

Empathic Characters in Computer-based Personal and Social Education

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Abstract.

The advent of techniques for affective computing [1], both in capturing user's emotional states and allowing for systems to display emotionally charged expressions, has allowed for a new development of interactive media. Following these ideas, in this paper we will discuss the role of empathy in the construction of synthetic characters to interact with learners in intelligent learning environments.

We tried to answer the question: How can we build synthetic characters that are able to evoke and establish empathic relations with learners in a interactive learning virtual environment?

To do that, we will describe a system, FearNot!, that uses synthetic characters and role playing, developed as a set of bullying situations, which emerge from the actions and interactions between synthetic characters in a 3D virtual world. The system was designed to evoke affective responses by the users, in this case, children.

FearNot! has been evaluated with 345 children in June 2004. The results achieved show that empathic interactions were achieved with synthetic characters.

Keywords. Synthetic Characters and Emotions in Learning Environments

1. Introduction

During the last few years, Intelligent Learning Environments brought new aspects such as flexibility and intelligence into current technology enhanced learning systems. However, most of the applications developed so far address learning areas such as maths, physics, languages, among others. The use of these systems in still problematic and complex areas such as science education, allows not only for proactive interventions, but also poses several challenges to the researchers that need to handle questions such as com-

plex problem solving. This need to build good applications in these areas has somehow hidden the necessity in other different areas of intervention, such as personal and social education (PSE) (or more recently as Personal, Social and Health Education - PSHE in the UK). However, the need for affective education has been emphasized as essential and should thus be a dimension of the educational process [3]. In general, PSE covers topics such as education against bullying and racism, on drugs, including smoking and alcohol, and sex education. These topics are addressed in many forms in the curricula. One possibility is through the inclusion of specific targeted activities that, in an horizontal way, are developed across different disciplines. A common thread in these topics is that knowledge in and of itself is not sufficient to meet the pedagogical objectives, since attitudes and emotions are at least as important to producing desired rather than undesired behaviour. For this reason, techniques such as small-group discussion, role-play and dramatic performance by Theatre-in-Education (TiE) groups may be used.

So, it is natural that in these areas, which require changes in attitudes, issues such as emotional responses, awareness of the others, empathy, etc, must play a role. And dealing with these issues in a computer based learning environment is not easy. As we all know, technology in general, and computers in particular, are often associated with cold and perhaps non-emotional interactions. Aspects such as emotions, personality or empathy were, until recently, considered only possible in human-human interactions.

However, the advent of techniques for affective computing [1] has allowed for a new development of interactive media with users. The use of affective interaction techniques, combined with technological achievements as the ones in the area of synthetic characters, allows for new types of systems, that in an effective way can address personal and social education issues. Combining these two aspects, in this paper we will try to answer the question: *Can learners establish empathic interactions in a learning environment?*

So, can learners respond emotionally to the interactions established with synthetic characters using a learning environment? If we can answer this positively, then we are on the right track to build intelligent learning environments for PSE.

To address this problem we will provide an example of an interactive application called FearNot! designed for addressing bullying problems in schools. By using synthetic characters and role playing, the application develops as a set of bullying situations, which emerge from the actions and interactions between synthetic characters in a 3D virtual world. The design of the characters and the situations explored, followed a framework that gives emphasis to the emotional reactions users will have to the synthetic characters. By designing *situations*, in particular exploring the narrative elements there embedded, the *behaviours* and establishing a degree of *physical proximity* between users and characters, we expected to attain emotional responses to the characters created.

This paper is organised as follows. First we will discuss the issue of empathy and its relation to synthetic characters. Then we will describe the system (FearNot!) and describe how the characters were build. Finally we will present the results attained in the evaluation done last June, drawing some conclusions and future work.

2. Empathy for Learning Environments

The most popular media, tv, films and literature, are masters in evoking empathic responses from the viewers. Indeed, we all establish affective relations with fictional char-

acters, suspend our disbelief and look at them as "alive". Differently, in computer based environments, characters are mostly seen as action-characters, detached from any kind of emotional behaviour. But, if we want to build environments populated with characters to apply in PSE, we need characters that evoke emotions and change attitudes. So, how can we build characters in computer-based learning environments that allow for the creation of empathic interactions with learners?

