From 7 to 77
I Teach You and You Teach Me!

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Abstract: This paper presents a project that aims to devise an innovative interactive application, more precisely a serious game, covering the topic of financial education. The topic is quite relevant nowadays, not only in Europe but worldwide, and is also one of the major issues on most government's agendas. The aim of this application is by using a storytelling framework devise a collaborative platform, where people from 7 to 77 acquire or enhance their financial skills. To do this, the application tackles several research fields such as interactive digital storytelling, collaboration human-computer interaction, autonomous agents, etc.

1 MOTIVATION

The presence of stories in our live existence is a fact, and any of us can tell a story about his/her own life. Throughout our life development the use of stories start assuming a bigger importance since it helps children to explore new situation, to understand the world that surrounds them. The safe environment of fantasy tales and make-believe activities helps them to explore situations that they are usually afraid to experiment in real life.

Nevertheless, new forms of make-believe and fantasy take place in their lives: video games, computer games, and the opportunity to participate in dramatic games and theatre performances at school. There is evidence that through these games children learn to master all the new knowledge, and to socially relate with their peers. Further, dramatic play promotes social competence, emotional development, or general well-being of the child, by enhancing each child's capacities of imagery and developing overt social and behavioural skills.

The use of narrative is not only present in children's learning environments, since it is common to devise role play training sessions for the acquisition of a specific skill. Moroever, serious games have appeared with the aim of developing innovative games that deal with themes of different areas (such as, medical and health training,

education, cultural training and public awareness (Zielke et al., 2009).

Based on these finding, it is clear that drama education is an excellence medium to convey learning and knowledge acquisition. Taking all these findings in consideration, it is possible to envision the application of such methods in financial learning environment. The research projects developed in the field of educational storytelling have as their main goal to portray educational material in an interactive format that aims to provide a higher level of engagement of the learners. Learners no longer have a passive role in their learning process, but they take part now in interactive and appealing situations, in which their actions matter. The knowledge acquisition processes itself in a more implicit and natural way, since it is now mainly achieved by a direct exploration and intervention of the learner of different learning situations. The idea of portraying financial education topics into a narrative environment emerges from the success of several research projects which used a narrative approach for attaining educational and edutainment objectives. For example, the Networked Interactive Media In Schools (NIMIS) project – in particular Teatrix application (Machado et al., 2005), the POGO project (Rizzo et al., 2003), etc.) As we have seen until now, there are strong evidence that supports the idea of developing a serious game (Michael and Chen, 2005) aiming at financial literacy

improvement for children and even older kids, but what about the adults and seniors? In the field of narrative intelligence, it is common to have virtual learning environment where the aim is to train people in a specific simulated context (see for example (Riedl et al., 2008) and (Swartout et al., 2006), etc.), but to promote the acquisition of mastery in a particular subject is more difficult. Even more difficult, is to find an application that aims to cover a target public from 7 to 77 years old. The problem of a universal interface for all is under study for some time (see for example (Stephanidis, 2001)), but since the nature, medium of usage of the applications is in constant change, there aren't yet a well-established set of guidelines. Also, in the case of elderly people there still exists a low level of computer literacy. This project tackles another important issue, when considers that each interaction should be collaborative, which means that two players must join efforts to succeed in the game. The notion of collaboration has been vastly explored, and there are strong findings that it improves the learner progression, but sometimes there is the need for mediation (Roschelle and Teasley, 1995). With the purpose of mediation, we introduced an internal social network that aims to provide the space for the players to clarify/reflect their intentions on the game, in order to proceed in the interaction or even to elicit new interactions with different players. This internal social network is a medium to achieve a social meaning construction (Stahl, 2006).

2 THE IDEA

The aim of this project is to develop a computational platform that promotes a better understanding of financial literacy. This issue is increasingly relevant given the economic and financial situation that all countries, particularly in Europe, are going through. In 2005 (OECD), the OECD published a study on financial education at an international level, with the aim of boosting the development of financial literacy of consumers by indicating best practices to be implemented at by each countries.

Since 2009, as a result of the financial crisis, financial literacy has been increasingly recognized as an asset to the individual (OECD/INFE). In Portugal, the Bank of Portugal held a questionnaire on the Financial Literacy of the Portuguese population, in 2010, in order to assess the attitudes and behaviors of the Portuguese population in the management of personal finances and their financial knowledge (SFLPP, 2011). In parallel the National Plan for Financial Training (2011-2015) (PNFF, 2011) was established in Portugal, aiming to improve the level of financial literacy of the population, promote the adoption of adequate financial attitudes and behaviors, increase well-being and contribute to financial stability and economic growth. This plan also sets out various target groups: students in elementary, high-school and university, vulnerable groups and general population. Given this reality, the idea of researching and developing an interactive computer application that empowers financial education from 7 to 77 years old has emerged. This application aims at being both entertaining and educational, thus inserting itself in the field of edutainment, which intends to make the convergence of entertaining activities, for example through video games, and educational objectives, the first being the ideal vehicle for presenting educational topics (Addis, 2005). More recently, this type of application has been coined as serious games, which are meant to be playful, but their ultimate goal is always learning (Frasca, 2007).

To have a better understanding of the purpose of such a wide and different target public, it is necessary to explain how we envision the interaction within the application. The application is collaborative by nature, since each person must always interact with a second player in order to be successful in the game. This collaboration is based on the transmission of knowledge, as has been a tradition, when the older and wiser members of the tribe communicated the cultural knowledge to the youngest (so in every interaction, we will always have two players with a generation gap between them). To achieve this collaboration, we must contemplate the existence of human and artificial players - conceptualized by autonomous intelligent agents - so that it is always possible for a given player to play with the application. Having also as an inspiration the transmission of knowledge over time, we envision all interactions through the generation/construction of narratives. Stories have always been part of human culture, and although civilization has passed through several changes (cultural, evolutionary, etc.), they remain inside and around us.

