FACILITATING OPEN PLOT STRUCTURES IN STORY DRIVEN VIDEO GAMES USING SITUATION GENERATION

Gordon Brown
Codeplay Software Ltd.
45 York Place, Edinburgh, United Kingdom, EH1 3HP
Email: gordon@codeplay.com

David King
University of Abertay, Dundee
40 Bell Street, Dundee, United Kingdom, DD1 1HG
Email: d.king@abertay.ac.uk

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ABSTRACT

Story driven video games are rising in popularity, along with the players desire to make meaningful choice within the plot and therefore become more involved and immersed within the experience. This paper investigates the problems which arise from implementing interactive narrative within video games and potential techniques to solve those problems. The main focus of the study was the situation generation technique, used to maintain the continuity within open, emergent plot structures, using behaviour trees as a means to implement and traverse plot sequences. The ISGEngine was developed during the course of this study in order to implement and evaluate the situation generation technique.

INTRODUCTION

Imagine you are playing a typical role playing game, you approach a village that is under attack and a soldier comes to you and asks for your help. You turn and walk away then come back one month later (in game time), the village is still under attack and the soldier still has the exact same scripted response. In this game, the graphics are incredible, the action is intense, the plot is plentiful and there is a massive, open world for you to explore. There is one thing however that keeps you from becoming completely immersed in this fantastic game world; the realisation that the decisions you make will never have any meaningful effect on the plot of the game or on the game world itself. This is the case for many video games today. Now picture the same game however this time every choice you make, no matter how insignificant, carries with it cause and effect, even if you are unaware you made the choice. Imagine if, when you chose to walk away, the village burned to the ground and this caused a chain reaction within the plot that was unpredictable and unique to you as a player.

Background

In recent years story driven video games have grown in popularity, emerging with a dominant place in the video games industry. These games stretch across various genres from first person shooters like Deus Ex: Human Revolution (Eitros Montreal 2011) to survival horrors like Silent Hill 2 (Konami 1999) and from role playing games like Fable 2 (Lionhead Studios 2008) to interactive dramas like Heavy Rain (Quantic Dream 2010). With this rise in popularity it is now becoming increasingly desirable for players to be able to interact with the plot and make the story their own. This desire is however not being met by current video games. There have been many recent attempts in games to create the illusion that the player's choices have a deep and meaningful impact on the games plot however these techniques are usually transparent and ultimately disappointing (Jubert 2010). This is where interactive narrative can be utilised. Interactive Narrative is the area of study involved in developing meaningful interactive human-computer narratives and dramas (Laurel 1991). With the graphical quality available today, the next logical step for the increasingly popular story driven video game seems to be to fully embrace interactive plot. The lack of development in the field, however, means that it is a huge risk for any developer to undertake and not many have tried to do so. There have been many projects involving interactive narrative; these have been developed primarily for research purposes, however if the techniques were to be implemented within a video game successfully it could lead the way for a whole new genre of video game.

The Element of Choice

Video games are, by their very nature, interactive experiences. This can vary greatly depending on the genre and style of game play. Alike any interactive experience, game play is one which emerges as a result of the player actively taking part and incorporating their own desires, anticipations and personal perceptions. This means that the experience is subject to each player's unique interpretation (Ermi and Mayra 2005). This makes the element of choice an extremely powerful and important factor of creating a better and more immersive game play experience (Carless 2009, Hydramyst 2012, Johnson 2008). There is however a big difference between choice and interaction, simply giving the player a choice is not enough, the player must also be given an appropriate and meaningful representation of their choice (Murray 1997). This however is no easy task as there are many problems which arise from trying to do so. Firstly there has to be a means for both creating large amounts of choice and having it meaningfully and appropriately represented. In addition to this the continuity and cohesion of the plot must be maintained throughout the game and all of the choices made by the player. Finally care must also be taken in order to constrain the requirement for new content.

