

# Towards Disambiguating Quests as a Technical Term

Kristen K. Yu  
kkyu@ualberta.ca  
Alberta Machine Intelligence Institute  
Alberta, Canada  
University of Alberta  
Edmonton, Alberta, Canada

Matthew Guzdial  
guzdial@ualberta.ca  
Alberta Machine Intelligence Institute  
Alberta, Canada  
University of Alberta  
Edmonton, Alberta, Canada

Nathan R. Sturtevant  
nathanst@ualberta.ca  
Alberta Machine Intelligence Institute  
Alberta, Canada  
University of Alberta  
Edmonton, Alberta, Canada

## ABSTRACT

Quests are a popular topic of study in many academic fields. However, literature has not settled on the elements in a quest, much less a specific definition or even debate between two or three definitions. The purpose of this paper is to take a preliminary quest definition from our previous work, and revise it to be more broadly applicable. To inform the revision, we analyze quests from a few published games. Then, we propose a few modifications to the definition which allows it to more fully explain some design patterns in games. Finally, we evaluate our definition against other definitions proposed in past research.

## CCS CONCEPTS

• **Human-centered computing** → **Interaction design theory, concepts and paradigms.**

## KEYWORDS

Video Games, Quests, Quest Theory, Quest Definition

### ACM Reference Format:

Kristen K. Yu, Matthew Guzdial, and Nathan R. Sturtevant. 2021. Towards Disambiguating Quests as a Technical Term. In *The 16th International Conference on the Foundations of Digital Games (FDG) 2021 (FDG'21)*, August 3–6, 2021, Montreal, QC, Canada. ACM, New York, NY, USA, 11 pages. <https://doi.org/10.1145/3472538.3472543>

## 1 INTRODUCTION

The academic community has had interest in video game quests for some time. Quests are most commonly associated with the genre role playing games (RPGs), where the player roleplays as a specific character or creates their own protagonist. In the RPG *Skyrim* [3], quests serve two main purposes: to guide the player through the main story and to provide additional content. These are commonly referred to as main quests and side quests [6] based on whether or not the quest contains main story narrative elements. Another common design pattern for quests is the “daily” or “weekly” quest systems featured in many massively multiplayer online RPGs (MMORPGs). These systems incentivize the player to return to the

game by providing content on a specific schedule. In modern video games, quests are no longer limited to RPGs or their sub-genres, and can be found in many other types of games [2]. Though there are clear design patterns for delivering a quest to a player, the exact meaning of a quest as a gameplay element across genres is less obvious.

Quest research is often associated with interactive narrative research due to the fact that many quests contain narrative elements. As such, quest research shares some of the same challenges as this field. One such challenge is the precise definition of technical terms. In the interactive narrative field, papers employ the terms “plot points” and “plot graph” in different ways [18]. Similarly, the definition of a quest as a technical term is ambiguous. In our previous research, a survey of papers focused on procedurally generating quests identified 16 different quest definitions [22]. If there was a single quest definition, it would facilitate research in several academic areas.

Other areas such as personalization research, interactive narrative research, and general quest theory, have their own quest definitions. Personalization research creates systems that provide the player with a unique experience, and often leverages quests to provide that experience [17, 21]. Interactive narrative research focuses on computationally creating stories, and primarily uses quests as a narrative vehicle [5]. General quest theory is further divided into two parts: literary quest theory and video game quest theory. Video games require their own quest theory because video game quests include player interaction. Literary quests are defined by their narrative context [11]. General video game quest theory emerged through analyzing games for design patterns in quests [1, 6, 7]. All of these disparate contexts lead to even more definitions, and exasperates the issue of a quests as a technical term not having a precise, agreed upon definition in academic literature.

Little is understood about how the video game industry defines a quest. This is largely due to the lack of communication between academic and industry communities. What information that can be learned about the industry is fragmented through blog posts and Youtube videos [14, 16], and the content rarely contains explicit quest definitions. Thus, it is unlikely that even the video game industry has come to a consensus on the definition of a quest. This idea is supported through anecdotal conversations with our colleagues who work in the industry.

The purpose of this paper is to propose a general quest definition for use in academic and industrial settings. A general quest definition provides value in three main ways. The first is to help establish a common language for academics (and eventually industry professionals) to talk about quests as a technical term. Quests for use in technical research should have at least one agreed upon definition

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than the author(s) must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from [permissions@acm.org](mailto:permissions@acm.org).

FDG'21, August 3–6, 2021, Montreal, QC, Canada

© 2021 Copyright held by the owner/author(s). Publication rights licensed to ACM.

ACM ISBN 978-1-4503-8422-3/21/08...\$15.00

<https://doi.org/10.1145/3472538.3472543>

so that academics can precisely understand the research starting from the same knowledge base. For example, if one researcher produces a quest generator where the generated quests do not include a reward for the player, a second researcher whose definition of a quest does contain a reward might consider the original research to be flawed, even if the generation technique is novel. The second way a general quest definition provides value is the applicability of the quest definition to several genres of video games. This would allow us to compare quests from different genres, and have broader and more innovative uses of quests. Last, a general quest definition is applicable to several areas of research. This encourages collaboration between the fields, supports a methodical exploration of quest usage, allows for critique, and inspires new ways of using quests.

