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Emergent Narrative: Leveraging Systemic Design to Create a Procedural Narrative

A modern game is more than just a collection of rules and interactions. Modern video games, and in many instances board games, have evolved to contain sprawling histories and stories. In addition, through the advancement of video game technology and theory, games have brought stories, visuals, and gameplay into the hands of millions of people across the world. Throughout all this advancement, many games continue to be designed with the concept of a linear narrative in mind. This use of traditional storytelling techniques has its merits but suffers from some key problems: re-playability and a player-centric influence on story arcs. While the path one player may take through a game is unique, in the end, that player often will encounter a similar story to the one presented for another player. In contrast, some games have developed more dynamic versions of narrative, but each of these design patterns often lead back to the same issue as before: they are inherently linear in their broad execution. However, these issues are created out of the necessity for less labor-intensive design choices and often the desire for a player to want to be able to see all the content that has been lovingly created. As Brenda Brathwaite once said: “For some game designers, a true interactive story is something of the Holy Grail of games” (Brathwaite). With these limitations in mind, the use of procedural generation could lend itself to solving some of these issues.

One aspect of modern game design is the extensive use of state: the data that comprises all the flags, values, and existence of a given object. State can, among other uses, be implemented to save games, signal event-driven behavior, or simulate character memory. Within the scope of this document, state can best be leveraged for another game design concept: Systemic Design. As Aleissia Laidacker was quoted on a recent episode of Game Makers Toolkit: “Systemic means there is a link between all the systems in your game, they’ve been developed and designed with the intention that one can influence the other” (Brown). The use of systemic design can be leveraged in many forms of game design but is heavily found in a genre of game: the immersive sim. In the modern immersive sim, the use of systemic design is often used in hopes of achieving emergent gameplay: “Things that weren’t intentionally designed by the game’s makers, but solutions and situations that emerge, thanks to the meeting of multiple systems” (Brown). In creating a game, systemic design can be leveraged to provide a state in which a procedurally generated narrative is guided.

As noted by Mike Sellers in a talk about systemic design; systems as a study was first popularized in the west by Isaac Newton in his text *De Mundi Systemate,* published in 1687, which was the conclusion of an intellectual argument that explored the relations of gravity on earth and the heavens (Sellers). This argument was one of the first written examples of a system that governed an entity, in this case gravity, through rules or laws. Within video games, the use of rules is used to enforce how entities interact or how mechanics work. To leverage systemic gameplay, the designer must derive consistent and universal rules for the systems in play. By constraining the system and generalizing its use the player may be able to create a mental model of the system and can exploit the systems in play to facilitate immersion. Furthermore, systems within the game must have awareness of some, if not all, of the state within a game to drive emergent gameplay. For example, the game being designed is a chef simulator where a player plays the role of a chef cooking for a dinner rush. Within the game there is a system for cooking food, a system for the dangers of a kitchen, a system to simulate the rate of placed orders, and a system of potential health hazards (mice, food-borne illness). The player during play gets overloaded with orders, leaving the cheese upon the table to start a fresh order. Due to this action, the game’s state has changed and the “cheeseLeftOut” flag is set to true. The mice entity, watching the cheese state, notices this action and executes its “cheeseLeftOut” code consuming some of the cheese in the process. The cheese object, noticing its own internal state, sets its “getWarm” flag. This in turn alerts the food-borne illness system to trigger its bacteria function. The player, without insight into what just happened, returns to the cheese and begins preparing another dish to be served. In simplicity, a handful of inputs can cause a highly systemic game to drive a game state forward for quite some time. But, the question remains, can this leap in overall game state be leveraged to create a dynamic narrative?

At *Game Developers Conference 2012* a developer from Valve Software, named Elan Ruskin, outlined a method of deciding optimal dynamic dialog through the comparison of game state and a database of dialog rules and sound clips (Ruskin). This dialog database houses lines of dialog, the rules in which decides if they should be said, and any state that should be modified upon that dialog’s display. The method begins when an entity builds a query using elements of the current state of the game. Then the database retrieves a list of dialog rules that match some, or all, of the elements in the query. The system then sorts the list by highest number of rules matched, highest being the most relevant line at that moment. That database entry has a sound clip, or dialog text, that is then displayed to the user. Sometimes at this point, the system will update the state to retain a “memory” of things that have been said. After execution, the system then either alerts the next entity to broadcast or enters a waiting state until it is triggered again. Using this system, the narrative designers, rather than the game programmers, retain creative control of when and if a given line of dialog is played. Given the nature of the dialog rules and the use of game state this system fits nicely into the systemic design methodology. In addition to its inherent systemic nature, the dialog system handles iteration elegantly and can be modified and expanded quickly and easily. The system, in its original capacity, retains a simple elegance that can be modified to handle execution of arbitrary code instead of simply dialog.