INTERACTIVE NARRATIVE

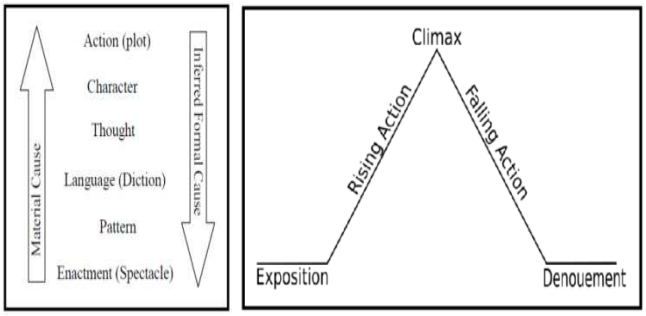
Since the 1990s interactive narrative has seen an abundance of interest from many different regions of academia involving work in artificial intelligence, computer based story-telling, and more recently, video games, however the ideology is still very young (Szilas 2003). As of yet there are no general techniques for designing and implementing an interactive narrative system. The main reasons it has proven so difficult is that interactive narrative is an oxymoron in itself as the term narrative refers to a static story predetermined by an author, while the term interaction refers to a dynamic process (Mateas 1997, Johnson 2008). However this is not to say there has not been a great deal of invaluable research and progress in the field. The most well known example is the Facade Interactive Drama (Mateas and Stern 2005), although there are many others (Aylett et al. 2005, Bangso et al. 2004, Ermi and Mayra 2005, Mateas and Stern 2005, Szilas 2003).

Murray's Aesthetics

An approach to defining the interactive narrative experience was proposed by Janet Murray; by dividing it into three aesthetic categories (Murray 1997). Immersion; which is the term used to describe the feeling of being physiologically submerged within another reality. Agency; which is the term used to describe the ability to make choices and have them represented in a meaningful and appropriate way. Transformation; which is the term used to describe the ability to experience all the different aspects of a plot.

Interactive Narrative Theory

There have been various different approaches taken when developing interactive narrative systems, these generally fall into two categories (Szilas 2002, Laurel 1991). Structuralism; which is the theory that interactive narrative can be developed by studying narrative analytically to understand the basic structures and ideas; and poetics; which is the theory that interactive narrative can be developed by studying the principles of drama and theatre. The most well known interactive narrative theory is the Aristotelian interactive drama theory; first introduced by Brenda Laurel in 1991 and generally considered the best foundation for poetics based interactive narrative systems(Laurel 1991). The theory adapts Aristotle's theories of the qualitative structure and causality (Aristotle 300BC) (Figure 1) as well as Freytag's theory of dramatic potential (Figure 2). The theory consists of material causality moving from enactment to action and formal causality moving from action to enactment (Laurel 1991).



Figures 1 & 2 : Aristotelian interactive narrative theory & Fretag's triangle

Plot Structure

One of the most important aspects of developing an interactive narrative system is the plot structure; of which there are two main forms (Johnson 2008, Murray 1997, Laurel 1991). Embedded; which involves inserting choice points into the game in order to modulate between different plot sequences; and emergent; which involves creating autonomous characters and a set of rules and allowing the plot to develop naturally from the player's interaction. A plot structure, however, can be neither fully embedded as there would be no room for interaction nor fully emergent as there would be no direction and the plot would fall apart, it must therefore be a careful balance of the two. Generally video games tend to utilise a more embedded approach as this is easier to maintain.

Agency

Many feel that agency is the most important aspect of an interactive narrative system (Pearce 1997, Ermi and Mayra 2005). True agency is achieved when the player's choices have a meaningful impact on the plot or on the game world itself (Murray 1997). Agency can be broken down in local agency; low level interactions, and global agency; high level plot direction (Mateas and Stern 2005).

Dramatic Potential

When developing an interactive narrative system it is extremely important to maintain the dramatic potential. Agency expands the potential, therefore there must be constraints in order to control it and ultimately bring it to it a conclusion (Laurel 1991). The dramatic potential can be portrayed with Aristotle's theory of dramatic probability, expressed in the form of a flying wedge. Moving through time the range of possible outcomes starts off completely open and narrows down the probability to one or more specific outcomes (Figure 3).

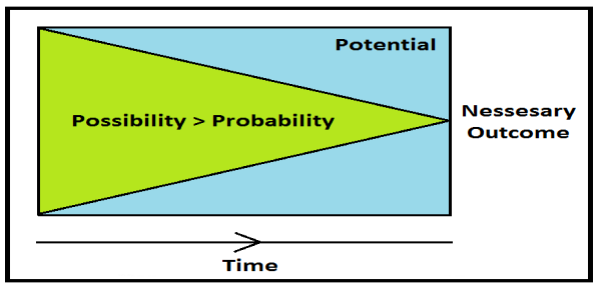


Figure 3: Aristotelian dramatic probability theory

Choice must therefore be constrained, but not in any way which would disrupt the immersion or transformation of the experience (Murray 1997, Ward 2004). Constraints can be anything from a suggestion to a rule and do not have to be invasive to the plot. They can be introduced in the form of natural events, situations or coincidences (Laurel 1991). In order to maintain the dramatic potential it is common to have a director or drama manager, however this can be problematic as if the director forces an inappropriate action within the plot the immersion can be broken (Mateas 1997, Mateas and Stern 2005). It would be great if a video game could give the player complete free will; however this is impossible as no designer could anticipate every action a player may wish to perform. Therefore this free will is more