A general quest definition can be applied in many ways. One of these applications is for use as the basis of procedural quest generation. If multiple generation techniques generate quests based on the same quest definition, then we can more easily compare the research. A general quest definition can also be used in personalization research, so that those researchers don't have to worry about defining a quest and instead can focus on the problem of providing quests to players. Another application could be designing quests, to help designers who change companies more quickly learn how their new company's definition of a quest differs from the general one.

This paper builds off of our previous work [22], where we originally proposed our quest definition. Section 2 is a discussion of the origins of the definition and the specific elements that comprise the definition. To understand its limitations, we analyze the quests in a few games using our definition in Section 3. From this analysis, we found that the definition was unable to explain some key ideas and Section 4 shows the modifications that were made to help cover this gap. Finally, Section 5 covers a comparison of the proposed quest definition to a few other published definitions to illustrate how accurately the quest definitions can explain particular quests in published games. This paper consists of on-going research and we do not intend the quest definition proposed here to be a final one. Instead, we show some enhancements that greatly increase the number of games that this quest definition can accurately explain. We end this paper with a discussion of the limitations the modified quest definition still has, and planned future work to address those limitations in Section 6.

## 2 QUEST DEFINITION

In our previous research, we built a general quest definition by analyzing 16 different quest definitions. The common elements of 'tasks, actions and goals', 'reward and progression', 'ordering', 'narrative, and 'player' combined to form the following definition:

$$Q = \langle T, \leq, R \rangle \quad (1)$$

Where  $T$  is the set of tasks to be completed,  $\leq$  is the partial ordering applied to  $T$ , and  $R$  is the rewards given to the player when they complete the quest. Tasks are the individual steps of a quest that the player need to complete. A partial ordering allows the player to complete these tasks in a variety of different orders. In this definition, we more precisely define rewards as the commonly

thought of money and in-game items, as well as progression and narrative elements. Progression elements are elements in the game that progress the player in some way, such as the ability to access the next level, and a narrative element could be a cutscene the occurs after the player completes the quest.

Fully defining a task is unique to this quest definition. We specifically defined a task  $t$  in order to gain a clearer understanding of when a task is completed, what aspects of the game help a player complete a task, and the rewards that are given to the player when they complete an individual task. We define  $t \in T$  as follows:

$$t = \langle C, M, I, R_t \rangle \quad (2)$$

Where  $C$  is the condition that must become true in order for the task to be completed,  $M$  is the system that monitors the sub-section of the game where  $C$  could become true,  $I$  is the presentation of the task, and  $R_t$  is the reward for the task. The presentation  $I$  refers to the part of the video game shown to the player to help them complete the task, such as a text description of what the player needs to do or a marker on a map.  $I$  can also include narrative context for the quest, such as a text description explaining why an NPC wants a particular in-game item.  $R_t \subseteq R$  is the reward that is given to the player when the player completes the task.

We proposed elements  $C$ ,  $M$ , and  $I$  as part of the definition of a task in our previous work, as an addition to the common elements found in the other quest definitions. We included these as a way to provide additional context to what, how, and why a player might be engaged with the task.

The last common element is the idea of player, and is not explicitly written as part of the equations in the quest definition. It is assumed that quests are specifically assigned to a single player, and not to non player characters (NPCs) or game playing artificial intelligence (AI).

Quests as a gameplay element are one way that a designer guides a player through a game. Generally, these quests also gate content with specific start and stop points, such that the player consumes this content at a specific pace. In genres that are not RPGs, we consider quests to be gameplay elements that guide the player through specific parts of the game. In a platformer, a quest is the completion of a single level. Similarly, a quest in a puzzle game would be the completion of a single puzzle.

## 3 GAME ANALYSIS

In this paper, we provide a deeper analysis of our quest definition. Since proposing our original definition, we analyzed six games to help understand its strengths and weaknesses.

We include the analysis of three out of six game here to test the limitations of our original quest definition. These games were selected because they pushed the boundaries for how well our quest definition could explain the quests in the game. After completing this analysis, we will propose an improved definition in Section 4.

### 3.1 Portal 2

Portal 2 [20] is a three-dimensional puzzle game where the player can create portals to allow them to access different parts of the level. Each portal is a part of a pair, and if the player places both of the portals of the pair in the level, then the player or other gameplay

objects can pass between the portals. We analyze the two player mode of Portal 2 instead of the single player mode due the increased complexity of the quests in the two player mode. In this mode, each player controls a single avatar and a pair of portals. The levels are designed around two players with two sets of portals, and both players must reach the end of the level to complete it.

In Portal 2, we consider a quest to be the completion of a puzzle as the game is not an RPG. A single level contains a puzzle, so the quest is to complete the level. We analyze the first level as a quest. We illustrate the approximate layout of this level in Figure 1. We annotated the layout with labels for ease of discussion. “Door 1” is where the players start, indicated by an up arrow. “Door 4” is the area that the players are trying to get to in order to complete the level, indicated by a left arrow. These doors are unlocked and can be opened by either player at any time. Dotted red lines indicate “Button 2” opens “Door 2”, and “Button 1” opens “Door 3”. These lines are also represented in the game. A glass wall separates “Room 1” from “Room 3”, so the players can see where they need to go to finish the level, which we indicated by a dotted line. An opaque wall separates “Room 2” from the rest of the level, indicated by a straight line. Portals can only be placed in the specific areas in “Room 2” and “Room 3”, indicated by gray boxes. Lastly, we simplified the starting and ending areas because they are not a part of the puzzle. In the game, there is a short hallway that leads to “Door 1” and the start of the puzzle, and there is also a short hallway that leads out of “Door 4” and into the level completion area. In the level completion area, both players need to stand in their designated area to complete the level.