Usually, empathy is considered to be a process between two human beings, more precisely "any process where the attended perception of the object's state generates a state in the subject that is more applicable to the object's state or situation than to the subject's own prior state or situation" [2]. So we have two people involved: one, known as the "subject" or more commonly referred to as the "observer", and the other, who is observed and is referred as the "object" or "target". In an empathic situation, the state of the subject changes due to the perception of an emotional state of the object. This is a very vague definition and although we think this is the most precise definition up to date it is still true that "empathy is, and always has been, a broad, somewhat slippery concept" [5].

Furthermore, most contemporary researchers consider that there are two types of empathy, namely cognitive and affective empathy. Cognitive empathy is considered as the basic aspect of empathy and is the awareness, or understanding of another's state or condition [6]. In case of cognitive empathy the result of an empathic process is a change of the observer cognitive system. For example, when an observer perceives a target crying, he or she could conclude that the target is sad. But the observer doesn't get sad him- or herself. On the other hand, affective empathy is that the feelings or condition of a person (the target) generate strong vicarious emotions on the observer. In case of affective empathy the result of the empathic process is a change in the emotional system of the observer, i.e. the observer is feeling something. This would be the case if the observer is perceiving a target crying and is getting sad him- or herself due to that perception. This later type is the one most commonly considered as empathy. Given these aspects of empathy, we will try to solve the problem of how to build learning environments that evoke empathic reactions in children. We expect that these emotional reactions to situations will lead to attitude change, and awareness of situations, in accordance with PSE objectives.

3. FearNot!: an application in the area of bullying

Bullying is a difficult and devastating problem in our schools. Victimization problems are widespread and cross-cultural. Consequences may involve conduct disorder, hyperactivity, physical health problems, sickness, depression, anxiety and low self-esteem. The most common initiatives are theatrical performances or classroom discussions. However, these are necessarily collective, and in any group it is very likely that some individuals will be victims of bullying by some other in the group and will be inhibited in their participation. So our approach was to address this problem through a computer based environment, that children, individually, deal with situations of bullying and try to cope with them, helping our synthetic characters on what to do.

FearNot! (Fun with Empathic Agents to Reach Novel Outcomes in Teaching) specifically aimed at anti-bullying education for the 8-12 age group. The structure of FearNot!

is inspired by the Forum Theatre approach developed by the dramatist Augusto Boal and is as follows: there are a set of dramatic episodes divided by periods in which advice can be given to a character. Bullying is naturally episodic: it is distinguished from other aggressive behaviour by its very repetitiveness and by the unequal power relationship between bully and victim, the structure of the application follows this division into episodes. Each episode may involve verbal abuse, physical bullying, such as hitting, pushing and taking money, or, in the case of girls, the manipulation of social relationships against the victim ("You can't sit with us", "We're meeting up tonight but you can't come"), known as relational bullying.

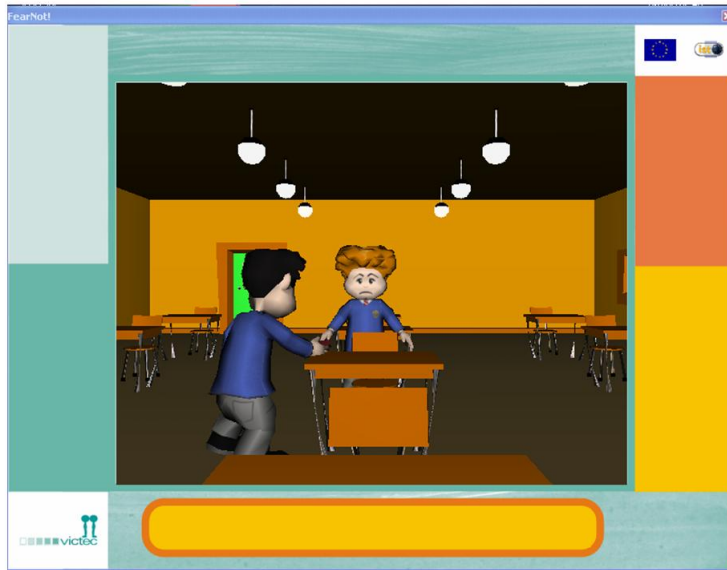


Figure 1. A Snapshot of an episode in FearNot!

