Scene-Driver: A Narrative-Driven Game Architecture Reusing Broadcast Animation Content

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ABSTRACT

Currently there is much interest in the development of computer and DVD-based games and activities that supplement or are marketed alongside broadcast television content. Scene-Driver was developed for the purpose of reusing content from an animated children's television series within the context of a narratively coherent game. Content from the children's television series "Tiny Planets" was used in the development and testing of Scene-Driver. Each episode of the series has been divided into a collection of scenes, each of which represents a narrative unit such as conflict introduction and resolution. The game is aimed at children of the ages 5-7 and an interface has been developed which can be intuitively used by children of this age. This interface takes the form of "domino-like" tiles which depict characters and objects from the television series (unlike ordinary dominoes that have numbers on either side). The tiles can be played according to different game rules. The child's choice of tile influences the direction of a narrative. The game and interface have been tested with children of the target age range in two evaluation studies. Both studies demonstrated the potential of Scene-Driver to produce engaging narratively coherent games using children's animation content.

Categories and Subject Descriptors

I.2.8 [**Artificial Intelligence**]: Problem Solving, Control Methods, and Search – *plan execution, formation, and generation*

General Terms

Algorithms, Design, Human Factors.

Keywords

Narrative, child-friendly interface, broadcast content reuse

1. INTRODUCTION

Children's television series often produce spin-off merchandise in order to recoup production costs, since this is not always possible to achieve solely through sales of the television series itself. Computer games based on the television series are a popular form of such merchandise. Pepper's Ghost production company have produced a children's animated television series called Tiny Planets. The show tells of the adventures of two space aliens called Bing and Bong, who travel amongst a group of "tiny planets" on a large white sofa and embark on adventures with the local inhabitants of the planets. In total, there are 65 Tiny Planets episodes, each containing approximately three minutes worth of novel animated content. Animated television series such as these are particularly expensive to produce.

As a part of the merchandising activity, there is much interest in the development of computer and DVD based games and activities that supplement or are marketed alongside broadcast animation content. In developing such products, the challenge is to produce interesting and coherent experiences that reuse scenes from the broadcast content. Some games based on children's television series have "viewing galleries" where children can select and view their favourite clips from the programme. However, it was our intention to extend this approach by structuring the content using narrative principles in order to provide a coherent experience. A further aim was to enable the child to have some control over what they see whilst still maintaining some element of surprise. Since the intended users are 5-7 year old children, a further requirement was to develop a suitably intuitive interface with which children of these ages could interact with the novel Tiny Planets narrative.

2. POTENTIAL APPROACHES FOR CONTENT REUSE

Figure 1 shows the potential approaches for reusing content from the Tiny Planet's television series. The first point to consider is whether the child should be a passive or an active participant in the narrative. The second point concerns the level of dynamic generation of the content, on a continuum from completely

"canned" content (i.e. the television series) to content that is completely dynamically generated.

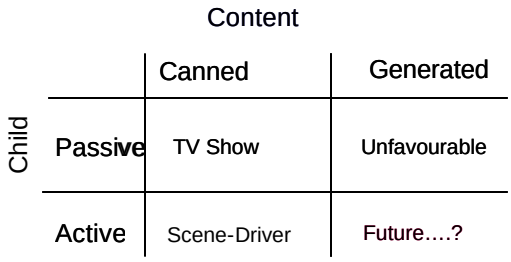


Figure 1. Potential approaches to creating interactive narrative

Considering the "passive – generated" category of Figure 1, there are arguments as to why this approach is unfavourable. For example, when developing an episode of Tiny Planets many creative decisions are made, such as which camera angle to use, at what distance to "place" the camera and how to edit between shots. Such decisions, particularly those used to provide some sort of dramatic effect, can significantly enhance the aesthetic quality and entertainment value of an episode. However, to formally capture knowledge at this level such that it can be used computationally is by no means a trivial task and the benefits of doing so are unclear. The child would merely be a passive observer of a novel, but potentially second-rate, episode of Tiny Planets.

For this reason it would seem that the second category, in which the child interacts with the narrative as it progresses, is the more favourable approach. The current version of Scene-Driver falls into the "Active - canned" category, using the existing scenes from the series which are joined together by activities involving the child. This has enabled the development and testing of the "narrative" aspect of the model. It is anticipated that future work would move the model into the "Active - generated" category by using the developed and tested model of narrative sequencing and interactivity as a scaffold to support the creation of new plots using dynamically generated story elements.

3. RELATED WORK

The most relevant work comes from the field of interactive narrative systems. Interactive narrative systems tend to fall into one of two categories. In the first category are systems that use narrative principles to organise and present a collection of resources in a coherent way. In the second category the systems create a dramatic experience with a protagonist and plot-structure. Given the nature of our work, we will draw on lessons learned from both categories of system.