**3.1.1 Quest Definition Application.** The quest to complete the first level can be defined as  $Q = \langle T, \leq, R \rangle$ .  $T = \{t_1, t_2, t_3, t_4, t_5, t_6, t_7, t_8, t_9, t_{10}, t_{11}\}$ , which includes the steps that need to be taken in order to solve the puzzle, shown in Figure 1. The level is broken down into many tasks because this puzzle requires a very specific ordering of actions in order to solve. Since there are two players, they are labeled player 1 and player 2. These labels are not strict, and simply denote that one player needs to complete some specific tasks, and the other player needs to complete other tasks in order to finish the quest. The player can complete this level in more than one way, so these tasks show one possible way to solve level 1. The ordering for the first tasks is  $t_1 < t_2 < t_3 < t_4, t_5 < t_6 < t_7$ . The order for the last tasks is less strict, where the only requirement is that  $t_8$  must be completed before  $t_{10}$ , and  $t_9$  must be completed before  $t_{11}$ . Both  $t_{10}$  and  $t_{11}$  must be completed in order to finish the quest. The reward  $R$  contains the ability to access room 2, the ability to access room 3, and the ability to go to the next level.

Figure 1 shows the flow of tasks that must be followed in order to complete level 1. The blue diamond denotes player 1, and the orange diamond denotes player 2.

$t_1 = \langle C, M, I, R_{t_1} \rangle$  is player 1 stepping on “Button 2”.  $C$  is the condition that becomes true when player 1 activates “Button 2” and  $M$  is the monitoring system that tracks the state of “Button 2”.  $I$  is the presentation of the first part of this level, where both players can see that they need to get into “Room 3” to finish the level.  $I$  also includes the line that indicates pressing “Button 2” will open “Door 2”.  $R_{t_1}$  is the ability to access “Room 2”.

$t_2 = \langle C, M, I, R_{t_2} \rangle$  is player 2 entering “Room 2”.  $C$  is the condition that becomes true when player 2 walks through “Door 2”, and  $M$  is the monitoring system that tracks the location of player 2.  $I$  is the presentation of the newly open door which allows access into “Room 2”.  $R_{t_2}$  is empty.

$t_3 = \langle C, M, I, R_{t_3} \rangle$  is player 1 stepping on button 1.  $C$  is the condition that becomes true when player 1 activates “Button 1”, and  $M$  is the monitoring system that tracks the state of “Button 1”.  $I$  is the presentation of the line that connects “Button 1” to “Door 3”, as well as the knowledge of player 2 in “Room 2”.  $R_{t_3}$  is access to “Room 3”.

Tasks  $t_4$  and  $t_5$  can be completed in order.  $t_4 = \langle C, M, I, R_{t_4} \rangle$  is player 2 placing a portal in “Portal Area 2”.  $C$  is the condition that becomes true when one of the pair of portals is placed in “Portal Area 2”. The portal should be the opposite portal that is or will be placed in “Portal Area 1”, otherwise  $C$  will remain false.  $M$  is the monitoring system that checks “Portal Area 2 for portals”.  $I$  is the presentation of “Portal Area 2” in “Room 3”.  $R_{t_4}$  is empty if  $t_4$  is completed before  $t_5$ , otherwise  $R_{t_4}$  is access to “Room 3”.

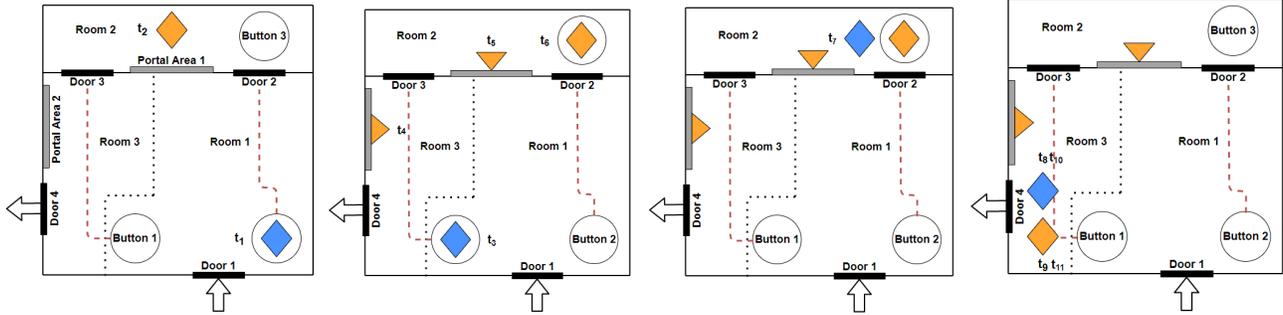
$t_5 = \langle C, M, I, R_{t_5} \rangle$  is player 2 placing the matching portal in “Portal Area 1”.  $C$  is the condition that becomes true when one of the pair of portals is placed in “Portal Area 1”. The portal should be the opposite portal that is or will be placed in “Portal Area 2”, otherwise  $C$  will remain false.  $M$  is the monitoring system that checks “Portal Area 1”.  $I$  is the presentation of “Portal Area 1” in “Room 2”.  $R_{t_5}$  is empty if  $t_5$  is completed before  $t_4$ , otherwise  $R_{t_5}$  is access to “Room 3”.

