

Expressive Characters in Anti-Bullying Education

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1. Introduction

Expressive behaviour can be considered a subset of behaviour in general for an embodied agent, whether this is a living human, a robot or a graphically embodied synthetic character. We can think of it as that behaviour interpreted by others as directly signalling an affective state. It may be a distinctly produced behaviour, as in facial expression or gesture, but it may also be a behavioural modifier as in posture or tone of voice. Because in principle it tells the observer something about the internal state of the agent, it acts as an additional communication mechanism alongside more externally directed and functional behaviour, whether physical actions or the use of natural language. Indeed it is argued that in the case of humans, around 80% of overall communication comes through these indirect channels (Argyle, 1972).

Knowing something about the affective state of an agent is important to a communicative partner for a number of reasons. It is the basis of social relationship-building ('does this person like me or not?'); of the creation of trust ('Is this person telling me the truth') as well of the understanding of the motives and goals which help to fill in the context of the functional behaviour and allow predictive inferencing about what an agent will do next. This can help to produce a feeling of coherent action that is required for a human to feel that in some sense they 'understand' what an agent is doing. In this way, knowledge of affective state acts as a major support to the application of a 'theory of mind' (ToM) to other agents. Its importance is underlined by the human tendency to anthropomorphize the behaviour of non-human agents in terms of human affective states and motives, from pets to inanimate objects such as cars and other machines.

Because of this importance, expressive behaviour is seen as a very significant issue in the development of *believable* graphically-embodied characters, as can be seen from the other chapters of this volume. A difficult term to define, believability (Bates, 94) is seen as the extent to which a human is willing to suspend his or her disbelief in a collection of graphical pixels and to see it as an autonomous entity with 'its own' internal life. Given that affective engagement with the world is such an important component of human internal life, it can be seen that appropriate expressive behaviour can make a major contribution to believability.

In this paper we discuss the role of expressive behaviour in the graphically-embodied characters developed as part of the EU-funded project VICTEC – Virtual ICT with Empathic Characters. This project, involving five partners in the UK, Germany and Portugal, seeks to apply virtual dramas acted out by 3D graphically-embodied characters to what is known generically in the UK as Personal and Social Education (PSE) (or more recently as Personal, Social and Health Education – PSHE). This covers topics such as education against bullying and racism, on drugs, including smoking and alcohol, and sex education. 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.

A motivation for the VICTEC project was to try to create some of the impact of dramatic performance through virtual dramas. The specific topic selected was anti-bullying education. Effective though theatrical performance is in this domain, it is 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 thus will be inhibited in their participation. Thus a virtual drama

application that could be used by the individual seemed to have a possible use.

We first consider the characteristics of bullying and go on to describe the demonstrator FearNot! produced by the VICTEC project. We discuss empathy and its role in meeting the pedagogical objectives of FearNot! We will go on to argue that consistency along the main dimensions of empathy is more important than the degree of naturalistic fidelity of expressive behaviour and cite early evaluation results supporting this position.

2. Bullying and FearNot!

Bullying in social relationships can be differentiated from merely aggressive behaviour by its frequency, planned nature and dependence on a perceived inequality of strength, power or status. In a widely accepted definition of bullying in schools:

“ A student is being bullied or victimised when he or she is exposed *repeatedly* and *over time* to *negative action* on the part of one or more other students” (Olweus, 1991).

Bullying may involve hitting, punching, blackmail, threats and spiteful behaviour, including overt abstraction or damage of possessions. This is known as *direct bullying*. *Verbal bullying* includes insults, mockery and the spreading of lies, whether verbally, by notes or more modern technology such as email or texting. A further category of bullying is known as *relational bullying*:

“The purposeful damage and manipulation of peer relationships and feelings of social exclusion” (Crick and Grotpeter, 1995).

This includes for example refusing to sit next to someone, or excluding them from group activities whether socially or in study. Studies have shown that bullying is a widespread problem in schools – for example a study carried out in the UK and Germany in the period 1996-1998 (Wolke et al, 2001) showed that 24% of UK school students aged 9-11 said they were bullied every week, while between 12% and 17% of the sample admitted to bullying others at least 4 times in the previous term.