Murtaugh's Automatist Storytelling system falls into the first category and is based around the concept of dynamic ordering of keyword annotated clips [6]. It uses a model of spreading activation, where activation levels fluctuate based on the user input and thus tailor the presentation of content to the user's interest and create an emergent narrative. Murtaugh has used the storytelling system to create Contour and Dexter, both of which are based around the idea of suggesting to a user some related resource (videos, documents, or pictures) based on what the user is/has been looking at, thereby guiding the user through the narrative whilst allowing them to choose exactly which materials they wish to look at. Murtaugh also discusses schemes for describing video-content, either in terms of stream-based representation (annotation of an entire video stream) versus clip-based representation (annotation of discrete clips from the video stream), suggesting that when clip-based annotation is used, each video clip should be coherent within itself, should form a "story phrase" and should lend itself to be "editable" with related pieces. Based on some of the principles of Murtaugh's automatist storytelling system, Srinivasan developed "Village Voice" [8]. The content for this system was a collection of stories in video format from the Somali community in Boston. The difference between Murtaugh's system and Village Voice is that rather than annotating clips with keywords, the video clips were described in terms of an ontology constructed by the Somalian community. Drawing from this work, we adopt the approach of dividing episodes into self-contained narrative elements. We then describe these elements in terms of an underlying ontology.

Rocchi and Zancanaro's work is notable for its attempt to introduce directorial techniques into the presentation of narratively structured graphical material [7]. This system is based around the idea that annotated images are chosen from a library to reflect the content of a verbal commentary. The system then provides a plan structure for synchronising the images with the audio soundtrack and also what sort of transition should be used between one image and the next, such as camera angle, movement (tilting, panning etc.) and editing techniques (fade, cut etc.). This work suggests the benefits of introducing directorial techniques for supporting transitions between scenes in order to maintain visual continuity and narrative flow.

Falling into the second category, that of using actual story fragments with which to create a dramatic experience, Mateas and Stern's interactive drama Façade uses pre-authored story fragments in conjunction with autonomous animated characters and allows interaction during the course of the story [5]. The scenario is that the user is the guest of a married couple whose marriage is in difficulties. This manifests itself throughout the course of the evening. The user interaction affects the outcome and whether the couple are still together by the end of the evening. The interface for interacting with the drama is primarily a text-box into which the user can type "speech" to which the on-screen characters react, although some object manipulation is possible. One particular focus of their project is the creation of believable

characters in order to enhance engagement with the narrative. To this end, the characters in Façade are constructed to display a range of emotions, such as anger and delight, which is expressed via the tone of voice from the pre-recorded phrases that are available for each of the two characters. This work demonstrates the possibility of creating an engaging narrative through real-time user interaction.

Hayes-Roth et al. devised a model of interactive narrative called "Directed Improvisation" in which characters create a story within directorial constraints[4]. Their testbed application CAIT (Computer-Animated Improvisational Theatre) is aimed at children. It is based around a set of 2 dimensional characters, each of which has a range of behaviours which they can exhibit either in an improvisational role (i.e. the behaviour is decided by the character) or else by direct instruction from the child. This provides flexibility in the level of "direction" by the child versus unexpected, improvised, behaviour exhibited by a character. Children decide what level of instruction they want to give the characters. Additionally, a child can either interact with the system real-time, by choosing from a situated behaviour menu which includes a subset of possible actions a character can take, based on what is in the immediate environment and which direction they are looking in or else the child can build a script and then "run" it. In both cases, the child can work at different levels, between actor (choosing exactly what the character does) to director (giving direction, but leaving the mode of carrying out the task up to the character). These two modes may also be mixed, such that a script can be stored that has been interactively created and then played back, and scripts can be interrupted and modified during play back. This work suggests the possibilities available for dynamically generating story content with visual on-screen characters, with children as the targeted end-users.

Gorbet, Orth and Ishii developed a tangible interface for interacting with narrative, which takes the form of triangular tiles which can be interlocked together in various configurations [3]. Depending on a particular configuration, a story-segment is relayed either on screen or via an audio track. However, due to the high number of possible configurations, authoring all the potential story segments is a very labour intensive task for even a small number of triangles. This suggests the need to develop the game and interface in such a way that it does not necessitate the use of more content than is available.

