in some detail. Moreover, challenges with respect to the design of an appropriate UI are discussed.

2 Related Work

The creation of authoring methods or generic tools for IDS, however, is still a challenge. A large number of IDS systems still provide authoring on the level of script or rule authoring only, thus requiring programming skills and restricting the group of possible authors. Most of the few systems that support a graphical editing employ directed graphs (e.g., Cyranus [5], Scenejo [1]). Other systems provide spreadsheet-like interfaces to ease entering declarative information needed by some agents (e.g., Thespian [10]). Finally, there are some examples of systems with tools for graphical programming of conditions for actions, conversational flows/dialogue states, or facts and propositions as fundamental information for planning-based approaches (e.g., [3]). There also have been several approaches to apply IDS methods and technologies in the classroom. An example in this domain is FearNot! [1], which provides children with various pre-authored scenarios about bullying behavior. However, none of the current approaches aims at facilitating authoring of dialogues as part of second language school teaching. Furthermore, no tool seems to allow for teaching method variations exploring the possibility of using both linear and branching stories depending on particular teaching goals and activities.

3 IDS for English Learning as a Second Language

A central objective in the field of second language learning is the improvement of comprehension and communication skills. However, while this objective is generally accepted, most students fall short to acquire the corresponding skills until leaving school. There is general agreement that the reasons for this lie in a domination of text-based speaking and teacher-student dialogues in class [8], and independent and free speaking for instance in role-playing like scenarios for a given situation are not sufficiently being trained [2]. A reason for this is that it is usually difficult to apply role-playing in a larger scale with school students, because of the organizational overhead, and because only a few students are involved at a time.

In our approach, students develop dialogues for virtual actors in English language utilizing an IDS framework with animated 3d characters, text-to-speech support, and dedicated authoring tools. Besides increasing motivation using this Edutainment-like approach, we see the following advantages:

- It helps teachers to use role-playing methods in classroom;
- Students can develop and test dialogues that are automatically correctly spoken out and enacted;
- It fosters thinking in alternatives and functional equivalences, thus arguably enhancing dialogue skills;
- It provides a means for self-directed learning.

We envisage the following usage scenarios that are all related to role playing, and that shall train the dialogue skills in English as a second language:

- **Linear dialogues between virtual actors alone** in movie-like scenes: Students create dialogues and define the behaviors of the virtual actors, similar to common text writing assignments, but with the possibility of "testing". While interaction is restricted to the creation phase, iterative production processes are supported.
- **Interactive dialogues** between a student and virtual actors: Dialogues and their possible small variations are prepared by students, and then "tested" by other students. In this scenario, both the preparation and the interactive usage part provide learning effects. In the testing phase, input could be made via speech recognition, or alternatively with typed text.
- Dialogues performed by the students and recorded are **(semi-) automatically animated based on the speech input**. This functionality may extend the previous scenarios, stressing pronunciation and intonation training.
- **Collaborative setting**s, where dialogues are developed by a group of students. The idea is to investigate to what extent collaboration leads to the emergence of varied dialogues and perspectives increasing learners' engagement. To explore this potential the system will allow for branching dialogue structures to incorporate the different alternatives and perspectives.

We intend to investigate to what extent the tools designed foster language learning and explore new ways to scaffold the learning activity with simple feedback strategies. More specifically, the initial aim is to see if simple feedback strategies work with a shallow modeling of the activity instead of full-blown user models.

4   The IDS-Tool: User Interface Aspects

In relation to technological issues, we would argue that the main challenges are related to the graphical user interface and interaction design, whereas necessary fundamental IDS functionalities are available. Specific requirements include

- **Assisted animation** of communicating virtual actors. Students shall be able to produce appealing animations that they are able to control to some extent. Some level of automatic animation by the system is required, but heuristics

and a limited set of behavior templates should be technically sufficient for satisfying results. Students should be able to define emotions that express personality, and control prominent non-verbal signs, e.g., a sudden astonishment or a sign of strong rejection.

- **Narrow interactivity** for *virtual actor – student* dialogue scenarios. When a virtual actor enters into a "dialogue" with a student, we assume that the student and the virtual actor both follow a basic script and play narrowly specified roles, and that only minor variations are allowed. For example, a student may create as homework an interactive *virtual actor-student* dialogue for other students to enact; the assignment requires reusing previously employed material on "how to shop at the grocery"; the material deals with a limited set of phrases, dialog elements, and words only.
- **Manual branching** in scenarios where students create *virtual actor – virtual actor* dialogues. Here, the story is variable, but students choose the way to follow – there is no automatism involved. Automatic random choices or the option to depict all available branches represent possible extensions.