A child using FearNot! logs in and starts by watching an introductory scripted segment where the characters and school are introduced. This small introduction is followed by an agent-driven episode in which one of the characters is bullied (a 'bullying scenario' - see Figure 1). At the end of each episode, the victimized character goes to a resources room (the school library) where the child user is asked to give them advice about how to cope with the bullying problem (see Figure 2). For example, the child may advise the character to tell someone, like the teacher, or for example, to hit back. Then, the advice of the child is used in the application for the continuation and selection of the next episode. After a number of episodes the drama concludes with an educational message and a questionnaire assessing the extent to which the child user can 'put themselves in the shoes' of the characters they have seen and assess their motives and goals.

The educational objectives of FearNot! depend on the child user being willing to engage with the problems faced by the victimised character. This requires the child to act as an 'invisible friend' - invisible because they are not themselves present in the dramatic episodes, and friend because they can advise and support the character but not act with god-like power to solve their problems for them. The eventual aim in FearNot! is to use

the empathic agent architecture that has been developed for its characters (see [4]) to generate dramatic episodes from interaction, in a similar way to improvised drama.

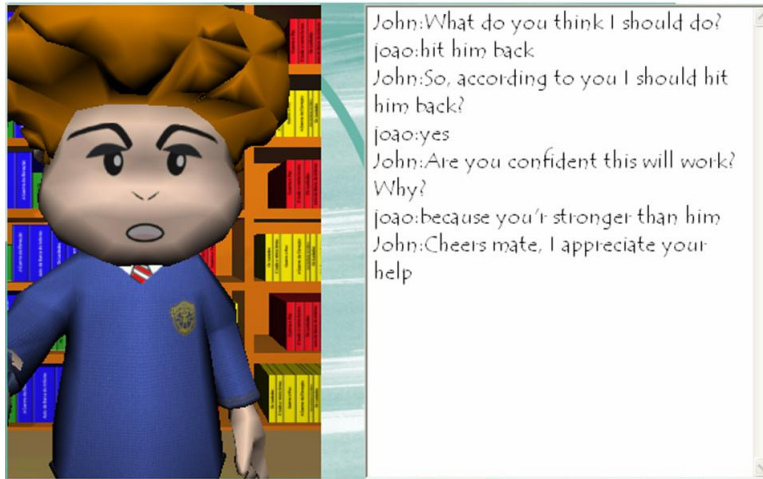


Figure 2. An interaction window between the victim character and the child (for the physical bullying and relational bullying)

4. Building Synthetic Characters for Empathic Interactions with Children

Animators and film makers have been creating unforgettable characters for years, characters that lead viewers to cry, become angry and react emotionally to what happens. However, creating embodied lifelike computer generated characters that have the power to make the user feel emotional reactions is still an unexplored research challenge. There are several factors to take into account and each one of them is, per se, may be regarded as a research topic. For example, what type of agent is more likely to evoke emotional responses from the user?

A good starting point for the identification of possibilities to design empathy enhancing synthetic characters is Bischof-Köhler's distinction of situation- and expression-mediated empathy [8]. The distinction relates to the source of which the observer receives the information about the state of the target. This source can be either the situation the target is dealing with or the emotional expression of the target. Situation-mediated empathy is promoted by the story the synthetic agent is part of. For example, if the target agent is beaten up or insulted by another agent, the user can infer that the target is either sad, angry or scared. On the other hand, if the target is crying, it expresses its sadness (expression-mediated empathy). Different possibilities for expressing emotions exist and are perceived by the user. They can be, for example: facial expressions, posture, gesture, psychophysiological cues (e.g. flush) or paraverbal cues (like voice pitch).

