SIMULATING CHARACTERS FOR OBSERVATION

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Abstract: Observation of young children is common in educational settings but student practitioners have infrequent access so limited amounts of observable activity can ever be captured. We have developed a software application using research-based models of child development to support observations made by pedagogical practitioners. The prototype system – Observation – which we believe is the first to employ 3D interactive computer graphics for visualising early childhood play, is available for download and evaluation.

1 INTRODUCTION

Observation of young children is common in early childhood settings to plan and assess activities according to the developmental needs of the individual child. It is difficult for an observer to be a distant onlooker because children expect adults present to supervise and help them. Making notes, recording a video, or taking photographs, can also have an impact on the way children play and behave. Fixed cameras can only capture activity within one area and may need editing to remove periods of inactivity but an edited recording is not a true representation of events. Hand-held cameras are more flexible but are intrusive. An observer may miss something interesting. It is also quite hard to walk and film at the same time (Bruce and Meggitt, 2006). For student practitioners, access to children is infrequent, and observable activity may be limited, so observation schedules are used with textual case studies, perhaps with supporting images and/or video. Early work demonstrated that the use of sound/colour film modules, combined with questions posed from a computer terminal, increased the observational abilities of the students (Durrett and Richards, 1976). However, there has been limited work attempting to simulate the educational environments of young children. Supporting the decision-making process of the adult is usually the underlying theme. The activities are often adult-initiated, more typical with children after pre-school, with static 2D graphics of learners. These systems do not show any activities occurring; it is left to the user's imagination.

2 OUR APPROACH

We have developed a cross-platform sandbox application, using C++ and OpenGL, to support observations made by pedagogical practitioners (Figure 1).

Figure 1: Characters engaged in blockplay on their patch.

A mixture of graphical and textual information is provided for the observer, via an intuitive interface. The observer is not represented as a 3D character themselves, but viewing is designed to be through the eyes of the observer, including: walking; flying; and following a character. New characters are randomly generated or defined manually along three dimensions: blockplay stage (Wellhousen and Kieff, 2000); social play stage (Parten, 1932); and egocentrism (Kesselring and Müller, 2011). Character ap-

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pearance is deliberately abstract, a physical manifestation of engagement in play, rather than figurative. Clicking somewhere in the scene adds the character at that position and allocates a colour-coded patch (1 metre by 1 metre) provided it is not: outside the terrain; on bumpy terrain; on another patch; or on areas with objects. Once added, a character may relocate their patch (at any time) if the location is not suitable for them, based upon their sociability. Each character has their own inventory to hold a database of currently owned objects. If displayed, it shows each type of object and its respective quantity. To keep the terrain free from clutter, in addition to returning unused items to their inventory, characters periodically claim objects within their patch and place them in their inventory, removing them from view. Characters may join a group; in some groups, individual inventories may be shared. The well-being for a character is a simplified representation of the 'Leuven scale' used in the process-oriented child monitoring system (Laevers et al., 2002), and uses the same five-points: extremely high; high; moderate; low; extremely low. The well-being can be determined visually by looking at their vest, where the tone ranges from white (highest), to black (lowest) using a continuous representation of the scale (Figure 1). Characters pathfind to obtain the shortest route through the world and around obstacles using our implementation of the A* search algorithm, and local steering helps characters avoid one other. Skeletal animations conform to the Biovision Hierarchy motion capture standard. Characters are selected within the scene to display static and dynamic data in the character information pane. A timestamped event log shows both archived and real-time events, filtered on characters, if needed. The terrain is interactively edited (height, textures) to create different types of landscape. Characters follow the terrain, even while it is being edited, and they will avoid steep areas. The corners of a character's patch are locked and cannot be moved. If a character relocates patch, those corners are unlocked. Objects are custom shapes defined in terms of other primitives, or 3D models; these are dropped into the scene and interactively manipulated. The physics library Bullet has been integrated to give added realism to objects in motion and at rest. Various visualisation options expose the underlying functionality of the simulation.

3 USER EXPERIENCE

A pilot evaluation with student practitioners and instructors in early childhood studies at Liverpool Hope University was promising. The student practitioners felt it was helpful: to have an influence on the well-being of the characters; to be present among the characters; to adjust their viewing position; and to define the behaviour of the characters. Some students reported increased understanding in the stages of block-play. Several were enthusiastic about changing the environment by modifying the terrain and applying textures, such as flooring. They found setting the scene to be useful because this is something that must be done in real life; "A practitioner provides things," said one of them. Another student said, "Observation would be perfect for developing observational skills in childcare courses, for those lacking in confidence to go into settings and just do it." Larger scale trials are planned.

4 CONCLUSIONS

The pilot evaluation was encouraging and suggests that computer graphics simulation of young children has value for student practitioners. However, we do recognise some limitations with our work. The well-being representation is very much a simplification, and does not take into account indicators such as body posture and facial expression, which are used in the Leuven scale. In addition, the uniform appearance and animations of the characters imply no specific age, which may be too open-ended when considering the development of the child. These, and other issues, are being addressed in our continuing research. Observation is available for download and evaluation from http://www.cs.man.ac.uk/∼aac/observation/.

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