4. TINY PLANETS ANALYSIS

To ascertain how we could reuse the content from the television show in the most effective manner, we analysed the 65 episodes of Tiny Planets. This was particularly necessary since the series is based around a particular set of characters - the two main characters Bing and Bong plus a variety of other characters (known as flockers, locals and robots), a set of props, a group of different planets and even particular stylistic qualities which must all be reflected in the resulting model. We devised a plot description based both on this analysis and also on narrative theory. We believe that this form of description would be applicable for describing a broad range of television series, for the purpose of implementing them within Scene-Driver. In fact, the structure used for plot analysis is consistent with established structuralist theories of narrative that have been used to interpret written and performed narratives [2]. The analysis suggested that each episode could be viewed from several different levels, most notably a *plot level* and a *directorial level.*

4.1 The Plot Level

The plot level contains elements that are more commonly thought of as being integral to a narrative. A basic plot structure is shown in Figure 2. Each plot element will be considered in turn.

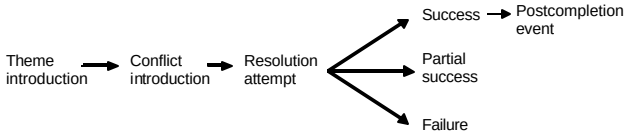


Figure 2. Plot level analysis of Tiny Planets episodes

4.1.1 Theme Introduction

Each Tiny Planets episode has a theme which tells the viewer the general purpose of the story, by way of a voice-over at the start of each episode. For example, in one episode called "Ramping Up", the theme is given as "A flocker is having trouble pushing a giant ball up a steep ramp on the Tiny Planet of Stuff. Bing and Bong figure out an easier way to move it". The theme introduction element of the plot-level is the introduction of the characters and props of the theme. In other words, at some point within "Ramping Up" (though not necessarily right at the beginning) the following constituents will be introduced into the story: a flocker, a giant ball, a ramp, Bing and Bong. Figure 3 shows a screen shot from the Ramping up episode. The character shown pushing on the ladder is Bing, the small 6-legged character is Bong and the "bird-like" creatures are flockers. The screen-shot shows Bing trying to lever a ball up the *steep* side of a double-ended platform (at the other end of which is a much more gradual slope).

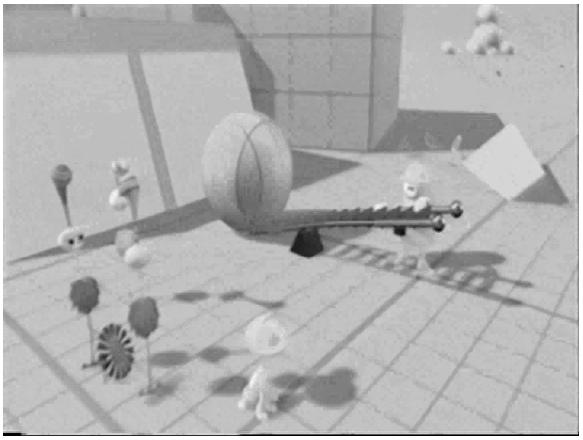


Figure 3. A Screen Shot from "Ramping Up"

4.1.2 Conflict and Resolution Attempts

Within each episode there is at least one conflict which must be resolved, through a successful resolution attempt, before the story can end. Analysis of the episodes revealed several possible conflict patterns. There may be one main conflict, for which many resolution attempts are made (ending in failure or partial success), before the conflict is successfully resolved. Or alternatively, there may be a series of conflicts, such that having resolved one conflict successfully, a further conflict is introduced. In the case of "Ramping up", the main conflict is introduced when Bing and Bong have helped a flocker to push a ball up to the base of a large ramp and then try, but fail, to roll the ball up the steep slope onto the top of the ramp. Several further resolution attempts occur which end in failure, such as trying to use a ladder to get the ball on top of the ramp, before finally the conflict is successfully resolved when Bing and Bong roll the ball up the gradual, rather than the steep slope of the platform.

4.1.3 Postcompletion Events

The story never ends immediately after a conflict has been resolved. Once all conflicts introduced within a story have been successfully resolved, there are one or more postcompletion events. In the "Ramping up" episode, the postcompletion event takes the form of Bing pushing the large ball down the steep slope of the ramp and into the midst of some giant skittles, scoring a perfect "strike" (all the skittles fall down). Other common elements of each episode include Bing and Bong waving goodbye to other characters before departing from the Tiny Planet they were visiting in that episode.

4.1.4 Sub-plots

In addition to each episode having a main plot, there may also be a sub-plot. A sub-plot is a self-contained plot occurring within the context of the main plot. For example, in "Ramping up" while the character Bing is trying to find ways to get the large ball up onto the top of the ramp via the steep slope, the other main character Bong realises that the solution lies in rolling the ball up the gradual slope on the other side. The conflict that Bong faces is that she cannot get Bing to listen to her idea.