A characteristic of education against bullying is that there is no definite strategy that will always work. Even the action urged in the generally-agreed educational message “tell someone you trust, don’t suffer in silence” is not guaranteed to succeed. “Hit the bully back” is an example of controversial advice: often offered by parents, it is opposed by teachers. In addition it only succeeds in a minority of direct bullying cases, but because of its dramatic effect, success may well be over-reported. Thus the educational

objectives of anti-bullying education, while partly intended to show that bullying is a ‘bad thing’ and to dramatise the effects upon the victim, are necessarily diverse. Equipping children with a greater understanding of social dynamics and demonstrating the range of coping strategies and the circumstances under which they succeed or fail is therefore a valid pedagogical approach.

The VICTEC project has developed a virtual theatre application called 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 Brazilian dramatist Augusto Boal (Boal, 1979) in order to incorporate theatre into the development of political activism. In this dramatic form, an audience is split into groups, with each group taking responsibility for one of the characters in the drama. Between episodes of dramatic enactment, each group meets the actor, who stays in role, and negotiates with them what they should do next in the drama, respecting the constraints of their role and character. This structure of dramatic episodes divided by periods in which advice can be given to a character has been adopted for FearNot! as shown schematically in Figure 1.

Here, an introductory scripted segment introduces the characters and school to the child user (I in Figure 1). It is followed by an agent-driven episode in which one of the characters is bullied (a ‘bullying scenario’). At the end of the 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. After a number of episodes (currently three) the drama concludes with an educational message (F in Figure 1) 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 (QA in Figure 1).

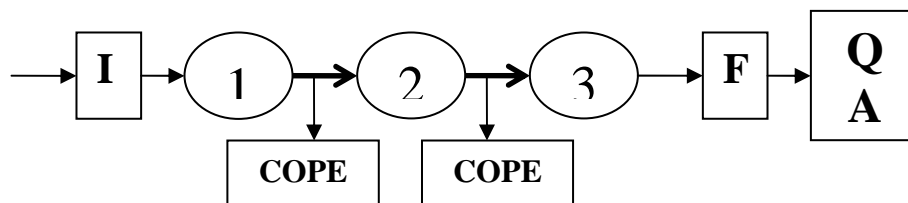


Figure 1: The structure of the FearNot! application



Figure 2. A shot from a bullying episode in FearNot!

Figure 2 below shows a shot from one of the bullying episodes in FearNot!.

3. Empathy

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 success of the Japanese Tamagotchis – small plastic capsules with rudimentary graphics expressing their ‘needs’ for food, cleanliness and play - suggests that children can indeed feel a sense of responsibility for the articulated needs of electronic characters. In the case of FearNot! these needs are emotional rather than physical and for this reason perception of the affective state of the character is fundamental.

In FearNot!, just as with the Tamagotchis, time moves only forwards, and dramatic episodes cannot be replayed, but the repetitive nature of bullying means that at an abstract level all episodes are the same. The psychological basis of the relationship between child and character lies in empathy, and the characters can be described as empathic characters if they succeed in building the desired empathic relationship.

Empathy was a concept originally developed as part of a theory of aesthetics to describe the emotional impact of works of art on the human perceiver. The word is a translation by Titchener (1909) of the term *Einfühlung* of Lipps (1903), which he described as the act of projecting oneself into the object of a perception, ‘feeling into’ a work of art. A modern definition suggests that empathy is:

“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” (Preston and de Waal, 2002).

One can distinguish between three types of empathy: *cognitive empathy*, *affective empathy* and *ideomotoric empathy*. In the first of these, perception of the ‘object’ (another person in this case) produces an understanding of their affective state. In the second case, a change in the affective state of the subject is produced, with congruent empathy where the resulting state is similar to that of the object, and contrast empathy where it is markedly different. Affective empathy in its congruent variant was earlier known as sympathy, but this term has been more recently reserved for the emotional state called compassion (Wispe, 1987). Ideomotoric empathy relates to an empathic motor response, for example if ‘seeing someone dancing makes me want to dance too’.

Apart from different types of empathy, one can also distinguish different mediating mechanisms. Empathy may be mediated by the situation in which the object is perceived to be, so that for example seeing someone have their handbag stolen may produce the cognitive empathy effect of understanding that they are sad and angry. It may more obviously be mediated by expression, where any element of the full range of expressive behaviour produces the empathic effect. Thus sadness is indicated by crying.

Both of these mediating mechanisms are used in FearNot! However, as in most drama, there is a sense in which situation is dominant in FearNot! and expression is subordinate to it. Thus its focus is less on the accuracy of the expressive behaviour of the characters – as we will see this is not intended to be naturalistic – and more on using expressive behaviour to emphasise the dramatic situations being presented. In this FearNot! is rather different from some of the other applications discussed in this volume, such as online chat or arranging meetings, where expressive behaviour dramatises what is not in itself a very dramatic activity.

