COMP 521: DISCOVERING PLAYER BEHAVIOUR CATEGORIES THROUGH PLAY

April 11, 2017

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1 Introduction

Our objective is to investigate player behavior and categorization of players. We hypothesize that better player categories could be created by gathering statistics about how players game, instead of gathering statistics via surveys like previous work in the field. Our intent is to build a game that analyzes a gamer's behavior as they play. This game could be used as a tool to cluster players who have similar patterns across the variables studied and produce categories with this data. We reviewed literature about player classification that builds on the work done by Bartle and used this work to choose characteristics to measure. A game narrative and world were developed that collects the characteristics we are interested in and provides an interesting experience for the player.

Our result is a fifteen-minute game where the player explores a desert-like world. Spread out throughout the game world are possible tasks that correspond to different gamer characteristics. The game is purposely designed to have an open-ended goal driven by the gamer's idea of fun, such as exploring the world, killing evil characters, or collecting the most gold. We had four people play the game to generate some initial results to test the concept of categorizing players via play style instead of survey, and had some success with these metrics reflecting observed play style.

We both developed metrics and the game narrative together. Elisabeth implemented the game world. Tricia implemented the player and all non-player characters.

2 Background

Understanding why people play games enables us to design better ones. We can deduce that gamers have different underlying motivations and interests for playing video games - just look at the broad spectrum of video game genres with widely varying audiences that exists today. Among avid gamers surveyed in 2015, the top three most frequently played genres were social games (31%), action games (30%), and puzzle games/board games/card games/game show (30%) [1] - note that the split across these significantly different genres is almost even. Even among players within a single game, different play behaviour can be observed [5].

Players are kept engaged when games stimulate them in a way that they find 'fun', but how each player defines 'fun' depends on their individual preferences - figuring out how to make a game fun for many types of players, or how to make a game extremely appealing to one type of player is key to successful game design. Achieving this goal is much easier if we can predict and understand the different preferences and motivations that exist among players. So we turn to player type theory and the challenge of constructing player types and categorizing players.

2.1 Bartle's Classification System

One of the best known and most popular player type classification systems is Bartle's system that categorizes gamer behaviour, published in 1996. The four categories, originally designed for players of multi user dungeon games (MUDs), are killers, socializers,

achievers, and explorers. [2, 5] These categories are drawn from two axes shown in Figure 1.
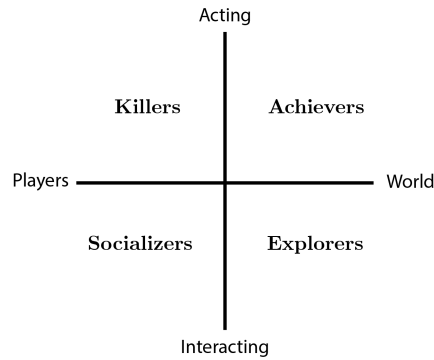

Figure 1: Bartle's Classification System [2]

In the early 2000s, the Bartle Test of Gamer Psychology was created by a pair of researchers unaffiliated with Bartle. The test is a series of questions with two possible answers, where the player picks the answer they feel they agree with more [3]. An example question is below:

You're a player in an online game, and about to go into an unknown dungeon. You have your choice of one more person for your party. Do you bring:
(A) A bard, who's a good friend of yours and who's great for entertaining you and your friends
(B) A wizard, to identify the items that you find there? [3]

Below are key drawbacks of Bartle's System:

- Bartle's was developed without statistical data and an empirical model that can be replicated. Multiple traits associated with the same type are suggested to be correlated, however this may not be the case. [6, 8] In fact, data has disproved some of the assumptions Bartle made (for example, socializing and role-playing are actually independent from each other). [5]

- The lack of empirical basis for Bartle's model means that theories built on top of it are unfalsifiable. Work that builds on his system can simply reinforce the assumption that Bartle's player types are correct rather than actually validating them. [5]

- It is a rigid classification system that does not allow overlap. For example, a player may like teaming up with others (socializer) to ensue destruction (killer) together -

but the socializer and killer types are on opposite corners of the axes defined by Bartle.[5, 6]