With respect to the user interface design, these are main requirements:

- It must be possible for a student to enter **linear dialogues**, which then could be rendered and performed by the virtual actors. This involves the definitions of interactions and animations that are coordinated to the speech.
- Students shall be enabled to integrate **dialogue patterns with "wildcards"** to branching structures, developing dialogues with branching variants.
- **Flow control** to enable students to create and present variable, branching stories.

These requirements to UI design are in practice quite complex. The creation of linear dialogues suggests the usage of a timeline, but it is still an open research question whether an explicit timeline representation, where time is isomorphic to length of a user interface element, would be easily understood by young students. In fact, while explicit timeline representations and the depiction of independent channels for animation represent the industry standard for user interfaces in the field of computer animation (e.g., Maya, Blender), children software with animation functionalities regularly seems to avoid this representation (e.g., KidPics). Apparently, timelines and animation channels are assumed to be a too complex metaphor to be presented to children. Possibly, a more simple representation must be found, for example with larger time slices and more global parameterization, e.g., with sentences as minimal elements and global emotional parameters that are applied to the sentence as a whole, and not to parts of it.

Another difficult user interface problem is related to the representation of branching structures in dialogues. As mentioned above, graph-like representations are often being applied in the field of IDS authoring tools. Graphical programming languages for children also provide solutions for the visualization of branching structures. Languages such as Lego Mindstorms NTX-G [7], Squeak [4], and Alice [6] apply more iconic representations with special elements for branching structures.
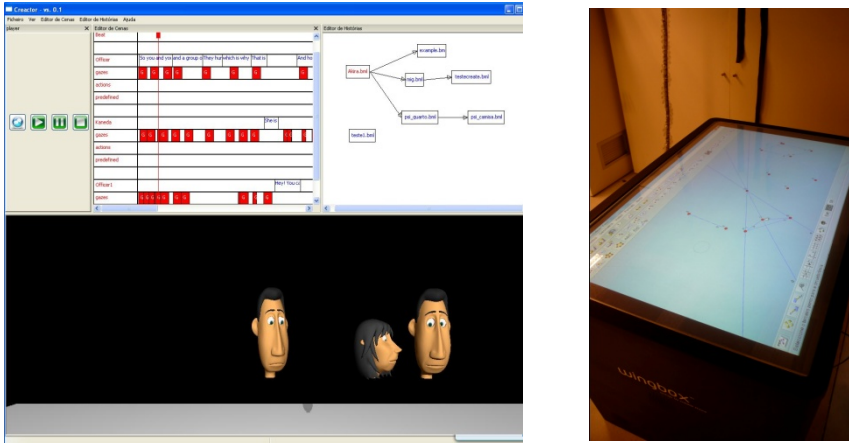
Fig. 1. (left) Creactor user interface with timeline and branching authoring support; (right) Multitouch table of CCG. Collaborative scenarios pose additional challenges that are best coped with appropriate devices. Multi-touch tables and whiteboards are becoming wide spread and enable simultaneous work and physical gathering of the students. In particular multi-touch tables may support the utilization of physical devices, e.g., physical building blocks that represent dialogue parts, and that students can assemble to story structures.

In IDS, we can find combinations of both, directed graphs for branching structures and timelines for linear dialogues / actions (e.g., Creactor). However, it is not clear whether this form of combined representation would be understood and accepted by students. Integrated representations of structural views with temporal aspects are in general rare, and in the field of IDS completely missing. One of the few examples in visualization literature is the UML activity diagram based on swim lanes. Currently, we are investigating the acceptance of a combination of graph and timeline vs. an integrated representation utilizing iconic elements. We expect first results from usability tests with children in the near future.

Speech technologies also play a major role in our concept. In fact, speech recognition may develop the potential to support a much wider range of scenarios based on our storytelling concept in the future. However, while progress has been made in this field recently, the requirement to operate also with wrong sentences and pronunciations prohibits a central role of such technologies for now. Consequently, we selected usage scenarios that could be realized based on text-input and more reliable text-to-speech technologies only.

5   Conclusions and Outlook

We are currently working stepwise towards an understanding of the IDS tool requirements of various aspects of employing role playing metaphors for second language learning at schools. Our next step will consist in devising and testing tools for linear story (movie) creation within this second language learning context. The results shall provide also key interface elements for probably every other envisaged

scenario. For this first step, we will build upon our previously developed IDS-tools (Scenejo and Creactor). They were not originally devised for children, and we will recur to user centered design methods to understand if and how our existing user-interface elements can be reused in this context, in particular to understand whether and when a timeline is an appropriate representation for school children of different ages. We aim at strengthening role-playing and storytelling methods at schools by IDS technologies. As a final result, we expect to be able to provide IDS concepts and tools that are flexible enough for several learning scenarios, and that are proven to be useful and easily usable within second language teaching at schools.

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