4. Expressive behaviour and creating empathy

Much work in expressive behaviour for synthetic characters has focused on producing a naturalistic effect, allied to the parallel move in graphics for

photo-realism. Thus the work of Ekman and his colleagues on the coding of human facial expressions (Ekman and Friesen, 1978; Ekman, 1982), which itself can be traced back to the 19thC photographic work of Duchenne de Bologne (Duchene, 1876), has been a major influence. It has directly impacted the design of the Facial Activation Parameters approach used in mpeg4 and has then been applied to some of the best current work (for example, Greta: de Rosis et al, 2003) in ‘talking heads’, where only the head and shoulders of an agent is shown.

However, in the context of virtual drama, one must question whether believability is the same thing as naturalism. Taking film animation as a guide rather than psychology, of course the answer is a clear negative: good animated characters (Mickey Mouse, Buzz LightYear, Shrek) are highly believable and give ‘the illusion of life’ (Johnston and Thomas, 1995) without in any sense being naturalistic. In the same way, theatre uses many non-naturalistic devices, as was demonstrated in a Theatre-in-Education performance on the theme of bullying attended as part of the background research for FearNot! Here a set of short episodes used elements of mime, music, and exaggerated physical action to allow three adult actors dressed in black to portray the life of a victim in a large secondary school.

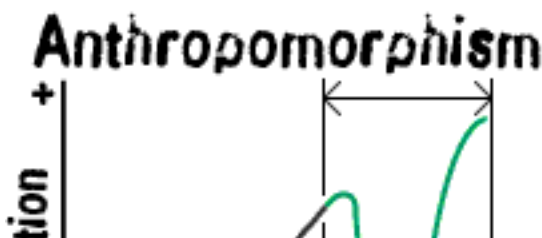
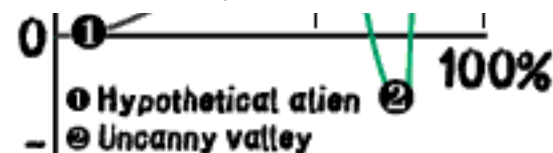


Figure 3: The Uncanny Valley, see Mori, 1982 and Dautenhahn, 2002.



used in Dautenhahn, 2002) who characters. He argued that the ac- they became more anthropomor- phic up to a point of near-realism, and then dropped very sharply, right into the negative part of the graph – as shown in Figure 3. He called this drop in acceptability ‘the uncanny valley’ since it appears to correspond to the emotional reaction accompanying shuddering.

It seems that humans develop expectations for synthetic characters based on consistency between appearance and behaviour. The more naturalistic the appearance, the higher the expectations that the behaviour will be natu-

realistic. Any even slight mismatch between the two is then the cause of the ‘uncanny valley’. Given the subtleties of human expressive behaviour, as for example discussed by LaFrance in this volume, it is clear that meeting the behavioural expectations generated by a very naturalistic appearance is actually very difficult and may be better avoided. Two robot examples illustrate this very well. Kismet (Brezeal, 200) has a metallic face with large red rubber lips, big dark eyebrows and long pink ears a little like those of a donkey and looks nothing like a human baby. Yet analysis of human interaction with it shows that it evokes many of the same behaviours as a baby. On the other hand, the Face Robots of Hara and Kobayashi (1996), with wonderfully engineered and accurate representations of facial muscles, latex skin, glossy hair and glass eyes can irresistibly remind the observer of zombies.

Both the dramatic paradigm being applied and the dangers of the ‘uncanny valley’ led to particular decisions about the appearance and expressive behaviour to be used in FearNot! Firstly, as can be seen in Figure 2 above and Figure 4 below, it was decided to make characters cartoon-like in appearance. This reduces expectations about the naturalism of their behaviour and allows non-naturalistic expressive behaviour to be used if needed – in cartoons for example, anger may be signalled by lightning above the head, and crying may create a pool of tears. In fact more conventional combinations of facial expression, stance and animation have been used, but the important point is that less naturalistic behaviour is consistent with the less naturalistic appearance of these characters.