- Bartle has warned against applying his player type theory on types of game other than multi-player online role-playing games. [7]

In 2004, Bartle published an improved model with eight player types instead of four. The new model was intended to address two flaws in the original paper: (1) lack of explanation of how players change over time, and (2) adding subtypes to the original four categories. The primary difference introduced in this new model was a third axis which ranged from acting to interacting. [4] This model did not address all proposed flaws, however, as it is still category based and not empirically grounded. Further models would be needed to explain player types more fully. It is important to note that Bartle laid the ground work for understanding different player motivations and recent developments in the field build on his ideas. [8]

2.2 Yee's Factor Analytic Approach

Nick Yee, a critic of Bartle's method, used an iterative factor analytic approach to develop a player motivation model empirically. He did this through online surveys on two MMORPG (Massively Multiplayer Online Role-Playing Game). [5] His findings are shown in Figure 2.

Figure 2: Yee's Factor Analytic Approach Results. Graphic obtained from [5]

Achievement	Social	Immersion
Advancement Progress, Power, Accumulation, Status	**Socializing** Casual Chat, Helping Others, Making Friends	**Discovery** Exploration, Lore, Finding Hidden Things
Mechanics Numbers, Optimization, Templating, Analysis	**Relationship** Personal, Self-Disclosure, Find and Give Support	**Role-Playing** Story Line, Character History, Roles, Fantasy
Competition Challenging Others, Provocation, Domination	**Teamwork** Collaboration, Groups, Group Achievements	**Customization** Appearances, Accessories, Style, Color Schemes
		Escapism Relax, Escape from RL, Avoid RL Problems

The three components, achievement, social, and immersion, are made up of 10 subcomponents, each comprised of features. This is a more thorough and descriptive alternative to Bartle's model. Most importantly, it allows for a fluid way of analyzing players by not

forcing players to fit types. Instead it defines a player's behaviors with subcomponents of varying levels that work together. [5]

3 Methodology

Our overarching goal was to design a game that would measure player behaviour characteristics. While the player plays, the game would track information about how they play and what parts of the game or world they choose to interact with. This goal meant we wanted the game to provide lots of different play opportunities, so that player choices about what do would be meaningful, and so lots of different play styles would be possible.

This meant we needed to decide which play opportunities we wanted to offer, and to do this we needed to decide what player traits we wanted to measure. Through a review of relevant literature, a list of important charateristics was compiled. We decided that our game should be single player to avoid having to deal with the effects of other players - a single player environment is easier to control. A single player environment is different from a multiplayer environment, but we felt this would still be an interesting area for research since Bartle's and Yee's work both focused on multiplayer online games.

3.1 Choosing Characteristics

We drew from Bartle's and Yee's theories to decide what types of traits and behaviours would be useful to track and study. Note that because our game is single player, we incorporated fewer socializing behaviours than Bartle or Yee did. Below are the traits we chose and reasoning behind those choices.

1. **Achievement-Oriented:** How much satisfaction does the player get from leveling up in the game? Is the player driven by a desire to master the game? Will the player unrelentingly retry the same challenge until they beat the it? This characteristic derives from a combination of Bartle's "Achiever" player type and Yee's "Advancement" subcomponent. [2, 5]

2. **Enjoys Exploring and Discovering New Things :** Does the player appreciate the open-endedness of the game? Does the player enjoy finding small, usually hidden, details of the game world? This characteristic derives from a combination of Bartle's "Explorer" player type and Yee's "Discovery" subcomponent. [2, 5]

3. **Socializes with NPCs:** Does the player seek out interactions with game characters? Are they more driven by group goals rather than individual goals? This characteristic derives from a combination of Bartle's "Socializer" player type and Yee's "Social" component. [2, 5]

4. **Appreciates Customization:** Does the player spend time customizing their appearance, even if it may not improve their skill during the game? Does the player seek to earn money so that they can buy new items for customization? This characteristic derives Yee's "Customization" subcomponent.[5]