of an illusion, a balance of agency and constraints which allow the player to perform all the actions which are appropriate for the current simulation. Therefore the aim is not to limit what the player can do but limit what the player thinks of doing (Laurel 1991).

METHODOLOGY

The motivation behind this study was to develop interactive narrative within video games in order to create game play experiences where the player can make meaningful choices, take control of the direction of the plot and even make it unique to them. The first major problem with this idea is that generally video games follow very strict embedded plot structures where the player is unable to deviate from the authored story. Therefore in order to make this possible, techniques must be developed which allow video games to incorporate an emergent plot structure and a strong element of agency but also solves the problems discussed earlier. The main focus of the study was the situation generation technique. In order to evaluate this fully, an interactive narrative engine was designed and implemented; the ISGEngine, and a short demo was created.

Interactive Story-Game Theory

Before developing an interactive narrative system it was crucial to have a strong theoretical foundation. The interactive story-game theory (Figure 4) was derived from the Aristotelian interactive drama theory (Laurel 1991). The theory was developed in order to aid the study and further the development of the ISGEngine. The theory was designed towards story driven video games and incorporates an equal representation of both story and game elements as well as a balance of agency and constraints.

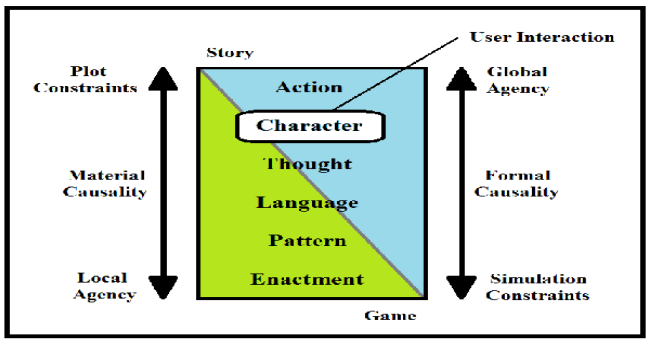


Figure 4: Interactive Story-Game Theory

In this theory both the formal causality and material causality have been broken down into two separate components; global agency and simulation constraints and local agency and plot constraints respectively. Each element in the qualitative structure remains the same and the user interaction is placed within the character element, however now each element is both the global agency and the plot constraint of the element below and the local agency and the simulation constraint of the element above. Each line of causality works in parallel as the player progresses through the game and time passes, affecting both the story and the game. The four main components (global agency, local agency, simulation constraints and plot constraints) all must be balanced in order to achieve appropriate and meaningful agency and maintain an impressive experience. This model is used in two ways, firstly as implemented functionality of the ISGEngine and secondly as a set of heuristics to guide the authoring process. As an example imagine a game where the player is in a gun dual in the wild west. The plot constitutes the background, the characters, the setting, the time period and much more. The game constitutes an action game where the aim is to avoid dying and attempt to kill the opponent. In this example the four elements of the interactive story-game theory can be used as follows. Local agency could be used to allow the player to aim freely at their opponent and choose when to shoot. Global agency could be used to allow the player to choose whether or not they shoot at all, and maybe instead find a different solution to the confrontation. Plot constraints could prevent the player from being able to use an unrealistic weapon as this would break the immersion of the story. Simulation constraints could prevent the player from being able to kill themselves as this would break the rules of the game.

