

# Personalization of Video Games: An Implementation of PaSSAGE

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**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. Player Specific Stories via Automatically Generated Events (PaSSAGE) is a technique game developers can use to help take advantage of this unique trait of the medium to tell an immersive story. PaSSAGE accomplishes this through runtime player mapping to delay design decisions to runtime. This research aims to find if games implementing PaSSAGE are viewed as having higher player agency and being more fun than fixed counterparts by their player bases. To do this, a short game was created, including both fixed and PaSSAGE variants to allow for a survey to be conducted between the two versions and analyze which is more fun and gives players more agency.

*Index terms* – GM, PaSSAGE, Personalization, Video Games

## BACKGROUND

### I. Introduction

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 role playing games (RPGs) and their gamemasters (GMs) (such as Dungeons and Dragons) have been creating interactive and personal gaming experiences long before it was common practice for people to have a powerful specialized gaming computer sitting in their living room [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 [10].

Though games should still maintain 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 [1]. These different player aspects can then be used to modify various game elements: playable space, missions or levels, in-game characters, game

mechanics, narrative, music or soundtrack, match making, or difficulty [4].

### II. Related Work

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 [2].

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 [8]. looked into matchmaking for Massively Multiplayer Online games, as these games are not typically competitive in the player vs. player sense; different and more in depth criteria should be measured when creating a matchmaking system. Where previous examples focus primarily on gaming aspects of personalization, Poo Hernandez and Bulitko [9] focus on making narrative decisions based on the player's current emotional state.

### III. PaSSAGE

Player modeling is a very important step 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[6]. In his book on GMing, he identifies 6 categories of gamers: power gamer, butt-kicker, tactician, specialist, method actor, and casual gamer.

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 [6] player types (but does not include casual gamer), and is the foundation of this research paper[3][7]. Proposed in the Thue et al. [7] 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, they 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.

## RESEARCH

This research aims to discover the effectiveness of PaSSAGE as a framework for game design. It aims to do so with the following approach: (1) create a short video game implementing the PaSSAGE framework, (2) survey participants who have played either a PaSSAGE enabled or fixed plot version of the game, and (3) analyze those results. Initially proposed by Thue et al. [7], the hypotheses this research aims to test are:

$$Fun_{adaptive} > Fun_{fixed} \quad (1)$$

$$Agency_{adaptive} > Agency_{fixed} \quad (2)$$

where adaptive represents the version of the game with PaSSAGE enabled, and fixed is the version with PaSSAGE disabled, these will also be the primary hypotheses for the following research.

### I. PaSSAGE

The game built to implement the PaSSAGE algorithm is a 2d action platformer. It tells a short fantasy story about a small boy in a new world journeying to meet the new Queen. Along the way, the player will interact with a variety of characters. Each stage in the game has different ways in which the player can interact and affect their passage mapping. At the end of each stage, the PaSSAGE algorithm will decide which stage is the most appropriate to play next based on the player mapping.