Following this research on empathy, we will address the problem of building synthetic characters for learning environments by considering the following elements: (1) the situation, that is, who to convey to the user some situation that allow for empathic responses; (2) the behaviour of the characters, that is, how can we develop architectures for the agents that lead to believable behaviour, capable of giving the illusion of life; and (3) the expression of the characters. All these elements are part of what we consider to be the needs of a system for evoking empathy. We will describe each one for the case of the characters in FearNot! (for more details, see [10]).

(a) *The Situation*: As has already been outlined, situational aspects play a central role when it comes to promoting empathic interactions between humans and agents. In the case of FearNot! an essential aspect of the design and implementation of believable and interesting bullying scenarios concerns the profiles and roles designated for each character depicted within the scenarios. A number of research studies have been carried out to assess bullying profiles and a classification of distinct characteristics are evident for 'pure' bullies, 'pure' victim, bully/victim, bully/assistants, defenders and bystanders. Together with teachers and students we have promoted a set of activities for data gathering where a set of typical situations were described. We have used Kartouche [?] to create scenarios through storyboards, in order to assess the children's preferences and empathy towards the characters with different roles.

With these data, we have defined a high level description of typical scenarios, and each simulated episode within the bullying scenario act defines a set of encounters that enacts (rather than dictate) bullying situations. Furthermore, and in order to obtain certain degree of similarity between the children and the characters, we have considered specific situations for both genders (more direct bullying for boys and relational bullying for girls).

(b) *Behaviour*: Characters must act in a believable way and in accordance with their roles. Their actions must be generated in a way that their behaviour allow children to recognize common situations found in schools. Given that we didn't want to script the actions of the characters, the architecture developed for our FearNot! synthetic characters allows for a dynamic generation of actions in a believable and autonomous way. Such architecture, is used for the emergent version of FearNot! and was done in a way that the characters are able to generate actions, consistent with their role in the episode and their emotional state at the moment.

(c) *Expression and physical appearance*: In order to design the characters we made some preliminary tests with children and designed two types of characters: realistic versus cartoon like. Although at first, one would be tempted to adopt realistic characters because they are more close to reality, it was clear from the studies and results that learners of this age preferred the cartoon characters (see [7]). Inspired by the very popular characters from a Portuguese children's web portal (Cidade da Malta in <http://www.cidadedamalta.pt/>) originally in 2D, we have converted the characters into 3D and adopted them adequately. The facial expressions, although simple, convey the emotional state quite clearly as they are a bit exaggerated.

Furthermore, the characters and the situations for the age groups we are targeting range a quite distinct set of children's appearances so that children can easily identify

with one or another character. For each country (UK, Portugal and Germany), we designed different characters given that children in the UK have uniforms and in Portugal and Germany do not.

5. Evaluation and Results

One first version of FearNot! was trailed at the "Virtually Friends" event at the University of Hertfordshire, UK, in June 2004. Although not including an emergent narrative yet, the version used had the episodes and the characters designed with the principles here described. 345 children participated in the event. 172 were male (49.9%) and 173 were female (50.1%). The age of the sample ranged from 8 to 11 with a mean age of 9.95 (SD: 0.50). The sample comprised of children from a wide range of primary schools in the South of England. For each day of the event, 2 classes from different schools participated.

The FearNot! evaluation session began with a general introduction to bullying and using the system. Children then completed questionnaires on bullying role and empathy profile. After completing the questionnaires, they interacted with FearNot!, firstly with a direct, and secondly, with a relational bullying scenario.

The direct bullying scenario had 3 characters; John (the victim); Paul (the bystander) and Luke (the bully). The relational bullying scenario has 4 characters; Frances (the victim); Martinha (the bystander) and Sarah and Janet (the bully and the bully assistant). After each scenario, lasting approximately 15 minutes, the children completed an Agent Evaluation Questionnaire.

With this evaluation, we wanted to find out if children responded emotionally to the situations and characters portrayed in the episodes shown. The results were as follows:

Did the children like the characters we wanted them to like?

Children stated that they liked John the victim the most, followed by Paul and Martinha, who both offered support to the victim in the direct and relational scenarios respectively. Janet and Sarah the female bullies had very little impact. Only 6 children stated that they liked these characters the most. 10% of the sample liked Luke the male bully the most.