ISGEngine

The ISGEngine is a basic story game engine containing plot incidents and sequences, characters, behaviours, quests, items and a dialogue system. The most important aspects are: plot sequencing, incident conditioning and situation generation. The aim of the ISGEngine was to solve the main problems with implementing interactive narrative in video games. It permits the player to be given choice in a wide range of ways including siding with a character during a conflict, where to go and who to speak to, which quests to accept and complete, the manner and content of dialogue and how quickly a quest is performed. It lets the player experience a meaningful response to their choices through character behaviour, content of character dialogue towards player, manner of character dialogue towards player and the availability of quests. It allows the continuity of the plot to be maintained through situation generation, and plot cohesion to be maintained through plot incident conditioning. It also allows control over the requirement for new content by placing the majority of the agency locally (dialogue and quests) and having the global agency (larger plot direction) guided by the local agency.

Creating Choice

Creating choice for the player is relatively easy, as they do not even need to know they are making it. It can be anything from how they interact with another character to the fact that they forget to finish a quest on time. Choices that the player does not realise they are making are the most effective as it means the player is unaware of what they did, therefore increasing the re-playability. In the ISGEngine the choice is mainly the completion or failure of a quest, the content and manner of the dialogue with other characters and the order of events encountered, throughout the game world.

Characters

The characters in the ISGEngine, have a persona; a set of values corresponding to their opinion of the player. They also have a basic behaviour system involving moving around the game world.

Dialogue System

The dialogue system is very similar to that of any role playing game, although it is a vital component of the ISGEngine. It allows the player to interact with the other

characters in relation to topics, items and quests and also to choose the manner in which they do.

Plot Incidents

Plot incidents are the main component of the ISGEngine, they are used to track the choices unique progress of the player throughout the plot. Incidents can be anything from a character performing a specific dialogue or behaviour to a quest being completed or failed. Incident conditioning involves using pre-/post-conditions to connect specific incidents with changes in character persona and behaviour, the availability of quests and dialogue topics and character responses to dialogue. Much of this is forced to allow for strong cohesion in any authored plot, for example the player cannot ask a character about a topic, item or quest they do not yet know about. By creating an open emergent plot structure of local agency incidents guided towards more dramatically relevant global agency incidents, the ISGEngine aims to allow the player the freedom to choose their own path, whilst at the same time guide them on a dramatic and interesting storyline (Figure 5).

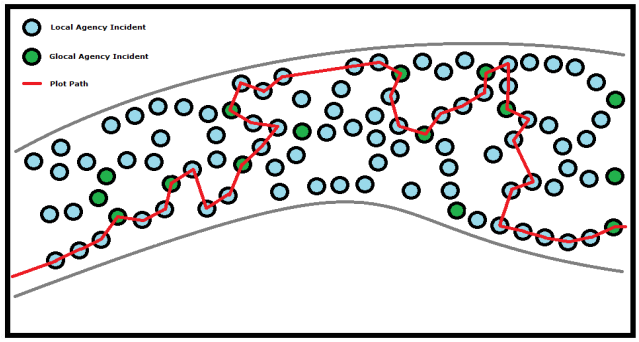


Figure 5: ISGEngine Plot Structure

Situation Generation

The ISGEngine was designed to allow for open emergent plot structures with a large amount of agency for the player whilst being non-disruptive to the experience. Most interactive narrative models utilise a director of some kind which monitors the player's choices and selects an appropriate plot sequence for them to follow, however this does not always guarantee agency and can be disruptive to the immersion and transformation of the experience. Situation generation allows the opposite of this. A web of plot incidents and the required content are created and the player can play the game, moving through the plot however they feel. Instead of forcing the player to follow a specific plot the director will merely guarantee the availability of the plot sequences and provide gentle guidance. This means that the player can feel in control of their decisions and the plot they are following, while safe in the knowledge there will always be an ultimate conclusion. The way this is implemented is by using behaviour trees to structure plot sequences that the author intends to be followed based upon a final incident. These trees can then be traversed in order to calculate the current continuity and progress (Figure 6). The reason behaviour trees were chosen as opposed to any other technique is that they are very simple and quick to implement, fast to traverse and are made up of AND and OR nodes, which is ideal for the incident conditioning required (Millington and Funge 2009). By measuring the continuity and progress of the different plot sequences the director can obtain a detailed analysis of the player's unique plot path and can aid and guide the player further. For example if the continuity of a specific plot sequence is getting low, meaning that either the player is losing interest or cannot find their way, the director can activate special plot revival incidents which can invoke a situation such as a chance meeting with another character which can introduce a new quest or dialogue topic to get the player back on track, if they so wish. The only real downfall of this technique is that if a player sets out to break the continuity on purpose then eventually they will, meaning that a generic, all be it less dramatic or interesting plot sequence, that is always possible, must exist. It is assumed however that most players will not be interested in doing this.