In the earlier example of the chef simulator, the systems interacted in a way that drove the game state forward. This example of a system where independent entities within the game interact with the game’s state could easily be tailored to also interact with the dialog rule system. While the dialog system can be utilized to handle the speech and sound clip “barks” of the game, it can also be utilized to update other systems either directly or by proxy. By example, the situation with the bacteria could cause the game’s daily newspaper to headline unhealthy practices at the establishment. This in turn can create situations of emergent gameplay as the game tunes the rate of customers to compensate, causing a new challenge to emerge. So, now the question becomes, how can this system and a systemic overall design be leveraged to produce a narrative that follows a more traditional narrative structure?

Utilizing the dialog structure offered by Ruskin, a designer could build a system that derives the current state of the game, queries the database, and returns a series of shifts in narrative. The problem with this action is twofold: the player might not immediately recognize the shift in narrative and, most importantly, a continued reliance on linear narrative. The first issue can readily be solved by utilizing player-facing highlights of the system in action. Some of these highlights can be in form of NPC rumors and newspaper headlines or even more overt, the use of UI elements to show how decisions were calculated. Dean Movshovitz highlighted a Pixar-based story structure that is akin to the mad-libs of childhood (Movshovitz). Utilizing a dynamic structure for a narrative, that follows traditional storytelling methods, offers a simple solution to the complex problem. Using abstraction, a designer could then split the intended stories into a series of hard and soft points. Hard points are the stereotypical moments of a traditional narrative, like Pixar’s “One day…” (Movshovitz). While soft points are the less important, and ultimately able to be bypassed, moments of the story. Using further abstraction, taking a point in the story and abstracting it similarly to a mad-lib allows the designer to dynamically assign the key actors and actions of that story. Using the chef sim case study, the designer could modify the narrative rules to trigger a change in story when receiving a bad review in the newspaper. That story could be derived from the current game state’s record of what characters currently work for the player and set one or more of the characters to quit or come up with a new slogan for the company. With proper attention to abstraction, the change in dynamic can provide an organic appearance to a procedurally generated narrative.

During this text, several important concepts were covered. Systemic design provides a framework, in which, to leverage a changing state to evolve in a natural and organic aesthetic. By designing constant rules of a system, in which a balance is inherently flawed, a designer can achieve a virtual state of emergence. Tying this system to a dynamic dialog system and abstracting out the rules of a traditional narrative, the designer can use the chaotic nature of the systemic design as a method of generating a procedural narrative. With proper attention to constraints, a systemic design can be utilized to generate an emergent narrative by manipulating an existing game state through character and entity interactions.

Works Cited

Brathwaite, Brenda. “Level 10: Nonlinear Storytelling.” *Game Design Concepts*, gamedesignconcepts.wordpress.com/2009/07/30/level-10-nonlinear-storytelling/. Accessed 2 March 2018.

Brown, Mark. “The Rise of the Systemic Game | Game Maker’s Toolkit.” *YouTube,* uploaded by Mark Brown, 14 February 2018, [www.youtube.com/watch?v=SnpAAX9CkIc](http://www.youtube.com/watch?v=SnpAAX9CkIc).

Movshovitz, Dean. “Pixar Storytelling Rules #5: Essence of Structure.” *YouTube*, uploaded by Bloop Animation, 8 December 2014, [www.youtube.com/watch?v=C7D8yDB7Tlk](http://www.youtube.com/watch?v=C7D8yDB7Tlk).

Ruskin, Elan. “AI-driven Dynamic Dialog through Fuzzy Pattern Matching. Empower Your Writers!” *GDC Vault*, uploaded by GDC Vault, 2012, [www.gdcvault.com/play/1015528/AI-driven-Dynamic-Dialog-through](http://www.gdcvault.com/play/1015528/AI-driven-Dynamic-Dialog-through).

Sellers, Mike. “A Systemic Approach to Systemic Design – Mike Sellers.” *YouTube*, uploaded by Sweden Game Arena, 17 November 2015, [www.youtube.com/watch?v=HR8EmTyJz9A](http://www.youtube.com/watch?v=HR8EmTyJz9A).

