



STUDENT SESSION

INFERRING PLAYER PERSONALITY THROUGH GAMEPLAY TELEMETRY IN UNREAL ENGINE

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Abstract:

Gameplay telemetry is tracked by most modern games, and the data provided could be the key to understanding the correlation between in game behaviour and real world preferences. Player motivation has been studied for decades, but the focus has been more on how motivation translates to in game behaviour. The goal of this study is to discover whether the same can be found the other way around, and whether the previously modelled types offer meaningful guidance on how to comprehend the connections between the two. A scaling system was proposed for inferring players' preferences using Unreal Engine with a telemetry plug in that records player actions, locations, and custom events. The prototype is made using trackers with thresholds to map preferences in a small open world game with interactable characters. The prototype illustrated how trackers could help the game adapt to behavioural differences and suggested the potential for inferring preferences. The design shows how thresholds may adapt to player type and improve the trackers' logic. The study revealed the preliminary scoring system for the preference interface, a telemetry based method for mapping player tendencies. The possibility for future research has also been demonstrated.

Keywords:

Telemetry, Player Preferences, Trackers, Adaptive Systems, Player Behaviour.

INTRODUCTION

As the technology improves, the pace of everyday life becomes faster, which is why younger generations are experiencing progressively reduced amounts of time and focus for long form media, such as movies, books, and theatre. These types of media are important because they help people deepen their understanding of complex emotions and situations that they may not have experienced yet, but they are becoming less common. The time and attention span an individual is willing to give long form media has lessened, which is why newer works are oversaturated and leave no time for a person to take the new emotion in, for fear that the attention will be lost, which nullifies the effect they were designed to deliver. Naturally, as technologies and lifestyles evolve, so do media forms. One way media has adapted to newer times is by shortening the length. Social media platforms lead this with massive amounts of short form media, designed to keep the attention of the viewer by adjusting to their way of living.

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On the other hand, viewers' attention can be maintained by actively engaging them in the story, therefore forcing them to be present. This has led to the popularisation of story driven games, where the primary focus is the narrative. These types of games are usually designed to mimic a movie, with the exception that the story cannot progress until the player makes decisions, making them a crucial part of the narrative.

The balance between how many decisions are needed for a player to feel involved, and how many will cause the story to be overshadowed by action, differs for most people. Adaptive game design allows players to choose the balance that is most comfortable for them. This is usually done by creating multiple levels of difficulty, ranging from easy, with very few decisions that do not have a significant impact, to hard, where decisions are more common and affect more of the outcome of the story, which often demands more skill and more difficult fights. It is natural to assume that the adaptation does not need to stop there; with advanced technologies, it is highly likely that the experience can be personalised further, in order to deepen the impact and immersion in the game. The hypothesis has been made that, through players' actions alone, the game can be dynamically tailored to the specific person. It has been decided that the hypothesis will be tested by developing a game that will dynamically customise itself to the individual player, without being too invasive, using mostly telemetry. Most modern video games collect data on user behaviour, hardware performance, and game usage, typically to debug crashes or balance gameplay, but it is believed that the data gathered can point to player preferences in tempo, the depth they are willing to explore, and some superficial preferences, such as colour and affinity for certain hobbies. The game will be developed to follow the player: an exploratory, story driven game, with triggers and game progressions depending strictly on play. Furthermore, to personalise the game to the player even more, some of the main character's characteristics will change throughout the game to match the personality of the player. Predictions of player types will mostly use research findings from the work of Bartle's Taxonomy, Yee's Motivations, and the HEXAD model, the most popular frameworks used to understand user motivations and player types, with additional assumptions. The goal of this study is to gain a better understanding of players, their motives, and the impacts that personalisation has on the narrative of story based games. The findings will be described in the future work.

2. RELATED WORKS

There have been many studies that have researched the psychology of a player, as well as what motivates them. These kinds of studies have produced relevant data that helped group different types of players into smaller categories, so their actions can be observed and can point to previously unknown patterns. With findings from previous works taken into consideration, it is believed that gameplay can be tailored to the specific player by identifying their type, strictly by examining the telemetry collected, and adapting the pace and events to match their style while still maintaining the integrity of the game.

Instead of focusing on one model only, this hypothesis unifies the three most common models to ensure that all aspects of a player type are observed and can be appropriately acknowledged. In the next sections, each of the models will be broken down into parts for easier cross reference and comparison.