5. **Values Wealth:** Is the player focused on accumulating a large amount of wealth (for example, gold) without necessarily spending it throughout the game? This characteristic derives from a combination of Bartle's "Achiever" player type and Yee's "Advancement" subcomponent. [2, 5]

6. **Enjoys Killing:** Does the player lean towards quests that require attacking? Does the player kill unprovoked? This characteristic derives from a combination of Bartle's "Killer" player type and Yee's "Competition" component. [2, 5]

7. **Materialistic / Collects Items:** Does the player enjoy growing their personal inventory, whether it includes items they found or bought? Does the player spend energy getting new items, without a level up or skill improvement incentive? This characteristic derives from a combination of Bartle's "Explorer" player type and Yee's "Discovery" and "Customization" subcomponent. [2, 5]

8. **Rate of Improvement of Skill Throughout Game:** How quickly does the player level up and learn skills from the game? Does the player figure out certain game mechanics and use that to optimize performance? This characteristic derives from a combination of Bartle's "Achiever" player type and Yee's "Mechanics" subcomponent. [2, 5]

The characteristics above are not necessarily our theory on gamer behaviour and types; they are intended as a guiding tool of what to measure and attempt to analyze. These are not rigid characteristics, and there is overlap between characteristics.

3.2 Game Narrative Design

After developing the characteristics to measure, we had to shape a general game narrative that would be able include them naturally. Importantly, the game had to be interesting to all players, regardless of their preferences and motivations for play. For this reason, we decided to make our game open-world with different possible tasks, so that the player can choose which to engage in, rather than following a structured narrative which limits player freedom to act as desired.

We chose to end our game after a fixed length of time, for two reasons. First, this would allow for a more fair comparison of metrics between all players because they would all have the same time to access the same opportunities. Second, we didn't want our game to skew towards "Achiever" behaviour by having the end to the game also be a goal to strive for depending on success in other parts of the game. This would allow us to see how players define their idea of "fun" and "motivation" by seeing what they attempt and what they succeed in doing for a fixed period of time. And, rather than end the game when the player dies, half of the player's gold and food is taken away, to provide a negative consequence for dying.

We wanted the game to provide some opportunity for immersion, rather than feeling like a test or experiment, so we also put effort into developing some story and interesting terrain. Below is the plot of the game that is shown to players when they begin the game:

"Your horse collapsed as you travelled across the desert, stranding you. Fortunately you know that your friend is coming through the area tonight and will be able to rescue you, but until then you need to stay alive. Food can be used to restore your health. Monsters roam the area, but won't attack unless you get too close - but you have a gun with you to protect yourself. Friendly people live in the region, who may be looking for help or willing to sell you goods. Finally, this area is known to be full of gold. Good luck!"

We also chose a first person perspective for the player, in an attempt to avoid any influence the choice of player avatar might have on player behaviour.
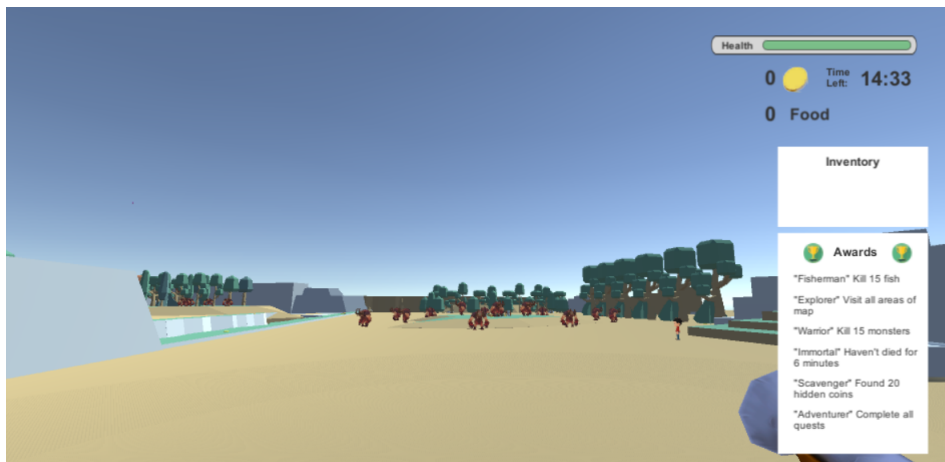

Figure 3: First Person Perspective

3.3 Designing a Game Map

We designed our game map with the intention that every characteristic would have a fair opportunity to be measured. Our game has an open world map with many potential tasks, enabling players with different play styles to find tasks that suit their preferences. Figure 4 is a simplified drawing of our map with the different possible actions in each area.