Annotated Bibliography

Brathwaite, Brenda. “Level 10: Nonlinear Storytelling.” *Game Design Concepts*, gamedesignconcepts.wordpress.com/2009/07/30/level-10-nonlinear-storytelling/. Accessed 2 March 2018.

This source discusses the intricacies of narratives in relation to game design. The article discusses the different types of narratives and some of their limitations and advantages. The source also examines the role of camera placement, interactive characters, and how to leverage them to create a more immersive story.

The author is a member of the games industry and uses the site as a virtual classroom. Much of the information provided could be seen as common knowledge or, in some instances, heavily biased by personal opinion.

This source is mainly of use as a highlight of the basic types of narrative used in game design. The designs listed amongst the article are fairly common knowledge and easy to digest with the diagrams provided.

Brown, Mark. “The Comeback of the Immersive Sim | Game Maker’s Toolkit.” *YouTube,* uploaded by Mark Brown, 18 August 2016, [www.youtube.com/watch?v=kbyTOAlhRHk](http://www.youtube.com/watch?v=kbyTOAlhRHk).

In this episode of Game Maker’s Toolkit, Mark Brown discusses the reemergence of a game design philosophy called the “Immersive Sim.” The video reviews historical instances of the genre by examining its roots in games such as *Ultima Underworld, System Shock* and *Deus Ex*. Mark Brown discusses the criteria for being labeled as an “Immersive Sim” and its uses of player agency, systemic design, emergent gameplay, reactivity and consistency of simulation.

Brown is a highly-regarded journalist in the game designer community that regularly analyzes game design philosophy and strategy. His videos are consistently cited and researched in similarity to a formal research essay. Many of his references and cited materials are influential game designers and members of the games industry. In some cases, however, his works are derived from his opinion and should be reviewed with thorough analysis; even though those opinions might ultimately be popular.

This work highlights the history and requirements of systemic design and immersive simulations that will provide a solid introduction to the concept for this paper. This foundation of systemic design and emergent gameplay will also help to reinforce my thesis of the use of systemic design in order to drive a dynamic narrative.

Brown, Mark. “The Rise of the Systemic Game | Game Maker’s Toolkit.” *YouTube,* uploaded by Mark Brown, 14 February 2018, [www.youtube.com/watch?v=SnpAAX9CkIc](http://www.youtube.com/watch?v=SnpAAX9CkIc).

Brown uses this episode to examine what makes a Systemic Game and why a player would care. He defines the term “Systemic Game” as a game with interconnected systems where systems and actors can reach out and influence other actors and systems creating emergent gameplay. In a simplified example he shows the use of inputs and outputs of an entity interacting to trigger a rule to be followed. By example, the rain entity outputs water and a campfire entity accepts that input. When the input is accepted the rule to put out the fire is followed. In traditional games, an entity is only aware of the player and anything it directly influences. In a systemic game, the entity is aware of the environment and its own rules which leads to the player being able to exploit the environment to their advantage. He posits that in order for these systems to build emergent gameplay the environment needs to be inherently unstable, driving entities to follow their rules in a more organic manner.

As mentioned earlier, Mark Brown is a well-renowned journalist in the game design community. His works often derive from research into influential members of the games industry and are often reviewed by members of the industry. Once again, many of his discussions are derived from opinion, and as such, must be analyzed thoroughly.

This video directly relates to my thesis. Many of the points Brown proposes have a direct correlation to the use of dynamic narrative in an immersive simulation. His points on imbalanced entities and uniform rules of interaction should be used in direct consideration of the limitations and requirements of dynamic narratives within a systemic game.

Gomes, Renata. “The Design of Narrative as an Immersive Simulation.” *DiGRA ’05 – Proceedings of the 2005 DiGRA International Conference: Changing Views: Worlds in Play*, Vol. 3, 2005, ISSN 2342-9666, [www.digra.org/wp-content/uploads/digital-library/06276.21047.pdf](http://www.digra.org/wp-content/uploads/digital-library/06276.21047.pdf).

In “The Design of Narrative as an Immersive Simulation,” Gomes discusses the concept of narrative within immersive simulations by compare and contrasting the two categories of games: character oriented and simulation (god-perspective) games. The article argues that narrative is inherently a system, by which the simulation interacts in a non-linear fashion. Some of the points referenced include the use of linear narrative design in traditional character oriented games and how this diverges within the immersive simulation genre. The author additionally argues that the convergence of the two styles leads to a more emergent gameplay.