2.1. BARTLE TAXONOMY OF PLAYER TYPES

Richard Bartle originally described the types of players in multi user dungeons (MUDs); however, the model also applies to single player games. He identified four things people tend to enjoy personally about games:

- achievement within the game context
- exploration of the game
- socialising with others
- imposition upon others

He later abbreviated these categories into four types that can also be represented with suits in a conventional pack of cards: achievers (diamonds), explorers (spades), socialisers (hearts), and killers (clubs). Bartle suggests that these areas overlap and that players usually drift between all four, but many (if not most) have a primary style. His model is based on players' motivation, from which he derived some of their behaviours. He goes on to explain how each of the types behaves and their views of other types, although for this study, only their outlook on the game and its goals affects the research [1].



2.2. YEE'S MOTIVATIONS

Nick Yee [2] went further. Rather than categorising players solely by their goal in the game, he focused on the correlation between age, gender, usage patterns, and in game behaviours. For this study, a factor analytic approach was used to create a model of player motivations and revealed ten motivation subcomponents that grouped into three overarching components [2].

As shown in Table 1, Nick Yee has observed that the ten most prominent motivators are the desires to gain power and progress rapidly, to understand the underlying rules and systems, to challenge and compete, to help and chat with others, to form long term and meaningful relationships, to be part of a group effort, to find and know things others do not, to create a complex character, to customise the character, or to avoid real life problems. These components were grouped into three overarching categories.

Yee explains that within these components, male players scored higher on all achievement components, while female players scored higher on relationship components. Although these results seem to confirm stereotypical assumptions, the variation in the achievement component is better explained by age than by gender. He further explains that even though there is a gender difference in the relationship subcomponent, there is no difference in the socialising subcomponent, which suggests that both groups socialise equally, but seek different things in those relationships.

2.3. HEXAD MODEL

Like Yee, Andrzej Marczewski [3] also based his model on previous studies but combined it with adaptations of the Myers–Briggs Type Indicator (MBTI) and other psychometric models, such as the Demographic Game Design model and its second version. In The Gamification User Types Hexad Scale [3, 4], Malczewski's work has been further reinforced and tested.

The theoretical background for the Hexad model was based on Self Determination Theory (SDT), which suggests that motivation can be located within a range of grades of internalisation. Simply put, motivation can be intrinsic, meaning that the task itself is viewed as enjoyable, or extrinsic, where factors outside of the task are viewed as enjoyable. Thus, these distinct motivating factors are expressed through the Hexad user types.

Another common way to analyse personalities is via the Big Five, the five factor model of personality, which is used to add a more psychological aspect to the categories. Most previous models observed players only for their in game behaviour and did not consider personality types that could be influencing that behaviour. By combining previous models, the Hexad model differentiates Philanthropists, Socialisers, Free Spirits, Achievers, Players, and Disruptors. Each of them is driven by a different motivator: purpose, relatedness, autonomy, competence, rewards, and change, respectively.

This model has been tested and has revealed that, of those who have taken the HEXAD test, 47% of people cannot be assigned to a single dominant type; the scores typically tie across two or more orientations. It has also been found that the rarest type by far is the Disruptor, with 1.6%, while Philanthropists, Achievers, and Free Spirits all lie around 22% and are the most common types.

3. METHODOLOGY

The game used to test the hypothesis will be developed in the Unreal Engine 5 environment, using the GamecanTeams telemetry plug-in [5], which allows the recording of player state, such as location, rotation, and player ID, but can also record custom events, environmental triggers, and heatmaps. These recordings will be used to determine players' types by cross referencing them with the previously mentioned models. The results obtained will then be compared to the assumptions made here.

Table 1. Subcomponents revealed by the factor analysis grouped by the main component they fall under

Achievement	Social	Immersion
Advancement	Socializing	Discovery
Mechanics	Relationship	Role-Playing
Competition	Teamwork	Customization
		Escapism



It is relevant to mention that the goal of this study lies primarily in the connection between model types and in game behaviour, in order to deduce some of the real world tendencies and preferences from said behaviour. The term *real world* will be used to describe aspects of players' social identity outside of the game.

3.1. GAMEPLAY

The narrative of the game follows a lost and disorientated player who moves through this carefully structured world in the hope of remembering who they are. While navigating this unfamiliar environment, they will have to get by either by skilfully avoiding wandering eyes or by honestly asking for help, and as they begin to find their footing, they will notice that the world around them becomes increasingly familiar, in an almost unsettling way, where things may change in front of their eyes, until one thing becomes clear: everything is not as it used to be. The emotional backstory is set in a dementia village, whose layout and components are designed to mimic, while adaptive personality inferring paints a personalised picture of the familiar confusion that can be caused by such an illness.