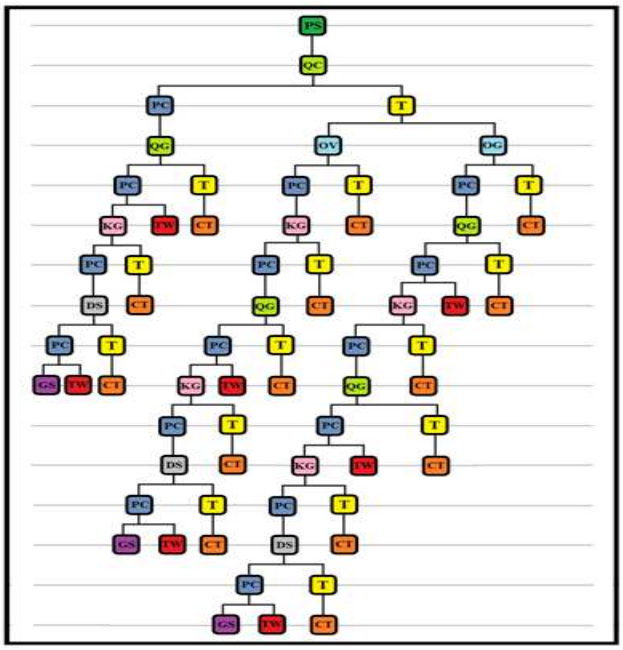


Figure 6: Plot Sequence Tree

EVALUATION

In order to evaluate this technique a 20 minute demo was created and both metric and survey data were collected from 20 user testers (Figure 7).

Figure 7: Demo Screen Shots

The Demo

In the demo the player was a traveller visiting a town for the first time. There were 7 other characters and various simple quests to perform, in the first half of the demo the quests all involved local agency, however towards the end there was a

larger global agency plot sequence involving 3 of the characters. This plot sequence consisted of one character attempting to rob a tavern and depending on the degree of help the player gave to this person and at what point the player alerted the guard if they did, various different endings could occur including the tavern owner dying, that character being arrested, that character fleeing and the player being arrested. Each player's play through the game was categorised under one of these endings using a simple algorithm which evaluated the incidents which had been triggered. In order to evaluate the situation generation technique one of the plot sequences was designed so that it was relatively easy to break the continuity. If the player follows a certain plot sequence the player is given the opportunity to help the character attempting to rob the tavern, however if the character misses the opportunity the situation generation creates a chance meeting with the character to give the player another possibility to complete the quest.

Results

The metric data showed that the plot paths that each player took varied greatly even when the same ending was encountered. In the diagram below, the coloured lines represent the paths of three user testers who all encountered the same ending (Figure 8).

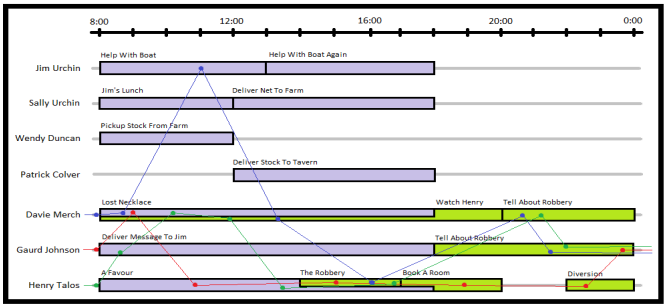


Figure 8: User Test Plot Paths

CONCLUSION

This study has discovered that creating emergent open plot structures is a very difficult task, although it is possible. With techniques such as situation generation such a plot structure can be implemented and its continuity maintained. As future work it will interesting to see how the ISGEngine performed with a much larger plot, as this would involve very large plot trees and a level of detail technique would have to be implemented in order to maintain performance. One addition which would greatly improve the ISGEngine would be to introduce randomly generated game content, alleviating the need for authoring, a feature which is being investigated in current video games (Bathesda Studios 2011). Interactive narrative is a rapidly growing area in the video games industry and there will definitely be a place on the shelves for story driven video games, however there is still much work to be done.

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BIOGRAPHY

GORDON BROWN recently graduated from the University of Abertay, Dundee with a first class honours degree in Computer Games Technology. He is now currently working on compiler technology and GPU acceleration, at Codeplay Software Ltd in Edinburgh, Scotland.