A very simple approach was taken to facial expression in the FearNot! characters. Rather than creating nodes on the facial mesh and animating



Figure 4: FearNot! cartoon-like characters

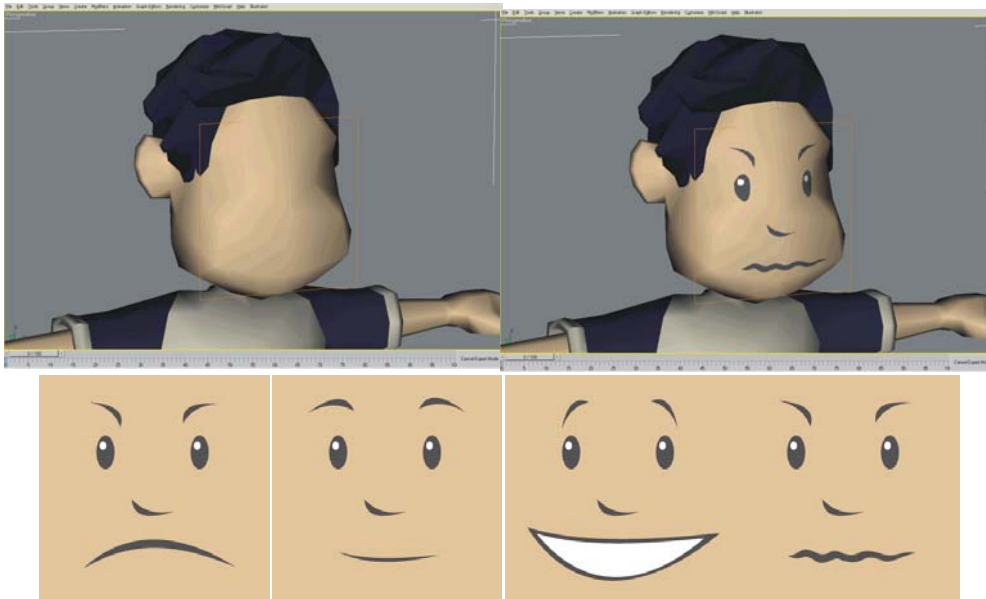


Figure 5: Producing facial expressions in texture

these to create expressions, a set of facial textures, each displaying a different stereotyped expression were designed, as shown in Figure 5, below.

The appropriate texture is then displayed on the face when the internal emotional system of the character puts it into the relevant affective state. This may seem unduly simple, but in fact it is very effective – it reduces the need for a child user to decode sophisticated expressions on what are very small graphical faces on a typical desktop computer, and makes it very clear what the emotional reaction of the character is to the situation in which it acts. Refinements under consideration are to morph from one expression to the next rather than making the current abrupt transition and to add in some mouth movement when a character speaks (accurate lip synchronisation is another behaviour nobody expects in cartoon-like characters).

Posture is another way in which affective state can be expressed, and its use in FearNot! is illustrated in Figure 6. Some of the ideas expressed in Vala et al, in this volume, are used here to distinguish between a confident and happy (or angry) character – the bully – and a demoralised and sad character – the victim. In this cartoon-like milieu, exaggeration is entirely possible – as we have seen with the facial expressions - and both exaggerated postures (as part of animations) and exaggeration via the use of shadow have been used in FearNot!

FearNot! seeks to produce unscripted dramas, in which action is generated by interaction among the characters. In a scripted system, the required expressive behaviour can be invoked at the global level and, for example, transmitted to characters via a mark-up language such as those cited in



Figure 6: Using expressive posture. Which one is the bully?

Ruttkay et al in this volume. In an unscripted system, expressive behaviour must be generated, like all other actions, by the internal architecture of each character through a sense-reflect-act cycle, so that characters produce their own mark-up in real time. This is feasible, though extremely difficult, for facial expression and posture, but the use of dramatic lighting, shadows, close-ups, cutting between characters and other dramatic effects depends on the development of intelligent camera agents, outside the scope of this project.

We will not discuss the character action-selection system in detail here, but in summary, it uses appraisal rules as in the well-established taxonomy of Ortony, Clore and Collins (1988) to establish the emotional reaction of a character to an event (an action of another character) or object. This is then used both to generate reactions – such as expressive behaviour and impulsive physical actions – and to establish goals for which immediate action sequences are planned. A memory of recent interactions and a parameterised set of personality parameters will also impact action selection. Table 1 shows some of the actions or behaviours associated with relevant OCC emotions in the bullying scenarios.