3.4 Translating Characteristics into Metrics

From the characteristics developed, we built a list of metrics to measure throughout the 10 minutes of game play that would fit into our game narrative. Below are the metrics along with relevant characteristic(s):
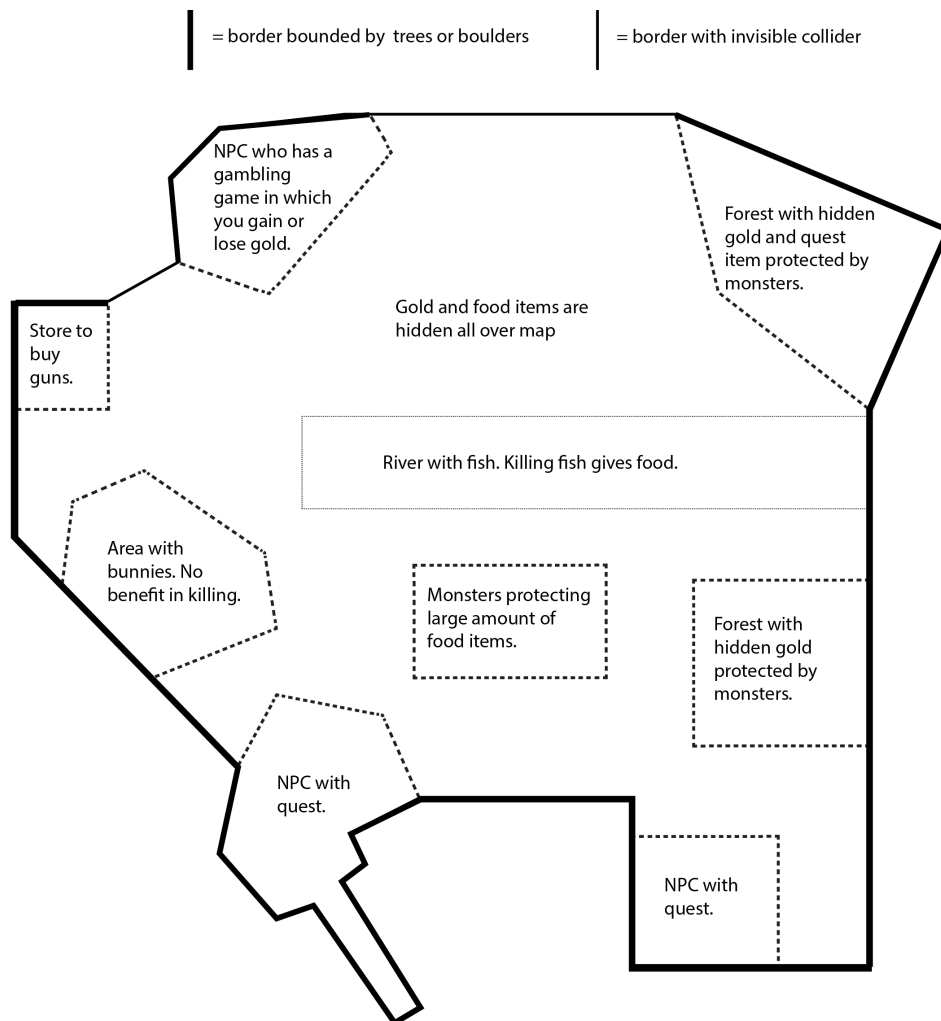
7