4.1.5 Sub-conflicts

A further plot-element identified at this level is a sub-conflict. A sub-conflict is a conflict which occurs and is resolved but which does not progress the story in terms of the theme. Sub-conflicts often have comedic value or provide dramatic effect. In "Ramping up", the character Bong is trying to help the flocker by rolling the ball towards the base of the large ramp. However, Bong suddenly reverses direction and goes trundling past a bemused flocker and Bing, going the wrong way. Bing and the flocker indicate to Bong that she should roll the ball in the opposite direction towards the ramp, thereby resolving that conflict.

4.2 Directorial level

The directorial level is the level at which events occur to provide dramatic effect, such as increasing anticipation or to provide entertainment value (such as the comedic events mentioned previously). The success of the directorial level, such that the enhancement of the enjoyment value of an episode is achieved, depends on the creative choices made in the edit and written into the storyboard. For this reason, the directorial level is more difficult to formalise.

The analysis of the episodes informed the design of planning algorithms to support engagement and coherence of the game.

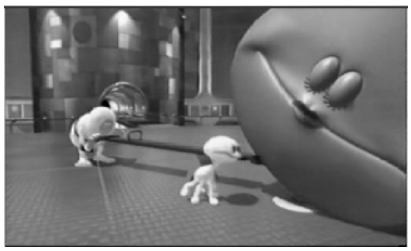
5. PLAYING THE GAME

Scene-Driver is a game in which a child can view existing scenes from the Tiny Planets television series in a narratively coherent way. A child constructs a narrative by placing domino-like tiles, which instead of the usual "dots", depict elements such as "characters" (other examples include props or actions), from the television series. The child interacts with the system by placing a tile that has a left-hand side which matches the scene they have just seen. The right-hand side of the tile specifies what will appear in the next scene. In this way, the child is able to manipulate the direction of the narrative, whilst a "scene-supervisor" module ensures that the narrative adheres to the principles of conflict introduction, resolution, comedic moments etc. The scene-supervisor also ensures coherent transition from one scene to the next by way of "transitional scenes", such that if a character that was not in a previous scene is to be in the next scene, that character is seen to "arrive". Conversely, if a character was in the previous scene and is not to be in the next, then the character must be seen to "leave". At present, these transition scenes are pre-constructed on a blank background. The aim is to move towards dynamically generated transition scenes. A theme (e.g. "heavy objects") and a "difficulty level" can be chosen prior to starting a game. This refers to the matching type, of which there are three

possible options. These are described below, assuming that a character tile set has been chosen.

5.1 Complete Matching Games

In a complete match game, the left-hand-side of a tile matches a scene if the characters shown on the tile were present in the scene. The right-hand-side then determines which characters are present in the next scene. In this scenario, a question arises as to whether the matching should be based on the characters that are physically present on screen in the final shot of the scene or on those characters assumed to be present. For example, a scene may end with a close-up of a character which was involved in some activity within the scene. Other characters may have been seen to be present, for example watching the activity throughout that scene, right up until the final close-up. We refer to these two distinct methods of matching as either implicit (matching to all characters present throughout) or explicit (matching only to characters that are present at the start and end of scenes). Figure 4 shows both matching types.



Domino Set

The scene above involves three characters: Bing, Bong and a Big local. The scene ends with Bing, Bong and the Big local on screen. The first two tiles from the set can therefore be matched to this scene. In *implicit* matching, if tile 1 is placed, the next scene played would have just the character Bong and for tile 2 the next scene would have both Bing and Bong. In an *explicit* case, the subsequent scene would either *start* with Bong, or else Bing and Bong (for tile 1 and 2 respectively), regardless of what may occur later in the scene.

Figure 4. Complete-matching games

5.2 Rewrite Rule Game

In a rewrite rule game, the left and right-hand sides of the tile have a different meaning to that of the complete match game. In this game, whichever character(s) are depicted on the left-hand side of the tile are to be "removed" and then "replaced" – in the next scene - with the character or characters on the right-hand side of the tile. So, for example, take a scene involving Bing, Bong and a "triangle local" (a "local" is a geometrically shaped character with eyes). If a tile depicting a "triangle local" on the left-hand side and a "round local" on the right-hand side is placed against that scene, this has the meaning "in the next scene, replace the triangle local with a round local". So instead of a scene involving Bing, Bong and a triangle local, there will be a scene involving Bing, Bong and a round local (see Figure 5).