$t_6$  can be started after  $t_4$  and  $t_5$  have been completed.  $t_6 = \langle C, M, I, R_{t_6} \rangle$  is player 2 activating “Button 3”.  $C$  is the condition that becomes true when player 1 presses “Button 3”, and  $M$  is the monitoring system that checks whether “Button 3 has been pressed”.  $I$  is the presentation of the line that connects “Button 3” to “Door 2”.  $R_{t_6}$  is access to “Room 2”.

$t_7 = \langle C, M, I, R_{t_7} \rangle$  is player 1 entering “Room 2”.  $C$  is the condition that becomes true when player 1 enters “Room 2”, and  $M$  is the monitoring system that checks the location of player 1.  $I$  is the presentation of the open door leading to “Room 2”.  $R_{t_7}$  is empty.

Tasks  $t_8$  and  $t_9$  are the tasks of player 1 and player 2 using portals to enter “Room 3”. They are identical except for the player that is completing the task, so for simplicity we only define  $t_8$ , which is player 1 completing the task.  $t_8 = \langle C, M, I, R_{t_8} \rangle$  where  $C$  is the condition that becomes true when player 1 enters “Room 3”, and  $M$  is the system that monitors the location of player 1.  $I$  is the presentation of the portal connecting “Room 2” to “Room 3”, and closed “Door 3”. If  $t_9$  is completed before  $t_8$ , then there is the additional presentation of player 2 being in “Room 3”. If  $t_9$  and  $t_{11}$  are completed before  $t_8$ , then there is the additional presentation of player 2 being in the designated area to complete the level.  $R_{t_8}$  is empty.

Tasks  $t_{10}$  and  $t_{11}$  are the tasks of player 1 and player 2 exiting the level using “Door 4”, and entering their respective areas to complete the level. They are identical except for the player that is completing the task, so for simplicity we only define  $t_{10}$ , which is player 1 completing the task.  $t_{10} = \langle C, M, I, R_{t_{10}} \rangle$  is player 1 exiting the level using “Door 4”, and entering the appropriate area to complete the level.  $C$  is the condition that becomes true when player 1 enters the designated area to complete the level, and  $M$  is the system



**Figure 1: From left to right: The ordering of the tasks players need to complete to finish the puzzle in level 1. Players are denoted as diamonds in the map which refer to the approximate location that the player needs to be in in order to complete each task. Portals are marked as triangles, where the color of the triangle matches the color of the player if the portals belong to that player. The direction of the triangle shows which half of the pair the portal is a part of.**

that monitors the location of player 1.  $I$  is the presentation of the designated areas that are in the room past “Door 4”. If  $t_{11}$  is completed before  $t_{10}$ , then there is additional presentation of player 2 being in the designated area to complete the level.  $R_{t_{10}}$  is empty if  $t_{10}$  is completed before  $t_{11}$ , but if  $t_{11}$  is completed before  $t_{10}$  then  $R_{t_{10}}$  is access to the next level.

**3.1.2 Quest Definition Limitations.** Our original quest definition fails to explain two features of the quest. The first issue is the use of two different players. The definition appears to be able to accommodate two players because players are not a part of any tuple that is used to define a quest. However, the definition assumes that a quest can only be given to one player, so it cannot handle a multiplayer setting. We will show how to address multiplayer quests in Section 4.

The second limitation is the concurrency of the two players. The quest definition treats each task as if it has a discrete beginning and end. However, due to the possibility of simultaneous movement between players in Portal 2, this assumption does not hold. Consider tasks  $t_8, t_9, t_{10}$ , and  $t_{11}$ . In reality, the tasks for player 1,  $t_8$  and  $t_{10}$  can be completed simultaneously to the tasks for player 2,  $t_9$  and  $t_{11}$ . This would mean that both players are using the portals to enter “Room 3”, and both players are entering the designated areas at the same time. This kind of behavior is more similar to how real players would play the game, instead of having player one completing tasks  $t_8$  and  $t_{10}$ , and then player 2 completing tasks  $t_9$  and  $t_{11}$ . We address this issue in Section 6.

### 3.2 Monster Hunter: World

Monster Hunter: World [4] is an action RPG where the goal is to fight fantastical monsters on a jungle island. In order to fight these monsters, players must go on quests. Players can play by themselves, or with a party of up to four people. Figure 2 shows the quest book that the player uses to select quests to fight monsters. After a player defeats a monster, there is a 30 second window in which players can complete additional actions such as picking up items in the world or carving the monster. When the timer is finished, the player returns to the village and receives rewards.



