Teaching Portuguese using serious games

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Abstract. Computer Assisted Language Learning (CALL) systems aim to teach a language providing technology and motivation to the user. They allow us to implement pedagogical content, motivational techniques and corrective feedback. On this basis, we present Medieval Adventure, which is a CALL system that aims to teach Portuguese's basic levels to adults. Medieval Adventure teaches a second language mainly through pragmatic. The teachers may maintain their teaching methods, once we allow them to develop new content, namely tasks, conversations, interactions and scenarios. We allow teachers to take advantage of pedagogy, motivation techniques and corrective feedback. The user learns Portuguese performing the tasks, which involve exploring Medieval Adventure’s world, namely interacting with characters and objects. Medieval Adventure has the adequate expressiveness for pedagogical content development, according to teachers, and it was well accepted by the users, as we concluded on the user tests.

Keywords: CALL, Second Language Acquisition (SLA), Serious games, Pedagogy on games

1 Introduction

Communication is a major necessity of human species since long ago. Everyone communicates every day to exchange information, express ideas and emotions. However, it is rather difficult to communicate when someone lives in a foreign country and does not know the host country’s language.

Computer assisted language learning (CALL) systems are developed to teach users a language. Those systems have several advantages like providing feedback during the learning process, they are always available so the users can practice as much as they like, they provide many kinds of media and a stress-free environment for learning and they also motivate the users, which is one of the most important factors in learning.

Medieval Adventure: The Language Quest .PT is a CALL game that was created to teach Portuguese basic levels, namely to immigrants and exchange students. It intends to simulate real-world situations, in which the player may learn mainly through conversations.
Our greatest objective was to conceive a game that would aid teachers in class and also let the students learn any time any where through pragmatic.

To create a tool to aid teachers in class, we had to allow them to create new content and maintain their teaching methodologies. This led us to another objective that was to make possible for teachers to use a wide range of pedagogical concepts while creating new content. In other words, our goal was to conceive a versatile framework that adapts to their methodologies.

We also had the objective to keep the student motivated so he/she had initiative to learn and make the learning process easier.

2 Related Applications

There are many CALL applications related to this work but Tactical Language and Culture Training System (TLCTS) [9] [8] and the Spoken Electronic Language Learning (SPELL) [13] [1] are the applications most intimately related to our work. These two applications employ virtual worlds inhabited by characters. Although other related applications do not employ virtual worlds and animated agents together, they succeed on teaching a second language through multimedia, mini-games and chatting. Also, most of the applications use speech recognition to teach and are successful, despite the current limitations of automatic speech recognition technology.

Medieval Adventure may enhance several related applications’ features because it focuses on pragmatic skills (Section 3), allows new content creation and teachers may maintain their own teaching methodologies. We do not have an open-world game but we give the user freedom to explore the scenario. Although TLCTS and SPELL provide a 3D game in which the user may feel more motivated than in other related applications, they do not give the user this freedom, which means that he/she will not be able to freely explore the scenario. This feature is important because it improves motivation. The user will not learn through quizzes, like it was done in TLCTS, but he will learn throughout the game, doing specific tasks, observing and exploring. We provide animated characters just like in TLCTS and SPELL, to enhance the environment, motivate the user and give him audience to practice.

The greatest feature in Medieval Adventure is the possibility to employ several pedagogy and motivational methodologies, which allows us to greatly motivate our users and puts us one step ahead of all other related applications. Our tasks are based on everyday scenarios, unlike TLCTS which is only designed for specific military scenarios.

SPELL uses prerecorded audio files, which improves the character’s speech fidelity to reality but it does not allow them to have an extensible application. Most related applications do not employ the most accurate corrective feedback
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(according to corrective feedback studies on Section 3). It is better to combine different types of feedback and it is important not to have excessive feedback because it may inhibit the user (Section 3). Also, most related applications do not have into account the user’s uptake on feedback. This feature is important because it may enhance the learning process (Section 3). Facing this, we allow teachers to employ all corrective feedback types (he/she can use a combination of different kinds), and to take advantage of user’s uptake.

3 Learning and Technology in CALL

Motivation is one of the most important factors in learning [15] and it may affect the students’ learning performance and their behavior. The “Head, Heart and Hands” motivational method[2] allows us to motivate the students making use of their mental skills (“Head”[10]), their feelings and emotions (“Heart”[3]), and by interacting (“Hands”[3]).