To support the idea of identifying players' preferences, and to subtly imply that their choices will matter, the game will indicate that its objective is for players to discover who they really are. The player begins their journey in their room, where hints of memory loss will be presented, and the player will be instructed to find out as much as possible about themselves. From that point on, players will have the freedom to explore the small open world in whichever way they choose, interact with non playable characters, or simply explore the environment. Unfortunately, for this hypothesis, some player types would skew the results by exploring every branch and interacting with every interactable object; whether they are referred to as explorers in Bartle's model or as the discovery subcomponent in Yee's model, their playing style would lead to false results. Thus, to counteract this issue, players will be limited by time. This way, they will be forced to choose carefully which pathways and objects genuinely hold their attention.

The world consists of one street with six parcels: the main house, shopping square, playground, neighbourhood, park, and hospital, shown clockwise in Figure 1. Each of them will contain interactable objects and storylines that players are free to explore. To give the player the feeling of a larger space, the layout will be quite circular, with a few alleys and shortcuts to add depth to this otherwise simple world, along with a path that goes around the entire area. The blueprint is shown in Figure 1.

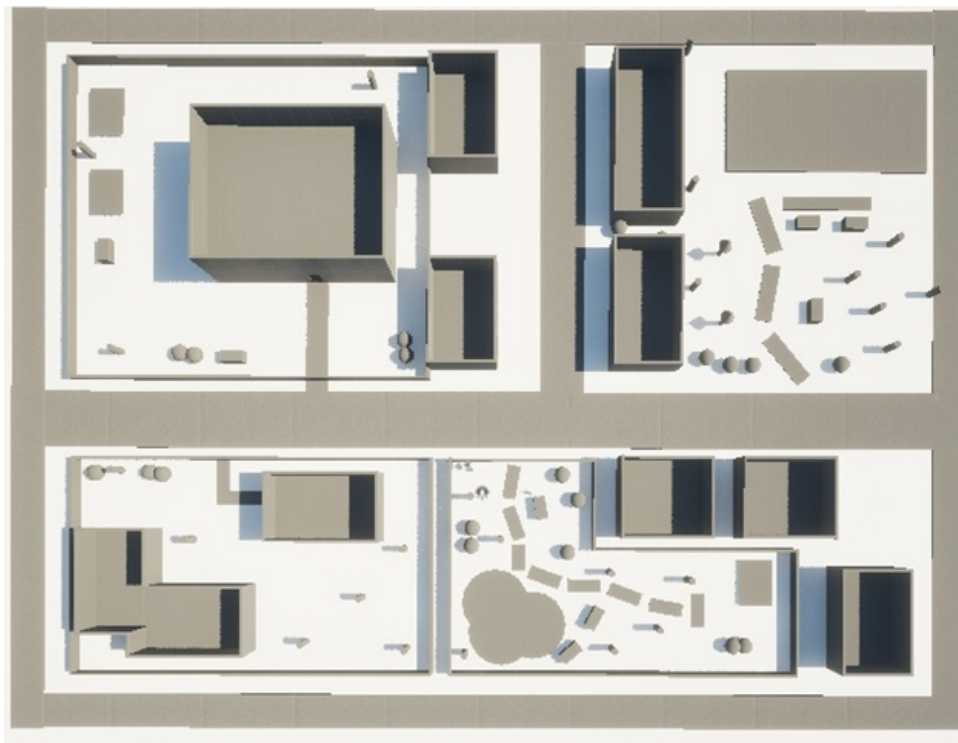


Figure 1. Blueprint of the open world



In Figure 1, the layout of the world is shown, with the main street dividing the area horizontally. The main house is located in the top left corner, and it is also the only building in the game with two floors. The house is modelled on a conventional two level layout, with shared areas such as the kitchen and living room on the ground floor, and bedrooms on the upper floor. The shopping square contains a regular market, a coffee shop, a library, and a general merchandise store, while the playground features several playground essentials and a volleyball court. The park is located between the hospital and the neighbourhood and is designed to feel like a nature retreat, with various greenery and a lake. The layout is designed to complement the emotional story. Each location will contain multiple interactable objects.

3.2. PERSONALITY INFERRING

Each interaction will be scored across one or multiple preference counters. It was previously established that people are quite complex and do not have only one sphere of interest, but more often have one or more main interests and a few casual ones. With counter based preferences, the player is not confined to a single interest. Some of the personality indicators will be shown through interest in sport, books, art, technology, travel, etc. Alongside these counter based traits, there will be some preferences that will be revealed in more clear cut situations, where once the trigger is hit, the one time reaction will be recorded; for example, cat versus dog person, with two additional states: animal lover and non interested. A combination of one time decisions and repeated choices will be the main method for drawing conclusions about one's personality.

