

# **Personalization of Video Games: An Implementation of PaSSAGE**

Evan Sturtevant

Computer Science Seminar

Dr. Kruse

11/08/2021

## Abstract

Video games are a modern medium through which story tellers can tell a story. What is unique about them is their ability for player agency and interactivity. PaSSAGE is a technique game developers can use to help take advantage of this unique trait of the medium in order to tell an immersive story. This paper is a research proposal in which a game will be made using the PaSSAGE framework and a subsequent survey will be conducted similar to the study done in the paper by Thue et al. in which PaSSAGE was proposed.

## Table of Contents

<b>Abstract</b>	<b>2</b>
<b>Terminology / Acronym Dictionary</b>	<b>3</b>
<b>Background</b>	<b>3</b>
<b>Objectives</b>	<b>5</b>
<b>Motivation</b>	<b>6</b>
<b>Procedure</b>	<b>6</b>
<b>Timeline</b>	<b>7</b>
<b>Works Cited</b>	<b>9</b>

## Terminology / Acronym Dictionary

D&D - Dungeons and Dragons

GM - Gamemaster

MMO - Massively Multiplayer Online Game

PaSSAGE - Player-Specific Stories via Automatically Generated Events

PVP - Player vs Player

PVE - Player vs Environment

RPG - Role Playing Game

## Background

People have been telling each other stories for a very long time. There are many mediums through which to do so, and the rise of technology only brings more possibilities.

Gaming - a unique medium due to its intractability with its audience - is not a new medium. Board game RPGs and their GMs (such as D&D) have been creating interactive and personal gaming experiences long before it was common practice for people to have a powerful specialized gaming computer sat in their living room (Laws 2-6). Though the art of telling stories through games is unique in the sense that the audience of the story can interact directly with it, this does not mean that stories told through games should abandon the wisdom of other mediums when it comes to the composition of a good story, things like aristotelian plot structure or moving character arcs (Seif El-Nasr).

Even though games should still stick to traditional storytelling best practices, this does not mean that they cannot highlight the interactivity of their medium while doing so. Personalization in video games is when the game takes some input from the player and uses it to dynamically create an experience unique to the player. Personalization is often achieved by modeling different aspects of the player, these aspects include: player

preference, personality, experience, performance, or in-game behavior (Karpinskyj et al.).

These different player aspects can then be used to modify different game elements: playable space, missions or levels, in-game characters, game mechanics, narrative, music or soundtrack, match making, or difficulty (Bakkes et al.).

There have been lots of examples and studies done on different forms of personalization in video games. One of the most common forms of personalization found in many modern video games is an adaptive difficulty system. Players have more fun when a game is the correct difficulty, games are boring when too easy and likewise frustrating when too difficult (Li et al.) Another example is match making systems in multiplayer games. Match making, especially in competitive games, is a similar concept to adaptive difficulty, and applies not just to video games; neither the grandmaster nor the novice will have fun playing chess against each other, as the skill level is not comparable.

Daylamani-Zad et al. looked into matchmaking for MMOs, as these games are not typically competitive in the PVP sense; different and more in depth criteria should be measured when creating a matchmaking system (Daylamani-Zad et al.). Where previous examples focus primarily on gaming aspects of personalization, Poo Hernandez and Bulitko focus on making narrative decisions based on the player's current emotional state (Poo Hernandez and Bulitko).

Player modeling is a very important step in order to create games that can adapt to the player. This can be done generally in a way that categorizes many types of players, as is done in the paper by Smith et al. What is more likely to be useful for a game developer, however is a slightly more simplified way of mapping player actions as is presented by Laws.

His book on GMing, he identifies 6 categories of gamers: power gamer, butt-kicker, tactician, specialist, method actor, and casual gamer (Laws 2-6). This categorization is the foundation for the narrative personalization system called PaSSAGE, or Player-Specific Stories via Automatically Generated Events. PaSSAGE is a system for deciding what narrative events and decisions to present the player based on a characterization of the player based on Laws's player types (but does not include casual gamer), and is the foundation of what this research aims to explore (Elson et al.)(Thue et al.). Proposed in the Thue et al. paper, PaSSAGE is a way for a game designer to delay narrative decisions until runtime. Briefly how it works is each decision presented to the player has a set of outcomes, and each outcome associates a point score for each of the five types of players presented by Laws. Then, whenever the game designer wants the game to start an event, he can use the PaSSAGE algorithm to select from a set of possible events based on the state of the game (it won't select an ending scene during act 1) and the mapping of the player. For example, if a player tends to pick actions associated with a fighter archetype, they will have a higher score in the fighting category, and PaSSAGE is more likely to pick a scene in which a player which enjoys fighting would enjoy.