**Figure 2: Screenshot of Monster Hunter World which shows the presentation of “The Eater of Elders” quest**

**3.2.1 Quest Framework Application.** We analyzed the quest “The Eater of Elders”. This quest can be defined as  $Q = \langle T, \leq, R \rangle$ .  $T = \{t_1, t_2, t_3, t_4, t_5, t_6, t_7, t_8, t_9, t_{10}\}$  where  $t_1$  is the optional task of breaking the left horn,  $t_2$  is the optional task of breaking the right horn,  $t_3$  is the task to slay a Nergigante,  $t_4$  and  $t_5$  are the failure conditions, and  $t_6 - t_9$  are the optional tasks to carve the Nergigante, and  $t_{10}$  is the task of waiting out the 30 second timer. These tasks represent one possible way to finish this quest. Since there are optional tasks, we treat this as the situation where the player completes all of the optional tasks. The ordering of the first few tasks are  $t_1, t_2 < t_3 < t_4 < t_5$ , and tasks  $t_6 - t_9$  can be completed in any order after  $t_5$ , and  $t_{10}$  is the last task that needs to be completed.  $R$  contains 18,000 in-game currency called “Z”, a randomized set of rewards for completing the quest, and a randomized set of rewards for defeating the monster. If the player completed any of the optional tasks, they gain the optional randomized rewards from breaking one horn, breaking two horns, and from carving the monster. Since there are additional tasks which determine whether the quest fails or not, we also include the not failing the quest as a reward.

Tasks  $t_1$  and  $t_2$  are identical, except that they refer to the left and right horn respectively. For simplicity, we only fully specify one task.  $t_1 = \langle C, M, I, R_{t_1} \rangle$ , where  $C$  is the condition that becomes true

when the left horn is broken, and  $M$  is the system that monitors whether a horn is broken.  $I$  is the presentation of the monster, and if  $t_2$  is completed before  $t_1$  the model will update to show a broken right horn. Otherwise, both horns will not be broken.  $R_{t_1}$  is the ability to receive the rewards for breaking one horn if  $t_1$  is completed before  $t_2$ , or is the ability to receive the rewards for breaking two horns if  $t_2$  is completed before  $t_1$ . The reward  $R_{t_1}$  is empty, because the reward for completing this is not given to the player at this time.

$t_3 = \langle C, M, I, R_{t_3} \rangle$ , where  $C$  is the condition that becomes true when the Nergigante has been killed, and  $M$  is the monitoring system that checks the status of the Nergigante.  $I$  is the presentation that is shown in 2. There is a quest book which includes the name of the quest and number of stars to indicate difficulty on the top left. In the bottom left it includes the “type” of quest that is offered to the player, a description of the task that needs to be completed “slay Nergigante”, the description of the 18,000z reward, as well as a time limit restriction on the quest. On the top right, there is map which shows the area that the Nergigante spawns in. The middle right shows the level that the player must be at in order to start the quest, the failure requirements, and the other possible monsters that will be present in the quest. The bottom right includes a narrative description which provides motivation for why the player would want to complete the quest.  $R_{t_3}$  is empty because the rewards are not given to the player when this task is completed.

$t_4$  and  $t_5$  are the tasks to account for the failure conditions, which are completing  $t_3$  in less than 50 minutes and dying less than 3 times.  $t_4 = \langle C, M, I, R_{t_4} \rangle$ , where  $C$  is the condition that becomes true if the timer is not at 50 minutes when  $t_3$  is completed, and  $M$  is a system that monitors the time.  $I$  is the presentation of the time limit restriction in the quest book.  $R_{t_4}$  is not failing the quest.  $t_5 = \langle C, M, I, R_{t_5} \rangle$ , where  $C$  is the condition that becomes true if the player has not died three times when  $t_3$  is completed, and  $M$  is the system that tracks how many times the player has died.  $I$  is the presentation of the number of deaths restriction in the quest book.  $R_{t_5}$  is not failing the quest.

Tasks  $t_6 - t_9$  are all identical, so only one is explicitly defined.  $t_6 = \langle C, M, I, R_{t_6} \rangle$ , where  $C$  is the condition that becomes true when the player has carved the Nergigante,  $M$  is the system that monitors whether the Nergigante has been carved.  $I$  is the presentation of the dead Nergigante, and  $R_{t_6}$  is the rewards that can be gained from carving.

$t_{10} = \langle C, M, I, R_{t_{10}} \rangle$ , where  $C$  is the condition that becomes true when the 30 second timer is over, and  $M$  is the monitoring system that tracks how much time has passed. The presentation  $I$  is a timer that counts down from 30 seconds.  $R_{t_{10}}$  contains the rewards from slaying the Nergigante and the quest rewards. Additionally, if  $t_1$  or  $t_2$  is completed,  $R_{t_{10}}$  will include the rewards for breaking one horn. If both  $t_1$  and  $t_2$  are completed,  $R_{t_{1-0}}$  will include the rewards for breaking two horns.

