Modelling Personality for Character Agents in Simulated Fiction

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Abstract. This paper outlines our project to construct an architecture for implementing characters with believable personality in interactive software fiction. There is a need for a detailed model of personality to drive the actions of simulated character agents in areas such as simulation and the computer game industry. While there are a number of related projects in similar areas, this project's emphasis is on creating a versatile and efficient model, suitable for use on standard hardware such as a home personal computer. The paper also outlines the prototypes being developed and a brief description of the project's future goals.

1 Introduction

Humans are by nature social, reactive and yet often irrational creatures. As automated systems are becoming more prevalent in use, it is desirable to 'humanise' these systems. To facilitate this humanisation process, we need to make systems respond appropriately to interaction, and introduce a level of irrationality similar to that present in humans. In other words, we need to give the system a 'personality'. A system constructed with a suitable personality could have numerous applications in various types of interactive systems.

Our project aims to create an architecture for artificial 'characters' that express an individual personality, and interact with other such characters (whether controlled by a computer or human). The goal is to create a simulated world where computer-controlled characters act within their environment in such a fashion as to seem 'alive', by having them act according to defined personalities. The actions that these characters take must seem plausible given their stimuli from the simulated world.

The main application that this project is designed for is interactive drama (including computer games). While other areas (such as military and commercial simulation) may also benefit from a model of human behaviour, the focus of this project is to create plausible fictional characters rather than build an accurate psychological model of the human mind.

1.1 Interactive drama and games

Stories have been popular since before the dawn of history, and still remain popular today. Whether the medium is a human story-teller or a modern computer-animated film, the use of well-defined characters is common. It is the personality and behaviour of the characters in these stories that make them enticing; the feeling of empathy with a hero and aversion to a villain is our reaction to the complexities of their character.

Now that computers can be used as a new medium for stories, we need to have well developed characters in order for the story to be compelling. One approach is to adopt the techniques used by traditional static media, such as that of film.[1] However, this method forgoes the inherent interactivity of the medium. A story told through software does not have to be static and linear like a book or film, particularly if we wish a human user to play the part of the protagonist. We can make the story adapt to the actions of the player. However, as most stories contain more characters than just the hero, this means that the 'supporting cast' need to be adaptive as well. 'Improvising' characters cannot have a fixed script, but instead need to act out their character's personality in a believable way. That is what this project aims to achieve.

1.2 Simulation of real-life situations

There are a number of fields, from military training simulations to marketing models of consumer behaviour, that require an accurate simulation of human activity. These simulations also have to account for the differences in each individual, as no two people will act in exactly the same way. In a military simulation, it is desirable to represent the effects of stress and skill level on the combatants' performance, and to introduce an element of irrational behaviour inherent in real humans [1]. Although this project will create a system for modelling personality, accurate representation of psychological and physiological processes present in real humans is not a key consideration.

2 Previous work on software characters with personality

The Oz Project [2] (developers of 'Edge of Intention'[2]) has developed a language called *Hap* [4, 5], to allow artists to individually script the personality of a character (by writing rules unique to the character to express their personality traits). This approach leads to the development of a distinctive character as specified by the vision of the artist, and is convenient for simulations containing

[1] This is the method that many in the computer game industry are attempting to master. More modern computer games are using cinematographic techniques to make their game feel like a 'movie'.

[2] The 'Edge of Intention' simulation features a group of four 'woggles', sphere shaped creatures who can communicate through body language (and in later versions natural language), with one woggle human controlled.[3]

a few characters with richly defined personalities. The downside is that as each character's personality is uniquely written, there is a higher cost of development, which may not be feasible for simulations featuring many characters (or for computer-generated characters).

An alternative approach is taken by the Virtual Theater Project [6], which involves creating dramatic pieces containing characters modelled in software. Instead of using individual scripting for each character, a personality is defined parametrically (i.e. the level of each personality trait is defined by a number). This allows greater customisability in the creation of new characters. However, the purely numerical approach to modelling personality has the disadvantage of making characters seem like they are 'factory-designed' (i.e. with only cosmetic differences) unless sufficient variability is provided in the model.

Some attempts to give individualism to characters have been made in games featuring artificial life, for example in the *Creatures*™[7] and *Petz*™[8] series. Their goal is to model organisms' behaviour at a low level, usually through the application of neural networks. While these can be used to create believable characters, it is hard to predict exactly what personality will arise due to the need for training. Also, sophisticated artificial life techniques tend to be computationally expensive, which restricts the depth and number of the characters allowed in a scenario.

Developing software characters with personality is involved in the building of MUD robots (such as *Julia* [9]). Part of the purpose of these agents is to converse with people in a human-like manner. These applications are also used as attempts to pass the Turing test. Turing test agents are designed to try to fool a person into assuming they are conversing with a human. Thus such agents tend to be designed to hold a plausible conversation rather than show a believable and interesting personality, and as such are not particularly useful as guides for building a personality model.