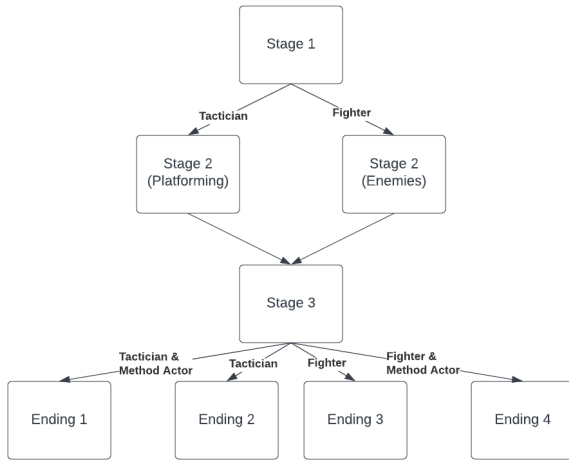


FIGURE I

Due to the small scale of the game, the player mapping does not leverage all five of the potential categories, instead only tracking four of them: Fighter, Tactician, Power Gamer, and Method Actor; and only decides on three of them: Fighter, Tactician, and Method Actor. Figure 1 shows the progression that the player can take through the game based on their PaSSAGE mapping. Stage One offers many opportunities to gain points in each of the different mapping categories. At the end of the stage, the PaSSAGE algorithm decides whether the player fell more into either the tactician or fighter archetype and picks the appropriate scenario for Stage Two. If the player is more of a tactician, they will end up in a Stage Two which is more involved with the platforming mechanics of the game (Figure II), while a fighter will end up in a Stage Two which is filled with more enemies and has less platforming (Figure III). All players will play the same version of Stage Three, where they meet a new character who informs them that the final scene is coming up. In Scene Three the player has another chance to affect their PaSSAGE mapping and thusly affect which version of the final stage they will be put into.



FIGURE II  
SCENE TWO PLATFORMING



FIGURE III  
SCENE TWO ENEMIES

### FUTURE WORK

Due to time constraints, this research was unable to complete its original goal of surveying a sample of players to determine the hypotheses (1), (2). The study would have proceeded as follows: From a sample of volunteer participants, each participant would play either the fixed version of the game, or the version where PaSSAGE is enabled. A fixed version of the game can simply be achieved by setting a default player mapping to have a high score in one of the categories such that player choice cannot affect the outcome. After their

playthrough, the player would fill out the questionnaire (Appendix A), from which data can be analyzed.

Since games vary significantly even within their own genre, this study should be conducted again on various games from all types of genres which may lend themselves to this kind of personalization, especially larger games. This will help ensure that results achieved from participant data are not due to confounding game design decisions unrelated to PaSSAGE.

## DISCUSSION

Designing this game with a PaSSAGE implementation in mind was challenging. The small size of the game, and the rather limited amount of ways that the player can interact with the PaSSAGE system and their mapping, mean ultimately that his game in particular would lend itself better to a tree or state based implementation of its systems. This reflects on the idea that there are infinitely many ways to implement a certain effect into a video game. While, some may certainly have more merit, perhaps the devotion of research should be intended to uncover the response to these effects rather than be based on certain implementations. However, a PaSSAGE based implementation would likely be more scalable for larger, more complex games.

Since this specific implementation of PaSSAGE has yet to be played by a sample of people, one concern, from a developmental perspective, is that players won't notice the personalization that the PaSSAGE algorithm is making to their playing experience. In most games that offer branching stories based on player decisions, they are often explicit to the player that a choice is being or has been made. A notable example of this are games developed by Telltale Games, who when specific dialogue options are chosen will display a message along the lines of: *NPC will remember that*. This makes the player aware that their actions are affecting the game world potentially in ways that they may not realize. Intuitively, as a developer, this seems like what you would

want the player to think as they play the game, but more research should be done on that.

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# Appendix A

No question is mandatory, any question may be left blank if you choose not to answer it.

## Questionnaire

What is your age?

- ☐ 18-19
- ☐ 20-21
- ☐ 22-23
- ☐ 24-25
- ☐ 25+

What is your Ethnicity/Race:

- ☐ Asian
- ☐ Black
- ☐ Hispanic
- ☐ White
- ☐ Other: \_\_\_\_\_

What is your gender?

- ☐ Male
- ☐ Female
- ☐ Other

On a scale of 1 - 10 (10 being the highest, 1 being the lowest). . .

How often do you play video games?

Almost Never

All the Time

1 2 3 4 5 6 7 8 9 10

Was the story easy to follow?

Not at All

Very Easy

1 2 3 4 5 6 7 8 9 10

How much fun was this game to play?

Not fun at all

Very Fun

1 2 3 4 5 6 7 8 9 10

How much agency did it feel like you had?

Almost None

A Lot

1 2 3 4 5 6 7 8 9 10

How much do you feel that the game reacted to your playstyle?

Almost None

A Lot

1

2

3

4

5

6

7

8

9

10

How likely are you to play the game again?

Not Likely

Very Likely

1

2

3

4

5

6

7

8

9

10

Overall, What is your opinion on the game?

Negative

Positive

1

2

3

4

5

6

7

8

9

10