The article is from a peer reviewed journal and is written by a member of the Catholic University of Sao Paulo and reviewed by a board of scholars in the video game field.

This article is of small use to me as the direction of my paper is to be about using emergent gameplay to design a dynamic narrative. The primary use of this article is in the point of systems introducing narrative through the intersection of systems. This point has been highlighted mode adequately in other articles of research.

Hunicke, Robin, et al. “MDA: A Formal Approach to Game Design and Game Research.” *Game Design and Tuning Workshop at the Game Developers Conference*, 2004, [www.cs.northwestern.edu/~hunicke/MDA.pdf](http://www.cs.northwestern.edu/~hunicke/MDA.pdf).

This paper is a presentation of the MDA framework for game design. MDA stands for Mechanics, Dynamics and Aesthetics. The paper focuses on the electronic version of game design and their interactions between coded systems to create complex, dynamic and unpredictable behaviors. The paper creates a groundwork to begin designing a game by first considering the aesthetic goals, introduce dynamics that support those goals, and then create mechanics that fit those dynamics. Using that framework leads to anticipating unexpected behaviors and conceptualizing the game as a network of systems.

This paper is written by three academics working in the video game fields and has been presented to the larger game design community through repeated related lectures at the *Game Developers Conference*. The paper is technical in nature and examines some long-debated technical points around game design (namely the Monopoly examples cited).

This paper will provide a good introduction to the methodology around game design in relation to my topic and can be helpful in creating a framework, in which, to outline how to create a dynamic narrative with systemic design. The First, Second, and Third Pass sections are a great example on how to use the framework in practice and are worth considering as an outline on how to structure the paper.

Movshovitz, Dean. “Pixar Storytelling Rules #5: Essence of Structure.” *YouTube*, uploaded by Bloop Animation, 8 December 2014, [www.youtube.com/watch?v=C7D8yDB7Tlk](http://www.youtube.com/watch?v=C7D8yDB7Tlk).

This video highlights part of the structure that Pixar uses to create some of their stories. The video is a short introduction to story structure derived from a twitter post of a (now) former employee of pixar.

The author of the video does not appear to be a solid source. However, upon further investigation, the original inspiration for the video was penned by a reliable source. In the end, the video, is suspect in accuracy however shows a simplified view of a common narrative structure, the heroes journey.

This source can be of use in outlining a basic requirement for a traditional narrative structure. This is extremely simplified, however its simplicity leaves many important topics up to artistic interpretation for the audience of the paper.

Ruskin, Elan. “AI-driven Dynamic Dialog through Fuzzy Pattern Matching. Empower Your Writers!” *GDC Vault*, uploaded by GDC Vault, 2012, [www.gdcvault.com/play/1015528/AI-driven-Dynamic-Dialog-through](http://www.gdcvault.com/play/1015528/AI-driven-Dynamic-Dialog-through).

Ruskin’s talk provides a framework, in which, a game designer can build a system to deliver relevant dialog in games. The system is dissected through fully developed examples and shows the methodology of each decision of the iterative process.

Ruskin is an accomplished programmer for Valve Software and has worked on many games over the course of his career. The venue where this talk appeared is a well renowned source within the game development community.

This is a solid source, and will be key in presenting a method in which to generate the dialog of my thesis. The method of examining the state of the application and the interaction of characters is inherently systemic in nature and applies directly to most aspects of the paper.

Sellers, Mike. “A Systemic Approach to Systemic Design – Mike Sellers.” *YouTube*, uploaded by Sweden Game Arena, 17 November 2015, [www.youtube.com/watch?v=HR8EmTyJz9A](http://www.youtube.com/watch?v=HR8EmTyJz9A).

In this talk, Sellers goes over the background behind Systemic Design and its importance in game design. The talk focuses on creating a definition of systemic design and how to create emergence using it. Many of the points behind the lecture tie back to the history, starting in the eras of Plato and Newton, and how game design evolved from these systems over history. In examining the modern implementations of systems and their impact in computer science, he is able to define how systemic design is achieved.

Sellers is a Professor of Practice in Game Design at Indiana University and teaches this talk as a semester class. He has over 20 years’ experience in game design and has contributed to many AAA games including The Sims 2.

This lecture provides a significant portion of history behind how Systemic Design came into existence and will provide ample opportunity for me to analyze the roots of where systemic design came from. The lecture also goes into significantly more detail in how emergence is achieved and the caveats of emergence than other sources I have provided.