Figure 4: Game Map with Action Areas

- **Final Gold Found.** Characteristic: 1, 5, 7

- **Final Food Found.** Characteristic: 1

- **Perimeter Hits (attempts to cross invisible border).** Characteristic: 2

- **Bullets fired.** Characteristic: 6

- **Number of Deaths.** Characteristic: 6, 8

- **Number of Heals.** Characteristic: 8

- **Times hit by Monsters.** Characteristic: 6, 8

- **Distance moved.** Characteristic: 2

- **Total Food Amount.** Characteristic: 2

- **Total Gold Amount.** Characteristic: 2

- **Rabbits killed.** Characteristic: 6

- **Monsters killed.** Characteristic: 6, 8

- **Quests Completed.** Characteristic: 1, 3

- **Time Bet Increased or Gambled.** Characteristics: 3, 5

- **Time Spent in Store.** Characteristic: 4,7

- **Awards unlocked.** Characteristic: 1

- **Number of food items at the end of the game.** Characteristic: 5

- **Number of coin items at the end of the game.** Characteristic: 5

- **Percent of time health is above 50/100HP.** Characteristics: 1, 7

- **Number of fish killed.** Characteristic: 6

- **Quests taken on.** Characteristic: 1,2,3

- **Quests completed.** Characteristic: 1,2

It is important to note that one player's metrics alone were not intended to be revealing. The intent of designing this game was to create a data collection tool, and later a test, for player behaviour. If a significant number of people played the game, play statistics could be collected for each of them and then the data for all the players could be analyzed. This would allow us to find correlations between different behaviours and cluster large scale behaviour patterns to create new player categories. Iterative playtesting and game redesigning could potentially allow for the addition of more useful game metrics, as unanticipated player behaviours are noticed.

4 Results

Due to the scope of the proposed idea, this project is intended to be pilot for our idea, rather than a final implementation of a categorization tool. We wanted to see if a game could be designed as a tool to collect useful data about player behaviour to allow further empirical research into types of players, and if a game could eventually be developed that

Figure 5: Game Characters and Objects

itself would be a test of player behaviour. In order to allow for meaningful insights into potential player categories, it would be important to collect data from a very large number of players so that we could cover the full range of player behaviours and motivations and have enough data to cluster behaviour metrics in order to discover player types. But for our pilot research, we only recruited a small sample of four participants to play the game. Their play statistics are shown in Table 6. We also observed players as they played and got feedback during gameplay - this qualitative information was used as tentative validation of our ideas, and to prompt further research questions for future iterations of the game.

4.1 Observations on Play Style

P1 played the game methodically, proceeding through the game methodically and exploring the world one area at a time. They focused on collecting hidden items, and didn't shoot their gun at all until they encountered monsters. They were careful to avoid aggroing the monsters, and never lost any health. This cautious play style is reflecting in their stats - they were the only player to never die and to never get hit. They also

Variable Measured	P1	P2	P3	P4
Final Gold Amount	184	2	20	6
Final Food Amount	42	32	34	4
Perimeter Hits	3	14	1	5
Bullets Fired	219	638	391	429
Number of Deaths	0	1	2	7
Number of Heals	0	0	0	2
Times Hit	0	1	14	50
Distance Moved	14306.56	23331.84	18691.31	20516.97
Total Food Found	30	34	26	31
Total Gold Found	35	51	36	39
Fish Killed	17	24	17	14
Rabbits Killed	0	1	0	21
Monsters Killed	33	33	28	30
Quests Completed	2	3	3	2
Times Bet Increased or Gambled	357	82	42	25
Time Spent in Store	45.61551	27.29803	42.33088	36.65
Awards Collected	5	6	6	3

Figure 6: Player Stats

fired the fewest bullets. They didn't focus very hard on completing game-suggested goals like the achievements or quests. They also spent the most time gambling, in an effort to collect as much money as possible by the end of the game.