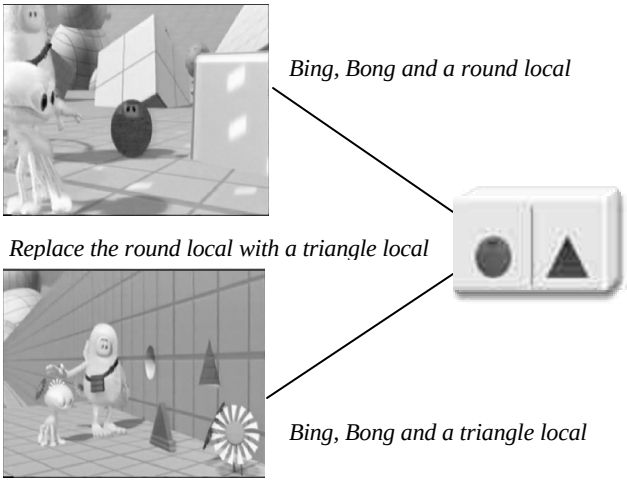


Figure 5. Rewrite-rule game

6. GAME PLAY SCENARIO

This section provides a series of screen-shots to illustrate some features of Scene-Driver. When starting the game, a scene is played on a "television" in the centre of the screen. In figure 6 this scene involves Bing and 3 flockers trying to push a ball up a ramp. In the top-left of the screen is an "inter" tile. "Inter" tiles are used in both the complete explicit and rewrite games, for continuity reasons and also to aid the child in matching tiles to scenes. In a complete-explicit game the "inter" takes the form of a different coloured tile, that matches the start and end state of the scene which has been played. In a rewrite game, the inter takes the form of a "cast-tile", which shows the cast that had been present within the previous scene and which characters are therefore available to be "replaced" in the next scene. In figure 6 the "inter" shows that the scene both started and ended with Bing and 3 flockers. At the bottom of the screen is a set of 8 available tiles. The icons to the left of the television say "try again" and "go". The "try again" icon lights up red if a wrong tile is chosen, otherwise the green "go" light is lit.

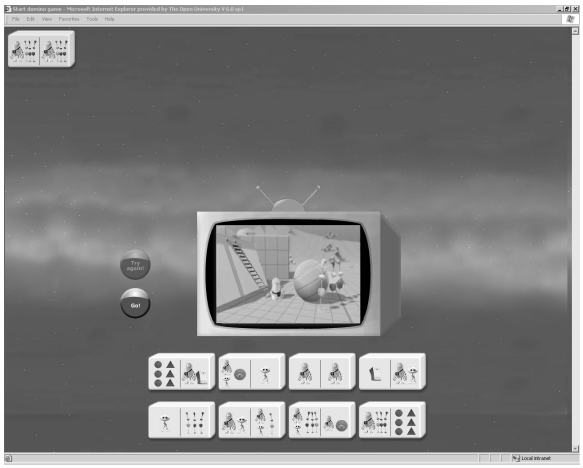


Figure 6. Starting the game (taken from complete-explicit)

In this scenario, a tile has been chosen with Bing and 3 flockers on the left-hand-side and 6 locals on the right-hand-side. Therefore, Bing and the 3 flockers must leave and the 6 locals must arrive (the transition is shown in figure 7). The next scene will start with the 6 locals.

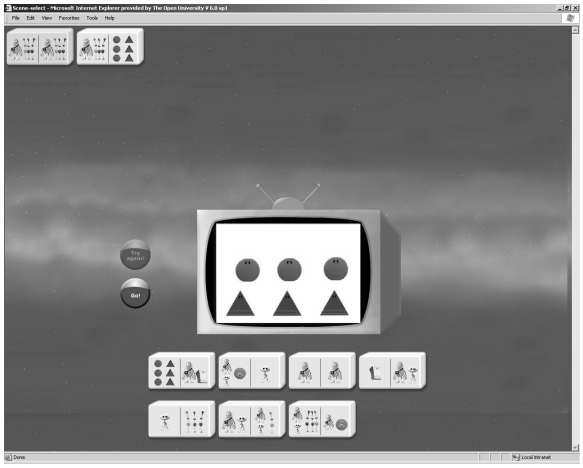


Figure 7. The transition showing the 6 locals arriving on the television (taken from complete-explicit)

Once the transition has finished playing, the next scene that has been selected by the choice of tile is played and the "inter" appears which matches the start and end-state of the clip that is being played (Figure 8).

Figure 8. The next scene (taken from complete-explicit)

A screen shot of a completed game (one in which all tiles have been placed) can be seen in Figure 9. The row of tiles represents the collaborative narrative created by the child and Scene-Driver.