Children identified with the non-bullying characters the most in terms of who they would choose to be, i.e. 31% of children would choose to be Martinha and 25% would choose to be Paul the defender. 16% of children stated that they wouldn't choose to be any of the characters. Children stated that characters they would most like to be friends with were John and Martinha followed by Paul and Frances. Few children wanted to be friends with a bully character. In line with our intentions, children could clearly be seen to prefer the non-bully characters.

Did the children feel sad for the victims?

Using FearNot! did evoke empathic feelings in most of the users, with 79% of children stated that they felt sorry for one/some of the characters in the dramas. Children predominantly felt sorry for John (80%) and Frances (67%) the victims in the dramas. Significant gender differences were revealed for feeling sorry for the characters ($X = 18.28$, (327) $df = 1$, $p = 0.000$) where females (89%) felt significantly more sorry for characters overall compared to males (70%).

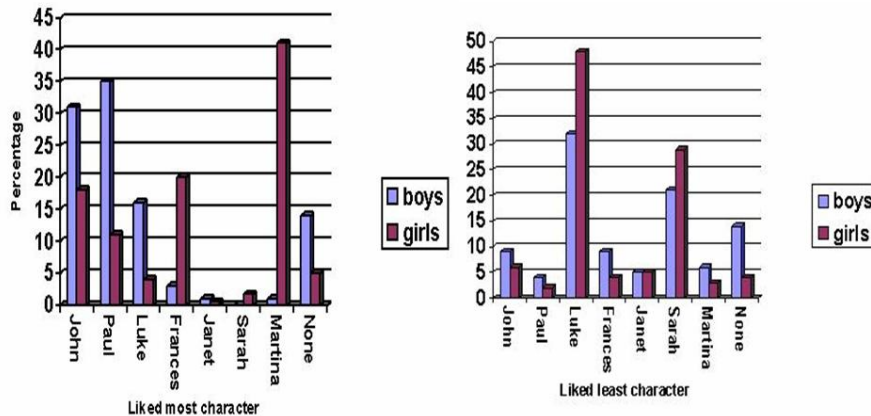


Figure 3. Results from the evaluation: Most and Least liked character

Children felt less sorry for characters if they chose to be friends with Luke (43.5%) or None (59%). The most empathy was expressed if children chose to be friends with Frances (the female victim).

Did children feel anger towards the bullies?

Interacting with FearNot! resulted in 72% of children stating that they felt anger towards one/some of the characters in the dramas. Children predominantly felt angry towards the male bully, Luke (70%), 58% felt angry towards Janet the bully assistant, 63% felt angry towards Sarah the bully. Significant gender differences were found ($X = 11.06$, (315), $df = 1$, $p = 0.001$) where significantly more females (81%) felt angry towards characters compared to males (64%). There was a significant relationship between prime character and feeling angry towards characters ($p = 0.005$). If children stated that they wanted to be Luke they were much less likely to state feeling sorry for the characters compared to others (42%). A significant relationship emerged between feeling angry for characters and which character children would choose to be friends with ($p = 0.000$). If children chose to be friends with Luke (26%), Janet/Sarah (64) or none (58%) of the characters they were significantly less likely to feel angry with the characters. A significant relationship was found between children's liked most character and feeling angry towards the characters in the drama ($p = 0.007$). Children who stated that they liked Luke (47%) the most expressed that they felt the least anger towards characters. This was followed by those that stated that they didn't have a liked most character (65%).

6. Final Comments

In this paper we have provided a discussion on some aspects that need consideration for the creation of synthetic characters that are able to establish an empathic relation with learners. To do that, we have relied on research on empathy and from them derived some guidelines for designing the characters in accordance. By describing FearNot!, an

application designed for addressing bullying problems in schools, we have illustrated the issues. The results of the evaluation of the system carried out with 345 children show that children can indeed feel empathy towards the characters, and that there are some gender differences that emerge.

Although the results obtained are restricted to this particular application in the area of bullying, we do believe that the results can be extended to other areas of Personal and Social Education.

7. Acknowledgements

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