3 Attributes of the system

The ultimate goal of our project is to create an architecture that allows creation of 'believable'[3] characters in software. There are nevertheless a number of additional subgoals that need to be achieved.

- **Efficient use of resources**: An architecture needs to be designed that is suitably efficient to be useful in standard commercial situations (such as in a computer game or simulation). Thus it is essential that the system operates efficiently on a standard desktop computer, while running multiple characters of sufficient complexity.

[3] 'Believable' is defined similar to that of those working on the Oz Project [2]. It means that the character acts in way appropriate to its personality, and is separate from realistic. For example, a cartoon character can act with a 'believable' personality which is not entirely 'realistic'.

- **Customisable personalities**: Ease in the creation and modification of the personalities of characters is a requirement. While a purely numerical approach to expressing a personality (similar in style to that of The Virtual Theater [6]) might be too restrictive, this might be a useful base point, and could be used for building a prototype character. It should not be difficult to create in a finished system a multitude of different characters in a limited amount of time. Some high-end authoring tool or scripting language for the personalities involved would be required to achieve this (and may also help authors who do not have a programming background to develop characters with the system).
- **Multiple models of personality**: Support for multiple models of personality is a further feature desired in this project. This may be required if different types of characters are modelled in one application. For example, a pigeon might have a basic model of personality, an average citizen would need a more complicated model, and a main character might have a more complex model still.
- **Ensuring the system is testable**: While not a prime goal, system verification is an important consideration for the project. One of the present advantages of using a linear plotline with simple models for characters is that predictable situations are easily tested to see that they work as expected. Adding the inherent unpredictability needed in the creation of a believable personality for a character (compounded with the unpredictable actions of human controlled characters) could lead to problems in trying to test the complete range of possibilities. Care must be taken in designing the project to allow characters to be tested in some way.

4 Playground Scenario

In order to test these ideas, we propose to build a prototype simulation using the scenario of a children's playground. The playground scenario has the following advantages:

- Although a number of existing simulations feature creatures such as dogs [10] or cats [11], we feel that children provide a better medium for modelling human interactions and personality types (compared to non-human entities).
- The use of children (as opposed to adults) avoids many of the complexities of adult interaction. The child-like characters being modelled need only a few simple high-level goals in such an environment. Goals like seeking enjoyment and socialising with other children are the main focus of the prototype, and the approaches to achieving these goals can be easily separated into simple personality types (shy verses social or active verses passive, for example). It avoids the added complexity of having to model survival desires (such as hunger) or more complex child-adult relationships.
- The 'playground' scenario is easily expanded. It can start with just a handful of child characters in an enclosed space with a ball, whose only goal is to entertain themselves with a limited range of activities (such as playing catch).

It can then be expanded to include more complex objects (such as swings and slides), more complex games (such as soccer), or more complex goals (such as adding a water fountain and adding thirst as a desire).
– Finally, a simulation of children in a playground is easily understandable and fun to show those who might be interested in the project.

4.1 Example of actions in scenario

This section presents an example of the sort of actions and character-based reasoning that can take place in the 'playground'. Here, the world just consists of an enclosed space containing three children (Adam, Beth and Claire) and a ball (see figure 1.a.). The only high-level goal for the children is to enjoy themselves, and the only 'games' available are: holding a conversation (which allows enjoyment through socialising); playing alone with the ball; or playing a game of catch with one or more other children.

Adam (like the other children) wants to entertain himself, and chooses to strike up a conversation with Beth (the decision of what action to take is based on their personality). The content of the conversation is also based on personality differences, and on past experiences with each other. Here we are assuming that Adam and Beth are both friendly towards each other. This conversation action is shown in figure 1.b.

At the same time, Claire decides to play with the ball. While she could play with the ball alone, she feels that playing catch would be more enjoyable. She knows that in order to play catch, she needs to fulfil two prerequisites. She needs to obtain a ball, and she needs at least one other child to play with. In figure 1.b. she achieves one of these prerequisites by picking up the ball.

In order to play, Claire needs to find at least one more child to join in the game. As Adam and Beth are the only other children in this scenario, Claire decides to interrupt their conversation in order to ask if they want to join her in a game (this is shown in figure 1.c.). As Claire does not mind who joins her, she asks both Adam and Beth at the same time. Here we are assuming Claire is not too shy to interrupt Adam and Beth, and that Claire doesn't have a specific grudge against either child that might dissuade her from asking them to play.

As Adam and Beth would both like to play catch, both accept Claire's offer (shown in figure 1.d.). This is acceptable as any number of people (greater than one) can play catch.