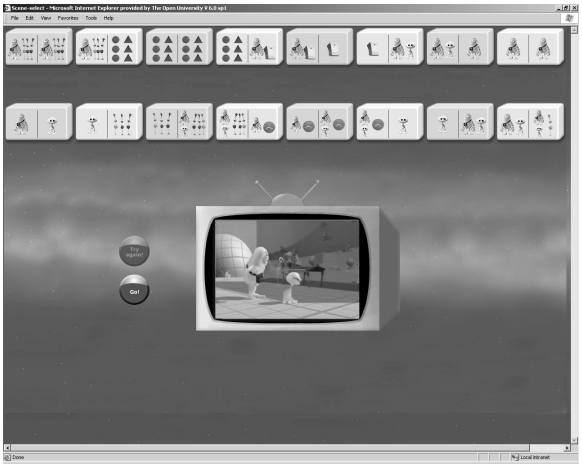


Figure 9. A completed game (taken from complete-explicit)

Sometimes, there is more than one matching tile available to be placed. When this occurs, a "back-button" appears and the child is able to go back to a previous choice-point and place a different tile (figure 10). Figure 10 also shows the "cast" tile which is used in the rewrite game. Unlike the "domino" tiles, the cast tile does not have a line. It represents the cast of characters who were in the previous scene and who it is therefore possible to "vote off".

Figure 10. A screen shot taken from the rewrite-game

7. ALGORITHM FOR TILE-SET CONSTRUCTION

Each scene in a "scene-library" is described according to an ontology. Examples of attributes used to describe the scenes are "has-characters", "has-props", "has-themes", "has-plot-level-descriptors". The first stage in tile-set construction is to create a sub-set of scenes which are consistent with the chosen theme. The theme may be intrinsic to the clip or may further reflect the theme of an episode or the theme of the particular planet the episode was set on. For example, a clip involving pushing a ball could be described by the themes "moving heavy objects", "shapes" and possibly "comedic".

The second stage is to ensure plot coherence. The simplest plot structure must have the plot elements "theme introduction" "conflict introduction" and "conflict resolution" in this order, to maintain plot coherence. More complex plot structures must still maintain this ordering, but could have additional plot elements such as "comedic events" to provide directorial consistency. Therefore, in this stage, the sub-set of selected scenes are classified as being one of the above four plot element types. The scenes that fall into the categories "theme introduction" and "conflict introduction" are part of a "theme phase" (TP) and "conflict phase" (CP), respectively.

From the set of conflict resolutions matching the theme, one is selected to be used within this particular game (CR). This will be the successful solving of the task by the character(s) displayed if the child succeeds in creating a chain of dominoes. The rest of the set of potential conflict resolutions are discarded.

From the set of scenes in the conflict phase, the one which is the corresponding introduction of the conflict resolution chosen in the previous step (i.e. from that same episode of Tiny Planets) is selected. This will be the first scene shown in the conflict phase during any playing of the game. We refer to this scene as the conflict anchor (CA).

Of the scenes in the theme phase, one is selected as the scene to be shown before the child plays the first domino. This scene is called the theme anchor (TA). Once these have been selected all possible legal pathways between the scenes can be generated (see figure 11). Arrows show possible paths between the scenes. Some arrows are uni-directional to maintain the appropriate order in which scenes are shown, such that a child progresses from TP, through CP before reaching CR. Comedic scenes can be associated with both phases.

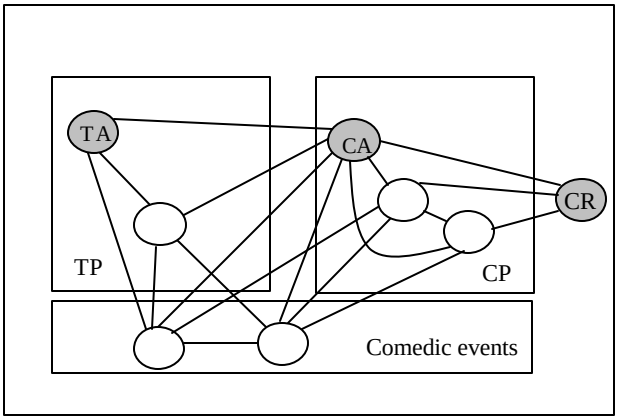


Figure 11. Representation of the scene-subset during tile-generation

The final stage of tile-set generation is to prune this search space to eliminate tiles which would enable illegal moves during a game. Examples of illegal moves are:

- The possibility that a tile is placed in the theme-introduction phase that links only to a scene in the Conflict introduction phase other than the Conflict introduction anchor.
- The possibility that a tile can be placed which necessitates playing the conflict resolution before the conflict introduction has been played.
- The possibility that a tile can be placed in the conflict phase that links only to a scene in the Theme Phase
- A tile is available that can be placed after the conflict resolution has been played.