Taking these facts into consideration, it is quite straightforward to imagine the application of narrative in a learning context, and why not in a serious game? The narratives will enrich the application as they will be the vehicle for the transmission of the literacy concepts, and simultaneously, stories are created by players, in

order to allow them to translate their interpretations/perspectives of their interaction within the application. This interpretation and perspective can then be shared among the various players - a social network of the application, which could be used for future interactions with the application since two players who share the same perspective can play together in the future. Again, these stories will be created either by human players or by artificial players. Finally, it is necessary to ensure that the main goal of the application is achieved; therefore a centralized mechanism for narrative control must be introduced (Riedl et al, 2008), in order to guarantee that each player's action will be meaningful for the achievement of the pedagogical goals.

3 CHALLENGES

This project aims to tackle the problem of how to improve the financial literacy of people in general, with serious game. The problem is well known, and it is present in most countries agenda for the next couple of years. So it's relevance for the society in general, is a fact and an urgent need. From a computational perspective, the lack of financial literacy knowledge provides an interesting domain to explore a set of novel and innovative ideas that has never been gathered in unique interactive computational platform. The major computational issues to be researched and developed within this project are: - How to use a narrative structure to present the different concepts associated with financial education? - What kind of narrative structures are the most appropriated to provide different experiences for the players, in their different interactions? - How can I track the achievements of each player without being too intrusive? - Is it possible to create player pattern profiles in order to provide richer and more pedagogical interactions? - How can I devise a graphical user interface that meets the needs of a target public from 7 – 77 years old? - What usability problems must be avoided and tracked for the success of the serious game? - How can we endow the artificial players with different skills accordingly to their supposed age? - Is it relevant to provide the artificial players with different personality traits, to have a more engaging and rich interaction between players? - How can we promote a healthy collaboration between human players, without any explicit mediation process? - What can be learnt from the internal social network, for the

improvement or even adaptation of the artificial agents in order to provide richer and more pedagogical interactions? - Are the interpretations of artificial players – the stories being told - as engaging as the ones from human players? - Are the artificial interpretations richer enough to elicit new games with human players?

These different issues can be grouped in four different areas: interactive digital storytelling, human computer interaction, collaboration and social meaning/perspective taking. The area of interactive digital storytelling, more precisely the generation of narratives as a medium to convey a pedagogical message has already been tackled before (Marsella et al., 2000), (Swartout et al., 2006), (Vanniniet al., 2010), etc.), but not in the same way, since in this project we do not aim to have a unique and general story but to have a general plot with n-parallel plots that are interactively created and linked as a result of the 2-players collaboration. The set of main plot plus secondary stories are not predefined, they emerge from the interactions. Nonetheless, in order to guarantee the achievement of the pedagogical goal a centralised mechanism is also introduced (similar to (Riedl et al., 2008)). The creation of stories is also conveyed in the interpretation of the artificial player's interactions. These interpretations are not only a mere log file of the agent's actions, but a story of the experience, which can be affected by the agent's personality, mood, age, etc. The human computer interaction field is also a major issue in the project, because of the wide and different target population that it is aimed for. The problem of a universal interface for all is under study for some time (see for example (Stephanidis, 2001)), but since the nature, medium of usage of the applications is in constant change, there aren't yet a well-established set of guidelines. This issue is going to be mainly tackled through the conduction of a participatory design (Schuler and Namioka, 1993) with different age groups and in multiple platforms (mobile, desktop, laptop, etc.).

At the end of the development, an exhaustive evaluation is going to be conducted aiming at gathering a large set of data that can help us to draw some conclusions on the graphical design decisions taken. From a collaborative perspective, some issues must be taken into account since however we envision a healthy collaborative thread, some unexpected situations may occur in human-human collaborative interactions. Behind the definition of collaborative interaction is the notion of: *"the collaborative construction of new problem solving*

knowledge. Collaboration is a process by which individuals negotiate and share meanings relevant to the problem-solving task at hand…. Collaboration is a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem." (Roschelle and Teasley, 1995), however, since there isn't any control over the human free will some problems may occur. The envisioned problems may be for instance divergent interpretations of the interaction, different beliefs about the story being told, etc. To account for these we envision the introduction of an internal social network where the participants can reflect and input their interpretation of the interaction (similar to (Machado and Paiva, 2002)). This internal social network may be the medium for sharing each individual meaning but also a tool for achieving a social meaning construction (Stahl, 2006). Although, inevitably useful for dealing with contradictory situations during gameplay, this social interaction may endanger the sense of immersion in the game and within the story context. At the end, this project aims to achieve results that demonstrate that: - The application promotes a playful and enjoyable medium for improving financial literacy across different age groups. To prove this, a set of guidelines and financial literacy goals are going to be established, and a non-intrusive evaluation is going to be applied. - The narrative approach taken provides an engaging context for delivering the financial education topics. - The graphical user interface designed is well fitted for the target public. During development several participatory design sessions are going to be conducted with different age groups, and at the end an exhaustive study. - The collaboration provides a valuable medium for constructing a shared social meaning and for taking different story perspectives, eliciting a new way of achieving knowledge.

4 CONCLUSIONS

In this paper, we present an innovative and interactive application that portrays financial education topics for a very heterogeneous target population. The aim of the paper was to discuss the main ideas of the project and demonstrate how these ideas can be conceptualised and implemented in a serious game.

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