P2 was initially recruited to debug the game before completion. Before the game was finished, there was an exploit in one of the quests that allowed the player to hand in the same quest item over and over and still receive a reward. When P2 found this exploit, they spent some time doing this over and over to generate extra income. Including an exploit of this nature was originally proposed during the design phase, to test for players who search for these sorts of bugs in a game. P2 also played the game a second time, after completion. (Note that while this wouldn't be preferable for generating final results, we felt that including more data was preferable for this exploratory project.) P2 also spent time during their second playthrough exploring the boundaries of the game and testing for bugs. This is reflected in the fact that they hit the tested perimeter more than any other player. They were also the only player who actually escaped the map during play - in future iterations of the game more colliders would be added in order to test for this behaviour more thoroughly. They also shot the most bullets, found the most gold, and travelled the farthest of any player - all possible reflections of explorer type behaviour that other players in our study didn't demonstrate. P2 also requested information about lore and character names - this interest in the game world might reflect interest in role play, or greater immersion, but these traits were not tested for. They enjoyed the cat and rabbits as well - this interest in NPC animals was also not reflected in the gathered information.

P3 complained that they were not fond of open ended games, citing Minecraft as an example. They proceeded straight to the first target in their view and only explored new areas once they had finished with the current area. This behaviour was not dissimilar to P1, but was not reflected in the gathered behaviour metrics. They also avoided monsters, only killing them if necessary to fulfill some objective. This behaviour also mirrored P1, but wasn't reflected well in the data collected. These behaviours might relate to a behaviour type not included in Yee's or Bartle's models. When P3 played the gambling game, they attempted to figure out if the game was fair by gambling one coin multiple times. More stats could be collected about the gambling game to measure this exploratory behaviour. While P3 did complete all objectives, they noted that this was largely because they didn't know what else to do. This is not distinguishable from an achievement oriented attitude, like P2 had, in the collected data.

P4 spent more time shooting non-hostile NPCs than other players, as reflected in their play stats. This might reflect a more killer oriented play style. After exploring the whole map, they chose to attack monsters rather than focus on completing quests or getting achievements. They were more careless when attacking monsters than other players, as reflected by their number of deaths. Unlike other players, P4 was less focused on having gold or food by the end of the game.

5 Conclusions & Future Work

The data we gathered with our game definitely seems to reflect player behaviour that mirrors player types developed by Bartle and Yee. In our exploratory work, we did see a correlation between qualitative behaviour and measured statistics, as intended. We also noticed qualitative behaviours that were not reflected in game statistics, but that seemed like potential behaviour types for a new categorization system. With more playtesters, we could collect more statistics and observe more reactions in order to develop a tool that captures more variations in gameplay behaviour. If this tool was developed, it could be a promising way to empirically study player behaviour without requiring players to self report motivations and behaviours.

The main focus of future work in order to develop a more functional tool would be iterating between improvements on the game design and playtesting to spur choices of different metrics to measure. Ideally more players would be included, and we might also wish to collect personal/demographic information or have players self report their in game behaviour and motivations, in order to draw better comparisons with previous work on gamer types.

Even within the current game, more data could be collected in order to better categorize players. Participants were observed engaging in behaviour that differed significantly between one another, but not all of these behaviours were clearly reflected in the measured statistics. Temporal information could also be collected - players took different approaches to exploring the map, for example, which might be reflected in the time taken to get the explorer achievement. This would be an obvious first step for future research.

There are some player types which weren't considered as heavily during the development

of this game. More features could be added to test for escapist behaviour, roleplaying tendencies, or a preference for socializing. Also, while eliminating a level/experience system and fixing game duration removed some confounding factors, these choices also prevented the study of differences between players with respect to these features. These factors could be considered and included in future iterations of the tool.

An alternative approach to the problem of discovering player types via gameplay might be to use existing games to measure player behaviour. A disadvantage of this approach is that researchers would have less fine control over the specifics of the games that are used for testing, but they would be able to spend much less time and energy on development, which could be preferable. Instead they would only need to focus on adding some comparatively small amount of code on top of existing games in order to measure the variables that they wished to test.

Using this approach, or the one taken in this project, machine learning could be applied to discover player types. Huge amounts of data about player behaviour could be collected, and ML techniques could be used to discover which metrics vary in interesting or meaningful ways, and which are less important.

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