8. PRELIMINARY FINDINGS

Two evaluation studies have been conducted. The purpose of conducting these preliminary pilot studies was to ascertain that children could use the domino-tile interface to direct a narrative, that they were entertained by playing the game and also to suggest improvements of the game for use in a full experiment to be conducted at a later stage. For this reason, the sample sizes were relatively small and much of the data is observational.

8.1 Evaluation Study 1

The first study was conducted with a dass of 24 6-7 year old children at Oldfield Park Infant school in Bath. In this study children directed the course of a narrative by placing cardboard mock-up dominoes, whilst an experimenter played the matching scene on a laptop screen. The principle aim of conducting this formative study was to establish the viability of the Scene-Driver approach in terms of whether children of this age range could understand how to play the three versions of the game. Following promising results from this study the Scene-Driver prototype was developed for use in the second study.

8.2 Evaluation Study 2

Development of the Scene-driver prototype meant that in the second study children could directly control the game without the need for intervention from an experimenter to play scenes. A further benefit of automating the game was the ability to record data, such as number of errors and the choices made when there was more than one possible matching tile. In addition to data-recording, the further aim of this study was to somehow assess the child's enjoyment of playing the game.

Two metrics were used to assess enjoyment. The first was the standard "smiley-face" rating scale which consists of a number of cartoon faces ranging from very sad to very happy. The child is asked to point to the face that most represents their enjoyment of playing the game (figure 12).

Figure 12. Example of the smiley-face rating scale

The second was a "sticky-ladder [1]. This is a ladder that is made of a material to which discs backed with Velcro may be attached. Rather than pointing to pictures on a scale, children can express their views by physically sticking items onto the ladder to rate them in terms of preference (figure 13). In this case, the children were to be asked to place a Scene-Driver disc in comparison to what they say are their most favourite and least favourite games. This would seem to have the benefit over the smiley-rating scale of asking children to compare "like with like" and to calibrate the scale to more accurately reflect their true preferences. The purpose of using both metrics was to enable comparison between the two types of scale for use in future studies and to get a more triangulated measurement of the engagability of a Scene-Driver generated game.

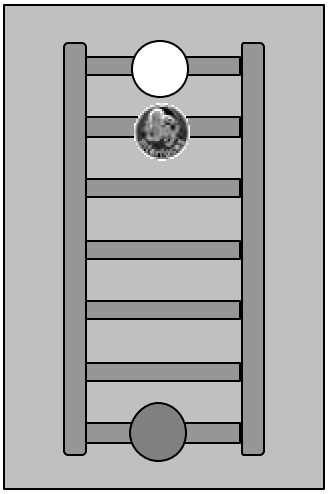


Figure 13. A sticky-ladder rating scale

The tool was installed on a laptop which had a mouse attached and each child was videotaped as they played the game. Each child was tested individually, being first taken through a "scene-domino-scene" example for the condition they were being tested in. When the child had said they understood how the game worked, the child was allowed control of the computer and the experimenter was on hand to guide the child if it were necessary. When all tiles had been placed the sticky ladder was produced. The child was handed the blue and red discs in turn and asked to think of their least and most favourite games, respectively. They placed the blue disc at the bottom of the ladder and the red one at the top. When both discs had been placed they were given the Tiny Planets disc and asked "if this is your least favourite game and this is your most favourite game" (with "this" being replaced by the name of the games the child had stated) "where on the ladder would you put the tiny-planets game that you've just been playing?" Their choices were recorded. The children were then shown the smiley-face scale and asked to point to the face that most described the way they felt playing the game.

The study was conducted with 9 children (3 female and 6 male), once again from year 2 at Oldfield Park Infant school in Bath. The children were aged between 6 and 7. There were 3 children in each condition: complete-explicit, complete-implicit and rewrite game.

8.2.1 Results of Evaluation 2

The overall impression was that the children enjoyed playing all versions of the game. It was noted that children who were already familiar with the Tiny Planets television series tended to understand the principle of the game slightly quicker than those for whom the characters and the television show were novel. In terms of understanding the process of matching the tiles, it seemed that comprehension was very good in the complete-explicit and

complete-implicit games, but that children in the rewrite condition required slightly more guidance from the experimenter than those in the other two conditions. These results are commensurate with the findings of the first study. Figure 14 shows the percentage of correct to incorrect domino choices.

It appeared that the ability to correctly match tiles was reflected in the enjoyment rating they subsequently gave on the sticky ladder (Figure 15). With regards to the smiley-face rating scale, all children chose the happiest face, which suggests that this rating scale is less discriminating in rating a child's preference within this age-group and will therefore not be used in future evaluations of the Scene-Driver game.