**3.2.2 Quest Definition Limitations.** The current quest definition has five main areas where the limitations of the definition do not fully accommodate the quest in Monster Hunter World. The first of these is the idea of randomized rewards. In the current definition, it is assumed that all of the rewards will be given to the player, however in Monster Hunter World most of the rewards are randomly

selected based on probabilities. For example, the quest rewards distributed to the player are based on the following probability distribution: High Commendation: 100%, with a 1% chance to get an additional one, Elder Dragon Bone 24%, Elder Dragon Blood 18%, Mysterious Feystone 18%, Advanced Armor Sphere x2 16%, Dragonvein Crystal x2 15%, and DreamCore Ore 8% [9]. It is impossible for the player to receive every single item from completing the quest a single time. The defeated monster reward, breaking horn rewards, and carve rewards are similarly distributed. These distributions also change between difficulty levels, rewarding the player with higher chances for better items at higher difficulty settings.

Second, there is the idea of optional rewards. If the player plays with a high level of skill, they will gain an optional reward. In the case of the Nergigante, if the player is able to break the Nergigante’s Horn, then the rewards of slaying the monster will also include Nergigante Horn+ with probability 66%, or Nergigante Regrowth plate x2 with probability 34% [10].

The third limitation is the idea of a party. If a player is in a party with one friend, and their friend is the one to defeat the Nergigante, then the player still gains the rewards from the quest. Because the quest definition restricts the quest to a single player, it has limited applicability in multiplayer settings. All three of these limitations will be addressed in the modification section, section 4.

The fourth limitation is the issue of concurrent tasks. When the player slays the Nergigante, the 30 second timer for the last task immediately starts. The player is only allowed to complete carving tasks in this window of time. Thus, the optional carving tasks of  $t_6 - t_9$  are being completed at the same time as  $t_{10}$ . Additionally, the failure criteria tasks  $t_4$  and  $t_5$  are being simultaneously completed as  $t_3$ . The issue of concurrency is discussed in section 6.

The last limitation is how our quest definition handles the failure criteria. In the game, if the timer reaches 50 minutes and the player has not slain the Nergigante yet, then the quest will be automatically failed. This quest definition models it as if there is a single check done when the player completes  $t_3$ . This is a small discrepancy between how the definition models failure and how the game treats the failure criteria.

### 3.3 Rocket League

Rocket League [12] is a sports game where the players control cars to play a game similar to soccer. There are goals on each side of the field, and a single ball which the players shoot into the opponent’s goal in order to score points. The game allocates players into teams of either one, two, three, or four, and a match lasts five minutes. At the end of five minutes, the team with the most points wins. In the case of a tie the game goes into overtime, where the first team to score a goal wins the match.

**3.3.1 Quest Definition Application.** We analyze the quest to “Win 5 Online Matches”. This quest can be defined as  $Q = \langle T, \leq, R \rangle$ .  $T = \{t_1, t_2, t_3, t_4, t_5, t_6\}$ , where all of the tasks  $t_1$  through  $t_5$  are to win an online match, and  $t_6$  is the task to claim the reward. Tasks  $t_1, t_2, t_3, t_4$ , and  $t_5$  can be completed in any order, and  $t_6$  has to be the last task that is completed.  $R$  is experience points and a random cosmetic item.

Figure 3 illustrates all of the components necessary to understand the presentation of the quest to the player. These components are

text which describes the quest for the player, a progress bar and number which indicates how many tasks have been completed, and a picture of the reward that will be given to the player.



**Figure 3: From left to right: Presentation of the “Win X Online Matches” Quest, and presentation of the task to claim a reward**

Tasks  $t_1 - t_5$  are all identical except for their presentation, so for simplicity, only  $t_1$  is fully defined.  $t_1 = \langle C, M, I, R_{t_1} \rangle$ , where  $C$  is the condition that becomes true when the team that the player is on wins a match, and  $M$  is the system that monitors whether a team has won a match or not.  $I$  is the presentation of the first tasks, and includes a text description of the quest for the player, which says “Win 5 Online Matches”, and a picture of the reward on the right side. The progress bar is empty, and the counter says  $\frac{0}{5}$ .  $R_{t_1}$  is experience points. As the player completes each task, the progress bar is filled appropriately, and the counter is incremented.

The task  $t_6$  is the final task that needs to be completed, and is the task to claim the final reward.  $t_6 = \langle C, M, I, R_{t_6} \rangle$ , where  $C$  is the condition that becomes true when the player has pressed the claim button, and  $M$  is the system that monitors whether the claim button has been pressed or not. Figure 10 shows how a similar quest is presented, and includes the same elements.  $I$  is a text description of the quest, “Win 5 Online Matches” as well as a picture of the reward. The counter and the progress bar are replaced with a button that says “claim”.  $R_{t_6}$  is the random reward.

**3.3.2 Quest Definition Limitations.** Rocket league highlights two main limitations of the quest definition. The first issue is the multiplayer aspect. Most multiplayer games enforce equal numbers of players on each team. This multiplayer requirement is more problematic than the multiplayer issue found in Monster Hunter: World because Monster Hunter: World can be played as a single player.

The second issue is the random reward mechanic. In this case, the definition can at least specify that a random reward was given to the player, but the definition would not be able to properly explain which rewards the player receives. Both of these limitations will be addressed in Section 4.

## 4 QUEST DEFINITION MODIFICATION

Based on the above analysis, we modified the previous quest definition. In this paper we only consider small additions that could greatly expand the games that the quest definition can accurately represent; major or fundamental modifications are not considered. We intend to address the other limitations highlighted by the above analysis in future work. We identified two changes to make the definition more general.