The literature on how students learn mentions three main learning channels: auditory, visual and kinesthetic[4]. Learning contents are preferable to be stored in long-term memory because, theoretically, we never forget them [5]. If we employ the three main learning channels, the contents may be easily stored into the long-term memory[5] [11].

In Medieval Adventure we teach Portuguese’s basic levels Pragmatic. Grammar and vocabulary are implicit in conversations. Vocabulary is also acquired interacting with scenario objects. Only the basic levels will be focused in this work (A1 and A21).

The students are more motivated and more willing to learn through games [15]. Games are a form of fun and play, have rules and goals, are interactive and adaptive, have outcomes, win states, conflict, competition, challenge, opposition, have problem solving, interaction and story. These characteristics may give the students enjoyment, motivation, learning, social groups, etc. In most games, the players are also allowed to make their own goals, which stimulates and motivates them to play.

Games also provide interactive learning techniques [14]. Games may provide practice and feedback, learning by doing and from mistakes, goal-oriented and task-based learning (through quests or specific objectives), question-based learning (intelligent agents may ask questions), situated learning (immersion in a virtual environment), role-playing, coaching and intelligent tutors (intelligent agents who provide guidance and feedback), multi-sensory learning (through images, audio, etc.) and learning objects.

1 http://europass.cedefop.europa.eu/LanguageSelfAssessmentGrid/en
Lyster and Ranta[12] [6] researched on corrective feedback and student’s uptake and concluded that they are both very important. The teacher’s feedback may be followed by student’s uptake, which is an attempt to correct his own utterance’s errors. It is better to combine different types of feedback[6]. Excessive feedback may inhibit the user, so we also need to employ implicit feedback.

4 Conceptual Model

Medieval Adventure is aimed to aid teachers in the classroom. We provide several scenarios and tasks, but designers (which may be teachers) may create new scenarios, featuring new objects and characters placement, and new tasks and conversations design.

Tasks involve conversations with characters and interaction with objects. Characters may give several items to the player (e.g. potions, keys, swords, etc.). The tasks may take advantage of the main learning processes and motivation, pedagogy on Portuguese as a second language, game-based learning and corrective feedback and user’s uptake (Section 3).

Medieval Adventure’s entities have relationships amongst them, as we can see in Figure 1. It has two main entities: Medieval Adventure and the player.

The player has a task log (journal) where he/she can check the tasks’ progress at any time and also can check it for guidance on tasks. He/She has a user’s profile that records his/her interaction with objects and characters, completed tasks, and the player has an inventory that holds every item he is given or that he bought.

The player also can freely explore the scenario, interacting with various objects and know the areas. He/She may interact with characters to start a dialog and he/she can chat using the mouse or speech input. NPCs may also ask the player to perform tasks.

Tasks may have several preconditions, which are a list of tasks that have to be completed so the player can perform them (e.g. the player has to complete the “walls” task before he starts the “roof” task). Task may also have rewards to the player (by providing him/her items, gold and experience points) when tasks are finished. They also have task steps. In each step, the player’s task log and profile are updated, and players may receive items (e.g. the task advanced one step so the player receives a potion, the task log is updated with the next objective, the NPC’s dialog changed and the profile was updated with the new objective).

Each dialog state is characterized by the NPC interactions: the animation, the
Figure 1. Game Object Model
NPC sentence and the player’s possible responses (or choices) (e.g. animation: bow; statement: “Olá, tudo bem?”; responses: “Sim!” “Não”). The dialog state advances according to the player’s response, and also may advance the task step (if the player is performing a task related to that character). The dialog state has a text sentence which is displayed in game window, and it is reproduced in the speakers so the player can hear it (e.g. the statement “Olá, tudo bem?” is shown in text and reproduced in the speakers).

Dialogs may also refer to items, which can be acquired by the player and are stored in his/her inventory (e.g. “Vai buscar-me uma poção” in which “poção” is an item that will be in the player’s inventory when he/she gets it).

Medieval Adventure’s scenario is compounded by several areas. The areas might have other areas, characters, objects and the player. Some of these areas may be locked and the player has to perform certain tasks to gain items to unlock them. We opted to lock some areas because it increases the challenge and our players’ motivation.