Adam, Beth and Claire move into a suitable configuration to play the game, and play catch by throwing the ball from person to person (shown in figure 1.e.).

As playing a game of catch does not involve talking, the three children decide to strike up a conversation while playing (shown in figure 1.f.). Multitasking is allowed in this environment provided it is physically possible to do both tasks at the same time.

This small scenario shows what kind of actions will be possible in the system. All decisions will be based on the individual personality of the characters, and from their past experiences in the scenario. Whether to hold a conversation or to play with the ball would be dependant on how much a character prefers verbal activities to physical ones, for example.

5 Conclusion

In this paper we have outlined our project into building believable characters in software fiction, with an emphasis on building an efficient model for supporting interaction between many such characters in a simulated world. It is hoped that developments such as these can bring an increased depth into the world of software entertainment. This paper also outlines a prototype system, which is still in the developmental stage. We expect this prototype to be completed and ready to display at the conference in December.

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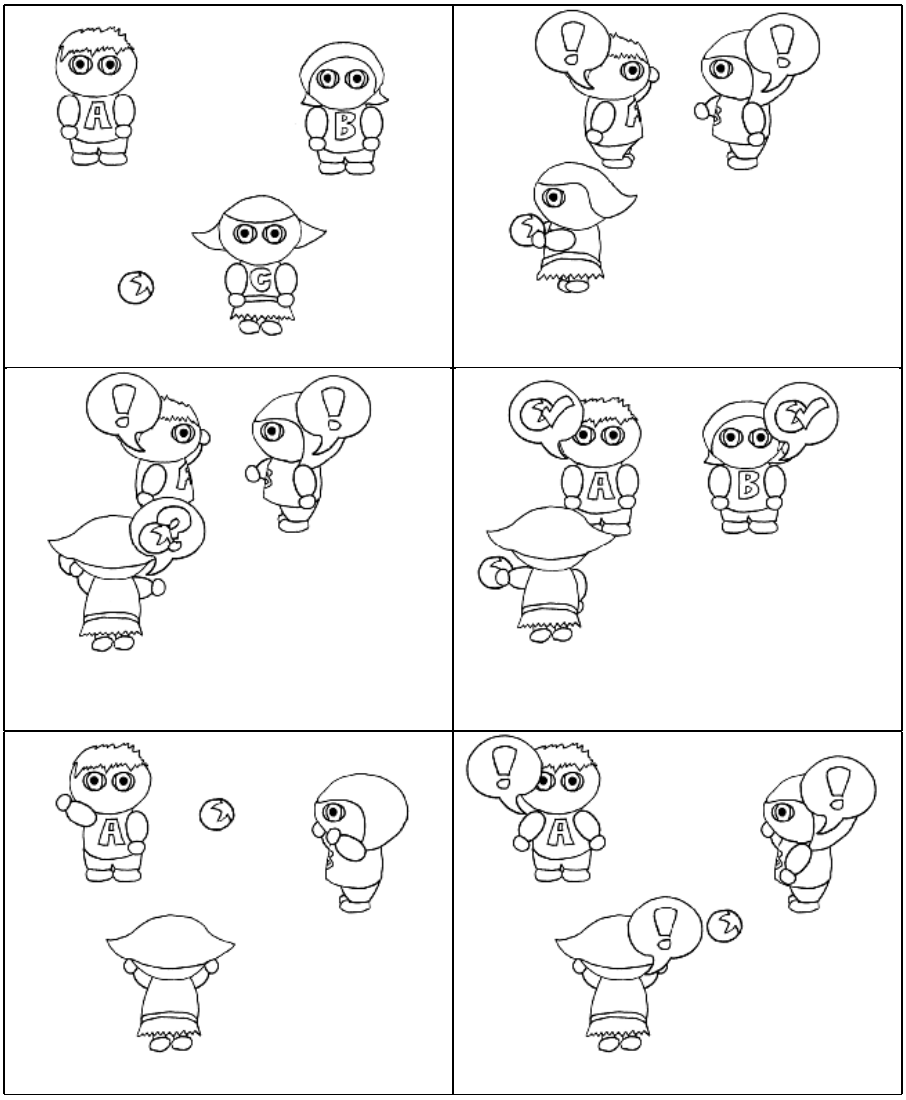

Fig. 1. Concept drawings of the 'playground' scenario

a). (top left) Starting state of the world.
b). (top right) Adam and Beth start a conversation, while Claire wants to play with the ball.
c). (middle left) Claire interrupts Adam and Beth's conversation to ask whether either of them wants to join in a game of catch.
d). (middle right) Adam and Beth both accept Claire's invitation.
e). (bottom left) The three children play catch.
f). (bottom right) While playing catch, Adam, Beth and Claire hold a conversation.