The first of these is to address the multiplayer limitation. All three of the games we analyzed have issues where the quest definition can not fully explain the quest in the context of more than one player. Considering this, we extend the task definition as follows:

$$T = \langle P, C, M, I, R_t \rangle \quad (3)$$

$P$  is the set of players that can complete the task. A task  $t$  can be completed by the player  $p$  if and only if  $p \in P$ . If any player  $\{P - p\}$  completes task  $t$ , then  $t$  is also considered completed for player  $p$ .

This change allows for two multiplayer systems to be supported: team gameplay and party gameplay. Team gameplay requires a specific number of players to start. Portal 2’s cooperative mode requires exactly two players to start, and Rocket League requires the entire team to be present. In the case where one or more human players is replaced by a game playing AI, the game playing AI are not a part of  $P$  because quests can only be completed by human players. Party gameplay doesn’t require specific number of players in order to start. In Monster Hunter: World, players have the option to complete quests by themselves or with up to four players.

To understand the impact that this change has, we re-examine quests in Rocket League, Portal 2 and Monster Hunter: World. In Rocket League, the team of players completes the task “Win the Online Match”. Lets assume that the player is playing matches of three versus three. Then, the task  $t_1$  of win a match includes of the new predicate  $P = \{p_1, p_2, p_3\}$  where  $p_1, p_2$ , and  $p_3$  are each players on the team, and one of  $p_i$  is the player. In Portal 2, tasks need to be specifically assigned to each player.  $t_1$ , the task of player 1 standing on the Button 2, can now be explicitly assigned to player 1 by specifying  $P = \{p_1\}$ .  $t_2$ , the task of player 2 entering Room 2, can now be assigned to player 2 by specifying  $P = \{p_2\}$ . In Monster Hunter: World, tasks  $t_1, t_2, t_3$  and  $t_{10}$  can be completed by anyone in the player’s current party.  $P$  is the party of the player, where the size of  $P$  is equal to the size of the party.  $p_i \in P$  if  $p_i$  is in the party and one of  $p_i$  is the player. If the player is not in a party, then  $P = \{p_1\}$

The second modification is to address some of the limitations of assigning reward. The quest definition from section 2 has difficulty fully defining the reward for the player in both Monster Hunter: World and Rocket League because the rewards depend on probability. Considering this, we added a distribution  $d$  over all the rewards.

$$Q = \langle T, \leq, R, d(R) \rangle \quad (4)$$

$$t = \langle P, C, M, I, R_t, d_t(R_t) \rangle \quad (5)$$

We added two distributions,  $d(R)$  and  $d_t(R_t)$  because there are two places where rewards are specified by the quest definition.  $d(R)$  is the distribution of rewards in the quest, and  $d_t(R_t)$  is the distribution of rewards for the task.

This change allows for lootbox gameplay and optional rewards to be accommodated. Lootbox gameplay is when the reward is chosen from some number of randomized rewards, usually a combination of high value rewards with lower probability, and low value rewards with a higher probability [23]. Lootboxes are found in Rocket League, where they are explicitly called a lootbox, and Monster Hunter: World, where they are hidden as a randomized

reward. Optional rewards are when rewards are only given to the player in specific situations. In *Monster Hunter: World*, players earn extra rewards by completing optional tasks.

To understand the impact of these changes, we re-examine the quests in *Rocket League* and *Monster Hunter: World*. In *Rocket League*,  $t_6$  provides the player with a lootbox as a reward. The new term  $d_{t_6}(R_{t_6})$  is included and is the distribution of the rewards that are found in the loot box.  $R_{t_6}$  is all of the possible rewards that can be received from the lootbox. *Monster Hunter: World* includes rewards that feature lootbox and optional reward systems. The lootbox mechanics can be addressed by explicitly defining the distributions over quest rewards, the rewards for breaking one horn, for breaking two horns, for slaying the Nergigante, and for carving. The optional rewards can be addressed by introducing a piecewise function into the distribution which directs when the player receives a reward from a particular distribution. This piecewise function would include the logic for providing the additional reward if the player breaks one or two horns, as well as changing the distribution over the rewards based on the rank of the player. We propose these two equations as a new quest definition, and we use this quest definition from now on in this paper.

## 5 QUEST DEFINITION COMPARISON

We select a few quest definitions for evaluation against our proposed quest definition. To compare the definitions, we analyze quests from two systems. The first quest is a simple quest from *Valorant* [13], and the second is the complex quest from *Monster Hunter: World* we previously analyzed. These two quests are used for evaluation to demonstrate how well the various definitions can handle simple and complex quest systems. The degree that each definition can accommodate the different components in each quest is the basis for comparison.

### 5.1 Quest Definition Selection

We select definitions from papers that contain a high number of citations. This does not explicitly mean that every citation uses this definition, but it gives a relative idea of the popularity of the definition proposed in the work.

Table 1 shows the chosen definitions. *Ashmore and Nitsche* proposed a definition in the context of procedural quest generation [2], and the paper has 89 citations according to Google Scholar at the time of this publication. *Tosca* proposed a definition for video game quest theory [19] and the paper has 97 citations according to Google Scholar at the time of this publication. *Howard* proposed a quest definition as the bridge between literary quest theory and quest theory in video games [8], and the paper has 141 citations on Google Scholar at the time of publication.