Areas have objects (e.g.: a street sign indicating a street name, the bread’s basket, etc.) and the players may interact freely with them. When a player interacts with an object, its text is displayed on the screen and it is reproduced in the speakers so the player can hear it, taking advantage of two learning channels (as we will describe on the next section). Also, designers may place new objects freely.

5 Medieval Adventure: The Language Quest.PT

The Medieval Adventure’s scenarios, featuring characters and objects were created using the Neverwinter Nights 2 toolset\(^2\) game engine (Aurora Engine). This game engine was selected mostly because it privileges conversations and allows us to create a role-play game with a virtual world in which the user may freely explore. Tasks and dialogs are created externally because it is easier to create new pedagogical content and link this to other modules, namely to the text-to-speech and to the speech recognizer.

Figure 2 represents Medieval Adventure’s framework architecture. “Medieval Adventure” is responsible for communications with Neverwinter Nights 2 and also for joining all other modules. “Medieval Adventure” has a list of “Dialog States” (one for each character). Each “Dialog State” has one “ASR Setup” (which sets the player’s choices into the ASR) and one “Dialogs”. “Dialog State” determines what dialog the characters present. “Dialogs” is a class that builds a list of dialogs, using XML. “Characters” is a class that builds a list of characters, using XML. “Objects” is a class that builds a list of objects, using XML. “Parser” is

\(^2\) http://nwn.bioware.com/developers/
Figure 2. Proposal’s Architecture

responsible to correct encoding errors. “Text-to-speech” is a class that sends text
to the text-to-speech synthesizer. “Tasks” is a class that builds a list of tasks,
using XML. “User Profile” loads and writes information from an XML file.

Users may interact with Medieval Adventure through mouse, keyboard and
speech. The mouse and the keyboard allow him/her to move the character,
interact with characters, objects, items and select answers. Speech allows the
user to select answers during conversations with characters.

6 Evaluation

To successfully evaluate Medieval Adventure, we worked with a teacher to create pedagogical content. The teacher has been teaching foreign students for more than fifteen years and usually teaches exchange students with ages between eighteen and thirty. At the first meeting, several possible tasks were discussed, together with the corresponding contents, and two tasks were selected. The next step was the development of the guidelines by the teacher, which was followed by the development of the contents (namely scenario objects, character placement, dialogs and tasks). Finally we validated the created content with the teacher to check if it was according to her mental model of the interactions, tasks and dialogs.

The two tasks created for Medieval Adventure were counting in Portuguese and character description (self and others). For the first task, several plaques with
numbers were placed on the scenario. The player had to speak with two characters who ask him to count several items. For the second task, several characters with distinct characteristics were placed in the school area. The player had to speak with them so they describe themselves. Then the player had to describe his teacher.

The tests were performed with seventeen users with ages between eighteen and fifty. Most of our users were native English speakers. The users’ nationality and their mother language (or known foreign language) affects directly their levels and performance in tasks (users with mother languages that derive from Latin managed to finish the tasks in less than thirty minutes). Languages derived from Latin have more affinity with Portuguese (such as Spanish, French, Italian, Romanian and Catalan).

The users performed a satisfaction quiz regarding game flow (based on “Pervasive Game Flow: Understanding Player Enjoyment in Pervasive Gaming” [7]) and game content.

<table>
<thead>
<tr>
<th>Game-flow feature</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean</th>
<th>Value Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasks could be completed</td>
<td>6</td>
<td>10</td>
<td>9.06</td>
<td>1.25</td>
</tr>
<tr>
<td>Ability to concentrate on tasks</td>
<td>3</td>
<td>10</td>
<td>7.88</td>
<td>2.03</td>
</tr>
<tr>
<td>Tasks had clear goals</td>
<td>6</td>
<td>10</td>
<td>9.12</td>
<td>1.22</td>
</tr>
<tr>
<td>Tasks provided feedback</td>
<td>5</td>
<td>10</td>
<td>8.35</td>
<td>1.73</td>
</tr>
<tr>
<td>Tasks were easy to complete</td>
<td>6</td>
<td>10</td>
<td>8.88</td>
<td>1.40</td>
</tr>
<tr>
<td>Tasks were challenging</td>
<td>5</td>
<td>10</td>
<td>7.65</td>
<td>1.62</td>
</tr>
<tr>
<td>Game controls mastery</td>
<td>6</td>
<td>10</td>
<td>8.47</td>
<td>1.18</td>
</tr>
<tr>
<td>Ability to forget the surroundings</td>
<td>2</td>
<td>10</td>
<td>7.18</td>
<td>2.07</td>
</tr>
<tr>
<td>Emotional involvement with characters</td>
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<td>10</td>
<td>5.71</td>
<td>2.64</td>
</tr>
<tr>
<td>Involved in game</td>
<td>2</td>
<td>10</td>
<td>6.59</td>
<td>2.50</td>
</tr>
<tr>
<td>Control over avatar</td>
<td>5</td>
<td>10</td>
<td>8.41</td>
<td>1.42</td>
</tr>
</tbody>
</table>