Table 1. Associating actions with OCC emotions in the bullying case

OCC emotion	Appropriate actions/behaviours
Joy	Smile, dance, laugh, wave
Happy-for	Felicitate, encourage
Sorry-for	Apologise, encourage, protect
Anger	Ignore, hit, avoid, aggress, humiliate
Distress	Cry, sit on the floor, beg

The personalities of the characters are parameterised according to which of five roles they play: bully, victim, bully-victim, defender or bystander. Fig-

ure 7 below shows an extract from the configuration file for a bully, expressed in XML. The extract shows values assigned to *emotional disposition*, *goals*, and *event response*.

The *EmotionDisposition* tag is used to specify the character's emotional threshold (0=low resistance to the emotion and 9=high resistance) and decay rate (0=long duration of emotional state, 9=short duration) for each of twenty-two emotion types, a subset of those defined in the OCC system seen as relevant for bullying scenarios. In the Figure 7, example, the bully does not easily feel afraid since a high threshold value (9) makes the character less sensitive to the emotion. Even if a fear emotion is created, it will disappear quickly, since the character has a very high decay rate (8).

```
<Character id="1" role="Bully">
  ...
  <EmotionDisposition emotion="Fear" threshold="9" decay="8" />
  ...
  <Goals>
    ...
    <Goal id="4" name="BullyVictim"
      importanceOfSuccess="9" importanceOfFailure="9" />
    ...
  </Goals>
  <EventReactions>
    ...
    <Event type="Action" subject="OTHER" action="Cry">
      <Desirability value="9" />
      <DesirabilityForOther value="-10" />
      <Praiseworthiness value="-5" />
    </Event>
    ...
  </EventReactions>
```

Figure 7: Extract from the role-definition of a bully

The *Goal* tag specifies what the character's goals are and how important they are to him. The goal described is the goal of physically bullying the victim. This importance of success in this goal is very high to the bully, and if he fails to achieve the goal, it will also feel very troubled. Since a goal can be shared by more than one character (but with different degrees of importance), a file containing all goals is used. In this way, each goal is defined only once.

Finally, the *Event* tag defines an emotional reaction rule, used in responding to emotional states of other characters. The example in Figure 7 specifies the bully's emotional reaction when he sees another character crying. He will desire such event, but knows that the event is very undesirable to the character that performs the action. Also, according to his standards, men do not cry and someone who cries is no more than a wimp. Therefore he sees the cry action as blameworthy.

It is worth noting here that to some extent we disagree with Carafiglio et al in this volume when they say:

“If, for instance, the application concerns a 2D embodied character that is sketchy in its appearance and is expected to show a limited range of expressions, a refined modelling approach is probably not needed.”

The FearNot! Characters, though 3D, are indeed very sketchy in appearance, but in order to create dramatic interaction a heavy onus is placed on their individual action-selection systems, requiring a much more sophisticated emotional model than is visible in their expressive behaviour. The important point here is that in an emotionally-driven drama, all action is to some extent expressive of the inner state of the characters because it is interpreted through the empathic relationship between the child user and the victim character, mediated by the dramatic situation. Thus the link between internal character state and selected action must be appropriate in order to produce coherent interaction between the characters.

5. Early Evaluation results

A large-scale evaluation of FearNot! took place in the summer of 2004 with about 400 children aged 9-11 in the UK. The individual responses as expressed through questionnaires are still being processed, but the focus groups held at the end of each of seven sessions revealed a very positive response from the child-users to using FearNot! This appears to support earlier evaluation results that were obtained by using what was known as the ‘trailer’ for FearNot! – a small-scale precursor to the overall application consisting only of the introductory segment and a single bullying episode, with no interaction with the victim character.

Table 2: Results of preliminary evaluation with 127 children

Movement	1= +ive view 5= -ve view	Emotion towards characters	Luke (bully)	John (victim)	Martinha (narrator)
believable	3.04	Sadness - % feeling	5	95	0
realistic	3.11	Anger - % feeling	85	13	2
smooth	2.82				
Attractive- ness of school envi- ronment	2.1	Match with char- acters	2.0		

While the results of the trailer evaluation are discussed in detail elsewhere (Hall et al, 2004), we here examine (Table 2) the responses to the appearance and movement of the characters and the amount of empathy felt by subjects with the victim. The questionnaire focused on character attributes (voice believability, likeableness, conversation content, movement) storyline (believability), character preferences and empathy (sorrow and anger). Measurement was predominantly by a 5 point Likert scale and the questionnaire was completed by 127 children from schools in England and Portugal, 64 male and 63 female, aged from 8-13 (\bar{x} =9.83, SD =1.04). They were drawn from primary schools located in urban and rural areas of Hertfordshire, UK (47%) and Cascais, Portugal (53%).