## Objectives

Game design is a highly subjective field. Thousands of papers could be written on the subject yet it wouldn't be a surprise if a game comes out opposite of all that advice and is still a success. Despite this, we can still look for best practices which can help predict the success of a game. PaSSAGE represents a methodology for game developers to relatively

easily create branching stories and gameplay experiences which players find more fun and think they have more agency (Thue et al.). The objective for this research is to design and create a video game following the PaSSAGE model and ultimately to try and recreate the results of the hypothesis tests found in the Thue et al. paper; those being  $Fun_{Adaptive} > Fun_{Fixed}$  and  $Agency_{Adaptive} > Agency_{Fixed}$ . The game will be 2d and will fall somewhere between the action and platforming genres as well as keeping focus on a simple story. The key will be to design a strong base moveset so that level and story design will become much easier to achieve.

## Motivation

Video Games for me were a large part of the reason for my interest in pursuing a computer science degree. Since deciding to pursue computer science, I have never really gotten the opportunity to try game design and it is likely that my career will not head in that direction either. This would be a great opportunity to get some experience in a game engine to design and build a video game. Additionally, I intend to get a secondary emphasis in data science, so I would enjoy having a little bit of statistical analysis to do at the end of the project.

## Procedure

Simply put, the procedure for this research will be to design and create a video game in the PaSSAGE framework, then have people play a version with adaptability enabled and a fixed-story version to do a hypothesis test on the hypotheses stated in the Objectives section of this proposal. The survey will take a sample of volunteering Juniata students and have them play two or three versions of the game. One where the game adapts to their decisions

and two in which they follow a fixed story. Then they will be asked a few basic demographic questions and a few multiple choice questions about the game and the versions of it they played. More detail about the procedure can be found in the timeline section.

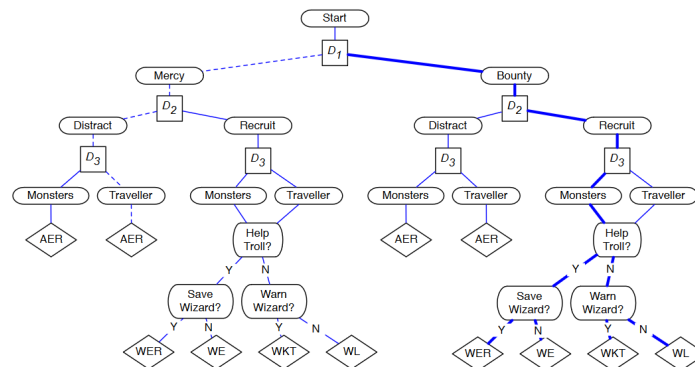
## Timeline

Week 1 (Class on 1/18/2022):

- Complete IRB approval for the survey
- Begin outlining game plot
- Begin working on general game systems and mechanics

Week 2 (Class on 1/25/2022):

- Identify different paths which correspond to different PaSSAGE play styles. Plot these elements as a tree, it should somewhat resemble the structure from the Thue et al. paper:



Week 3 (Class on 2/01/2022):

- Implement ending 1 into the game

Week 4 (Class on 2/08/2022):

- Implement ending 2 into the game

Week 5 (Class on 2/15/2022):

- Implement ending 3 into the game

Week 6 (Class on 2/22/2022):

- Implement ending 4 into the game

Week 7 (Class on 3/01/2022):

- Implement ending 5 into the game

Week 8 (Class on 3/08/2022):

- Implement pre-ending decisions into the game

Week 9 (Class on 3/15/2022):

- Implement inciting incident into the game
- Start recruiting a sample base of players for statistical analysis

Week 10 (Class on 3/22/2022):

- Finish playable game

Week 11 (Class on 3/29/2022):

- Have players play the game and answer survey questions

Week 12 (Class on 4/05/2022):

- Analysis of survey results and run hypothesis testing

Week 13 (Class on 4/12/2022):

- Prepare presentation for LAS next week

Week 14 (Class on 4/19/2022):

- LAS 4/21

Week 15 (Class on 4/26/2022):

- Make final adjustments to research paper



## Works Cited

Bakkes, Sander, et al. *Personalised Gaming: A Motivation and Overview of Literature*.

Association for Computing Machinery, 2012, doi.org/10.1145/2336727.2336731.

Accessed 19 Oct. 2021. This paper is another overview of “video game personalization.” They discuss some of the psychology and why a video game would want to implement it. They mention different areas of personalization. When they talk about story personalization they mention PaSSAGE and SSAU as well as using Facade as a good example of a heavily player driven story game..

Daylamani-Zad, Damon, et al. “Personalise Your Massively Multiplayer Online Game

(MMOG) with Artemis.” *Multimedia Syst.*, vol. 18, Feb. 2012, pp. 69–94,

www.researchgate.net/publication/220460651\_Personalise\_your\_massively\_multiplayer\_online\_game\_MMOG\_with\_Artemis, 10.1007/s00530-011-0237-x. Artemis uses MPEG-7 to personalize games. There is a large focus on matchmaking since the use is for MMOGs (like WoW), those games often require a good blend of different play styles to be fun.