Table 1. Game flow test results

Table 1 represents the game flow test results. We asked the users to rate the features from one to ten. Overall, we conclude that the game flow results were very satisfactory aside from the emotional involvement with characters.

Table 2 represents the user’s satisfaction with the game content. We asked the users to rate the features from one to ten. The characters’ voice had a lower result when compared to others, but we consider this result well counter-balanced by the great versatility allowed by the text-to-speech synthesizer. According to the teacher, the synthesizer is well suited for teaching Portuguese early language levels, probably because of more controlled speech rate and vowel reduction.
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<table>
<thead>
<tr>
<th>Feature</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean Value</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characters’ Voice</td>
<td>3</td>
<td>10</td>
<td>7.12</td>
<td>2.06</td>
</tr>
<tr>
<td>Characters’ Appearance</td>
<td>6</td>
<td>10</td>
<td>8.12</td>
<td>1.32</td>
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<td>Characters’ Interaction</td>
<td>6</td>
<td>10</td>
<td>8.12</td>
<td>1.27</td>
</tr>
<tr>
<td>Objects’ Interaction</td>
<td>4</td>
<td>10</td>
<td>8.24</td>
<td>1.64</td>
</tr>
<tr>
<td>Scenarios</td>
<td>6</td>
<td>10</td>
<td>8.94</td>
<td>1.20</td>
</tr>
<tr>
<td>Fun</td>
<td>5</td>
<td>10</td>
<td>8.06</td>
<td>1.35</td>
</tr>
<tr>
<td>First Task</td>
<td>7</td>
<td>10</td>
<td>8.41</td>
<td>1.00</td>
</tr>
<tr>
<td>Second Task</td>
<td>5</td>
<td>10</td>
<td>8.06</td>
<td>1.43</td>
</tr>
<tr>
<td>Transition zone</td>
<td>6</td>
<td>10</td>
<td>8.65</td>
<td>1.11</td>
</tr>
</tbody>
</table>

Table 2. Game Content Test Results

Overall, we conclude that we had very satisfactory results on the game content tests, and we were able to design a fun and motivating game.

7 Conclusion

Medieval Adventure is a 3D game that aims to teach Portuguese, designed based on various pedagogical and motivational concepts. Designers can freely create new content and teachers may maintain their teaching methodologies because they can use whichever kind of corrective feedback they want, they can take advantage of user’s uptake, teach whichever contents they want through pragmatic, through conversations and interaction.

Medieval Adventure is a very extensible and versatile tool that allows designers to design new content. It allows us not only to make a language game but also other kinds of role-play games. Part of this versatility derives from using a text-to-speech synthesizer that transforms the text from dialogs into sound.

Overall, Medieval Adventure has the adequate expressiveness to allow designers to develop tasks that teach Portuguese’s basic language levels, according to their opinion. Students might be willing to learn using Medieval Adventure because our satisfaction tests (Section 6) indicate that the game flow is adequate and because of the motivation techniques we are employing in the developed tasks. Medieval Adventure enhances a traditional classroom because of the motivation techniques we are employing, the employment of several learning channels at once, player’s immersion and concentration, the game’s challenge and the involvement with characters emotionally. The differences between Medieval Adventure and related applications show improvement in learning a second language.

Medieval Adventure Framework may be used not only to teach a second language but also to teach other subjects through pragmatic (e.g. we could use Medieval Adventure to teach medieval history to users).
References