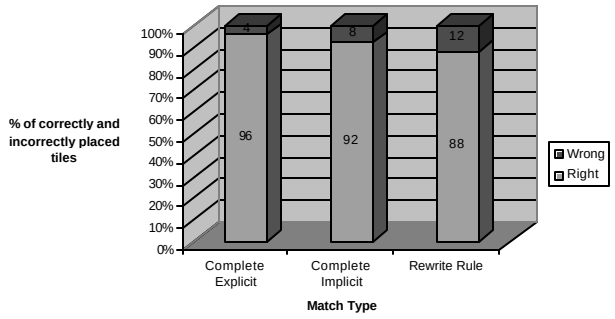


Figure 14. Percentage of correctly versus incorrectly placed tiles in each condition of the domino game

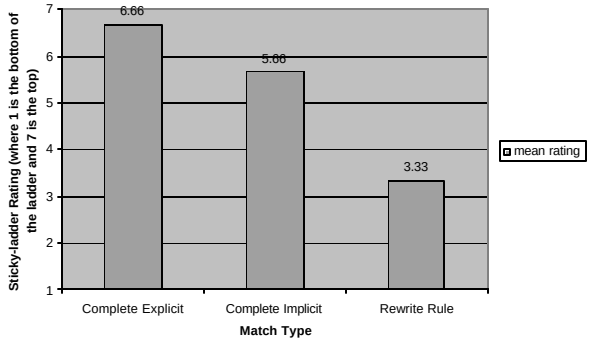


Figure 15. Mean rating on the sticky ladder rating scale for each condition

9. CONCLUSIONS AND FUTURE WORK

The Scene-Driver game aims to allow a child to actively explore clips from the Tiny Planets television series, whilst ensuring that the experience is directed by narrative principles in order to provide a coherent experience. The intention is to allow the child to be in control of driving the narrative whilst still having the element of surprise in not knowing exactly what they will see next (such as in the first viewing of a Tiny Planets episode).

The two preliminary investigations seem to support the Scene-Driver concept. In both instances, the engagement of the child with the game and their understanding of the game rules has been very good, particularly in the complete-explicit and complete-implicit games. An experiment with older children using the rewrite-rule game is currently being arranged, in order to evaluate this with older children.

Whilst the system has been implemented with content from the Tiny Planets television series, it is anticipated that the same principles and software infrastructure could be easily applied to a wider range of children's animation content. The Scene-Driver approach would be particularly appropriate for animation series of an educational or problem solving nature, where characters have to overcome various challenges introduced during the narrative.

A second version of Scene-Driver is under development. The main difference between the current version and the later version will be at the point of interaction. Whilst in the current version the interaction occurs at the end of a scene, the interaction for version two will occur within dynamically generated scenes.

There are also possibilities for introducing variability into the presentation of remaining tiles by having different characters present the tiles in different fashions, according to principles such as novelty (e.g. if they are present at the end of a scene and have yet to present tiles within that narrative) and by different methods (e.g. producing them from a hat or bag etc.). It is anticipated that further directorial elements will be introduced into transitions. For example, emotional engagement with the characters could be enhanced by showing reactions to events that have just occurred. One example could be if a character who has just presented the tiles for selection is "asked to leave" (i.e. not depicted in the right-hand side of a chosen tile) they may shrug, as if to say "I tried my best" before departing.

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12. REFERENCES

[1] Airey, A., Plowman, L., Connolly D., and Luckin R. Rating children's enjoyment of toys, games and media. Paper presented at 3rd World Congress of the International Toy Research Association on Toys, Games and Media, London, 2002.

[2] Chatman, S. Story and Discourse: Narrative Structure in Fiction and Film. Cornell University Press, London, 1978.

[3] Gorbet, M., Orth M., and Ishii, H. Triangles: Tangible Interface for Manipulation and Exploration of Digital

Information Topography, in proceedings of CHI '98 (Los Angeles CA, April 1998) 49-56

[4] Hayes-Roth, B., Brownston, L., and Sincoff, E. Directed Improvisation. Stanford University Report KSL-95-04, 1995.

[5] Mateas, M., and Stern, A. A Behaviour Language for Story-Based Believable Agents. IEEE Intelligent Systems, 2002, 39-47.

[6] Murtaugh, M. The Automatist Storytelling System: Putting the Editor's Knowledge in Software. Masters Thesis, MIT Media Lab. 1996

[7] Rocchi, C., and Zancanaro, M. Generation of Video Documentaries from Discourse Structures, in Proceedings of the 9th European Workshop on Natural Language Generation , 2003

[8] Srinivasan, R. Village Voice: Expressing narrative through community-designed ontologies. Masters Thesis, MIT, 1994.