It was previously mentioned that there will be six parcels that the player can visit, and each of them will contain interactors for most, if not all, of the preferences mentioned, although the logical ones will be favoured. For example, there will be significantly more books and art in indoor spaces, such as the library or the main house, and consequently, more sports in the park or playground. With that in mind, not only will interactions be monitored. Time spent in certain places will also be considered as an indicator of preferences, but also as an indicator of the pace that is right for the player. Players who spend more time in a single location and interact more slowly with the environment will have higher score changes per interaction, to balance the players who will try to speed run through the world and therefore have a higher number of interactions, even with objects that are of lesser interest to them.

3.3. SCORING PROTOTYPE

The scoring system will be described in this section. It is worth noting that the proposed system may differ from the one that will be implemented due to new realisations. At this time, there are three counter types for player traits, divided by the manner in which they track the specific trait. Time based trackers are designed to track time spent in certain areas; preliminary proposed indicators include total time spent inside, outside, and on each of the parcels. The second type consists of trackers that have polar opposites—sliders. Each tracker has two traits that cancel each other out, such as talker versus reserved, or slow versus fast progress. The third and final tracker type consists of individual trackers that track traits whose scores do not conflict with others. In this category, there are currently eight proposed trait trackers: affinity for books, sports, movies, technology, travel, games, art, and languages. These traits do not cancel each other out, even though some are more closely connected, such as travel and languages; it is still not uncommon to see someone who enjoys both books and sports. In this paper, the word *tracker* is used to describe trait mapping over a period of time, which is why the previously mentioned one time decisions were not included in the types of trackers.

Using telemetry from the game filtered through model types, it is justifiable to conclude that players' real world preferences can be inferred. Thus, assumptions were made that by determining the player type, it is possible to accurately determine player preferences. Trackers will be used to indicate two things: the closest player type and their preferences. For the scoring prototype developed here, Yee's overarching components are used as the first indicator. It would be naïve to presume that players led by Achievement, Social, or Immersion motivations would have the same playing style or speed, and therefore the same number of interactions. Thus, three different threshold systems will be used. It is relevant to note that the results for determining the overarching components may not be accurate and will change throughout the game. Since the archetypes will be needed from the beginning, it was decided that three triggers will be used as preliminary allocations, all of which will be located within the starting room. It is also noteworthy that different archetypes will mostly differ in thresholds, with Immersion having the highest threshold and Social the lowest; therefore, if none of the triggers are activated, the preliminary type will be Social. Since in this case the archetypes are used for their playing speed, they will in no way affect the preferences and traits of the player.



Traits will be inferred through the previously mentioned counter trackers. Some will be straightforward: when interacting with a book, the book counter will increase. Some will be combinations of two: for example, solving a puzzle involving a movie poster and its filming location will increase both the movie and travel counters. Others will be more abstract, such as going in the opposite direction from what was instructed, which would increase the games counter. Not all elements and interactable objects will be visible from the start, although their positions will be predetermined. When the threshold of an independent tracker is reached, the corresponding hidden object will become visible and interactable somewhere in the world. This does not guarantee that the player will interact with it, but it is implemented to maintain balance in the available options, so as not to force players into engaging with objects of lesser interest. The thresholds are also a precautionary measure, since players are likely to interact with objects that are simply visibly interactable, even if the theme has nothing to do with their preferences. It is also significant to note that counters can only increase, while sliders start in the middle and move towards the initiated trait, consequently moving away from the opposite one. Every interaction will be recorded in the player's profile and will be presented in the room where the player started, in the form of decorations and furniture, although some elements may appear throughout the game.

4. CONCLUSION

The idea was to explore whether gameplay telemetry can reflect real world preferences. To test that hypothesis, it was necessary to understand whether there is a significant difference between in game behaviour and real world behaviour. It was acknowledged that if the player type is determined, the style of playing could be used as a key to decipher players' traits and preferences through telemetry alone. The prototype demonstrated how trait trackers work and how they could adapt for each player type while reflecting a well founded player personality. Naturally, there are some limitations to this approach. The limitations presented by the world size and time restrictions might influence players' decisions. There is also a question of accuracy, given that no assumptions were backed up by a psychological model, as well as the lack of validation on a large scale.

With the results of this study, telemetry can be further used to enhance user interfaces for improving user experience and adding a new layer to story based games.

In further development, the goal is to define more traits and to add more complex trackers, while collecting data to possibly design a new model based on long term testing. This could result in valuable data regarding player types and user preferences.

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