Elson, David, et al. “Reports on the Fourth Artificial Intelligence for Interactive Digital

Entertainment Conference Workshops.” *AI Magazine*, vol. 33, no. 1, 4 Jan. 2012, pp.

55–56, www.aaai.org/Papers/AIIDE/2008/AIIDE08-041.pdf,

10.1609/aimag.v33i1.2393. Accessed 7 Oct. 2021. This is a shorter article, but I think it will have some good references for further research. In it they propose PaSSAGE,

an algorithm which allows game developers to make design decisions during play time based on player experience so far. From their testing, it is clear that PaSSAGE provides a better narrative experience than traditional techniques.

Karpinskyj, Stephen, et al. "Video Game Personalisation Techniques: A Comprehensive Survey." *Entertainment Computing*, vol. 5, no. 4, Dec. 2014, pp. 211–218, [juniatacollege.on.worldcat.org/v2/oclc/5627860726](http://juniatacollege.on.worldcat.org/v2/oclc/5627860726), 10.1016/j.entcom.2014.09.002. Accessed 21 Sept. 2021. Authors analyze different methods of video game personalisation. Personalisation is the act of actively changing the experience based on user inputs: I.E. Amazon recommends different stuff for you based on what you look for. They examine the following categories: Preferences, Personality, Performance, Experience, and Behavior. They have noticed that, in the current market there is a lack of measurable criteria to evaluate if the personalisation has had the intended effect.

Laws, Robin D. *Robin's Laws of Good Game Mastering*. Austin, Tex., Steve Jackson Games, 2002, pp. 2–6, [i4pcdn.org/tg/1368190742811.pdf](http://i4pcdn.org/tg/1368190742811.pdf). Accessed 6 Nov. 2021. A book for GMing. This book defines the 5 types of gamer which is later used as a foundation for PaSSAGE. Those types are "power gamer," "butt-kicker," "tactician," "specialist," and "method actor."

Li, Yi-Na, et al. "Adaptive Difficulty Scales for Parkour Games." *Journal of Visual Languages & Computing*, vol. 25, no. 6, Dec. 2014, pp. 868–878, [juniatacollege.on.worldcat.org/v2/oclc/5900953340](http://juniatacollege.on.worldcat.org/v2/oclc/5900953340), 10.1016/j.jvlc.2014.09.003. Accessed 5 Oct. 2021. Authors study the effect of adaptive difficulty in their test

mobile game. They found that it has a positive effect for difficulty - especially with a range of player skill - though it does not largely affect the replayability of their game.

Poo Hernandez, Sergio, and Vadim Bulitko. *A Call for Emotion Modeling in Interactive*

*Storytelling*. 2013. Seek to modify PAST and ASD narrative personalization

techniques to better incorporate the player's emotion. Those techniques are good for making narrative decisions, as used in Facade, but do not care for the player's state.

Seif El-Nasr, Magy. "Interaction, Narrative, and Drama: Creating an Adaptive Interactive

Narrative Using Performance Arts Theories Onboarding Design and Playability in

Citizen Science Games View Project Game Field Bibliometrics View Project."

*Interaction Studies*, 2007,

[www.researchgate.net/publication/233651644\\_Interaction\\_narrative\\_and\\_drama\\_Cr](http://www.researchgate.net/publication/233651644_Interaction_narrative_and_drama_Creating_an_adaptive_interactive_narrative_using_performance_arts_theories)

[eating\\_an\\_adaptive\\_interactive\\_narrative\\_using\\_performance\\_arts\\_theories,](http://www.researchgate.net/publication/233651644_Interaction_narrative_and_drama_Creating_an_adaptive_interactive_narrative_using_performance_arts_theories)

10.1075/is.8.2.03eln. Accessed 7 Nov. 2021. The author describes techniques of

designing game story branches in such a way that it will correspond with the wisdom of storytelling from other media, such as character arcs and plot structure.

Smith, Gillian, et al. *An Inclusive View of Player Modeling*. 2011, 10.1145/2159365.2159419.

Accessed 25 Oct. 2021. This article tries to identify and define different types of

player models. They create four categories: Domain, Purpose, Scope, and Source

which any given player model could fall into. They note that certain types of player model are much more represented than others.

Thue, David, et al. "Interactive Storytelling: A Player Modelling Approach." *AIIDE*, 2007, pp.

43-48, [www.aaai.org/Papers/AIIDE/2007/AIIDE07-008.pdf](http://www.aaai.org/Papers/AIIDE/2007/AIIDE07-008.pdf). Accessed 6 Nov. 2021.

This paper introduces PaSSAGE as a means to adaptability to narrative in game stories. They run a study and find adaptable games in this system are more fun and players find that they have more agency. This paper also describes how PaSSAGE works on a general level.