The results show that for example the children were not specifically impressed by the movement of the characters: 1 was a positive response and 5 a negative, and the values for believability, realism and smoothness were all around 3. However the 3D school environment and its match to the style of the characters was valued more highly, with results around 2. The questions on empathy indicate clearly that children did empathise with the victim, with very high percentages feeling sorry for the victim and angry with the bully. We take this as indicating that the design decisions on expressive behaviour, when taken with the narrative action, have supported the empathic engagement we were seeking.

Issues of culture and gender have also been highlighted in the evaluation work carried out so far. Use of story-board prototypes has indicated that while girls empathise with characters of both genders, boys empathise with male characters. A complicating factor here is that the scenarios involving girls tended to involve relational bullying rather than straightforward physical bullying, and questions on story-content indicated that boys in this age-group found it very difficult to understand relational bullying or indeed to see it as bullying at all.

6. Conclusions

As already commented, FearNot! is rather different in its approach from the embodied conversational characters (ECAs) discussed elsewhere in this volume. The synthetic characters involved are essentially virtual actors, and drama rather than naturalism is therefore the key paradigm. However there are also key differences between FearNot! and two other applications which are much closer to its objectives.

The Mission Rehearsal Exercise (MRE) (Swartout et al, 2001) has a similar dramatic element in that it uses a traffic accident during a peace-keeping exercise as a way of producing training situations for soldiers. However unlike FearNot! it is intended as an immersive experience, and

rather than using an empathic relationship as a pedagogical approach it creates the sort of emotional stress that a soldier who has conflicting objectives and little time to resolve them might experience. The user is a trainee who must make decisions in real time and therefore has a higher cognitive load than that imposed on FearNot's child users during its dramatic episodes.

Additionally, as a military training application it is required to move a great deal closer to realistic representation than is needed in an application for children. Much military training is intended to reduce the amount of expressive behaviour produced in stressful situations, so that its military characters remain fairly deadpan. The key expressive figure in the scenario is that of the mother of the injured child, and here posture, gesture and pre-recorded voice are used to produce dramatic expressiveness and to increase the stress upon the trainee.

A second relevant application is Carmen's Bright IDEAs (Gratch and Marsella, 2001), which is aimed at mothers of children with cancer. Its interactive component shows a dialogue between a mother called Carmen and a therapist called Gina, and the pedagogical objective is to teach a real-life mother a cognitive problem-solving technique. In the same way as FearNot! it tries to meet its pedagogical objective by creating empathy between the user and Carmen, and allows the course of the interaction to be changed by putting up three 'thought bubbles' for Carmen at various points from which the user must select one.

As in FearNot! a cartoon-like style has been adopted, though this is implemented in 2D rather than 3D. However a more significant difference is that the episodes are cast as conversations with a therapist, so that the dramatic dynamic (as well as the action-selection issue) is rather different. The amount of facial expressiveness is if anything more limited than in FearNot!, but pre-recorded voices contributed by actors make the aural channel extremely important as an expressive medium.

We have said little about the use of expressive voice in FearNot! so far, and it is worth pointing out that it is a modality absent also from other discussions in this volume. The reason is that the state-of-the-art in synthesised speech is still far too primitive for it to be used successfully for expressive purposes. Artificially-synthesised voices still sound very 'robotic' to the point that their use in affectively expressive situations is likely to be counter-productive.

Voices constructed from pre-recorded human input are more successful, but having been aimed at applications such as automatic telephone systems, are equable rather than emotional. In addition they require a substantial memory allocation to hold a large real-time database making them problematic alongside a 3D real time rendering system. FearNot!, like the

two other applications discussed in this section, used pre-recorded speech in its trailer, however this approach is not compatible with the unscripted dramas for which FearNot! is aiming. Expressive speech therefore remains a very difficult question.

To conclude, we have tried to demonstrate in this paper that consistency may be a more important objective in expressive behaviour for synthetic characters than outright realism. Believability – the willingness of a user to accept a collection of graphical pixels as a personality with ‘its own’ internal state, is the key we would argue to successful user-agent interaction. In FearNot! we believe we have created characters with which child users do engage and which can indeed produce the empathic engagement needed to meet its pedagogical objectives.

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