### 5.2 Quest Definition Interpretation

The definitions proposed by *Ashmore and Nitsche*, *Tosca* and *Howard* are less precise in their descriptions of elements. This causes issues in how to interpret the words that are used in the definitions. We disambiguate vague concepts by looking at the context of their original work, but there are cases where we have to make assumptions.

The definition proposed by *Ashmore and Nitsche* uses the word “setting”. We could interpret setting as the setting of the game, but

from the paper, “setting” actually means the narrative context of the quest. “Space” is also ambiguous in that definition, and we interpret space as the virtual space the player occupies. Because there is no mention of a player, we assume that the player is not a requirement of this quest definition. For this definition, we will specify the elements of setting, space, challenge, and goal for each quest.

The definition proposed by *Tosca* uses several vague words. The first one is “causality”, which we interpret as the reason the narrative is being told about the player. We consider “soft rules” to be too ambiguous to properly interpret, and it is unclear what the author means by this concept so we do not include it in the analysis. Because the word “player” is not plural, we assume that this definition only accommodates a single player. For this definition, we will specify the elements of characters, plot, causality, world, interaction and player for each quest.

The definition proposed by *Howard* uses “landscape” as an ambiguous term. We interpret this to be the playable space. Similarly to the previous definition, because the word “player” is not plural, we assume that this definition only accommodates a single player. For this definition, we will specify the elements of landscape, player, collects objects or talks to characters, challenge and goal.

### 5.3 Simple Quest

First, we analyze a simple quest from *Valorant* using the four definitions.

**5.3.1 Quest Description.** *Valorant* is a first person shooter (FPS) where teams of five play against each other, with each player on a team playing a unique agent. Each agent in the game has a specific set of abilities that can be used to help the team win the match. One of the quests is “Use your abilities”, which requires that the player use the abilities of an agent in the game 200 times. These number of times a player uses an ability is tracked between matches. The quest awards the player with 10,080 experience points at the end of the match.

**5.3.2 Quest Definition Application.** According to the definition proposed by *Ashmore and Nitsche*, the setting is the near future, where teams fight based on loose good and evil alignments. Space is one of the six available maps, which is the number of maps currently available in the game at the time of writing this paper. Space can also refer to the player’s specific location. Challenge comes from two places: the game’s systems, which restrict the number of abilities a player can use in a round, and from the strategic usefulness of a particular ability, which can affect the performance of a team.

According to the definition proposed by *Tosca*, the plot is empty, and the characters are the playable agents. There is no causality associated with this quest, because there is no explicit narrative tied to the quest. The world is one of the six currently available maps, and in particular, the map that the player is currently playing. The interaction is the use ability action, which varies by agent. The player is the single player in the game.

According to the definition proposed by *Howard*, the landscape is the one out of six currently playable maps that the player is currently in. There are two forms of interaction that are allowed in this quest definition: object collection or talking to an NPC, so the

Citation	Definition	Area of Research	Number of Features
Ashmore and Nitsche, 2007	Together these coalesce into four core elements that are the framework for understanding and defining quests in a virtual world: The setting, the space, the challenge, and the goal.	Procedural Quest Generation	4
Tosca, 2003	A quest, as we said earlier, brings some or all the storytelling elements (characters, plot, causality, world) together with the interaction, so that we can define it as the array of soft rules that describe what the player has to do in a particular storytelling situation.	Video Game Quest Theory	6
Howard, 2008	A quest is a journey across symbolic, fantastic landscape in which a protagonist or player collects objects and talks to characters in order to overcome challenges and achieve a meaningful goal.	Literary Quest Theory	5
Yu et al., 2020	$Q = \langle T, \leq, R, \rangle$ , $t = \langle C, M, I, R_t \rangle$	Procedural Quest Generation	8
Yu et al., 2021	$Q = \langle T, \leq, R, d(R) \rangle$ , $t = \langle P, C, M, I, R_t, d_t(R_t) \rangle$	Procedural Quest Generation	10

**Table 1: This table shows a high level overview of the definitions that will be compared.**

"use ability" action is not a valid form of interaction. The challenge comes from the ability system and the strategic usefulness of when to use abilities. The goal is to use an ability 200 times.

According to our proposed definition, the quest can be defined as  $Q = \langle T, \leq, R, d(R) \rangle$ .  $T = \{t_1, t_2, \dots, t_{200}\}$ , where each task  $t_i \in T$  is to use one ability. The tasks can be completed in any order. The reward  $R$  is the 10,800 experience points.  $d(R)$  is the distribution which gives the element 10,800 experience points with probability 1. Each task  $t_i \in T$  is the same except for the presentation, and is defined as  $\langle P, C, M, I, R_t, d_t(R_t) \rangle$ .  $P = \{p_1\}$ , where  $p_1$  which is the player of the game.  $C$  is the condition that becomes true when a player uses an ability, and  $M$  is the system that monitors whether abilities have been used or not.  $I$  is the presentation of the quest, which includes the text description of "Use your abilities", a progress bar, and a number out of 200 which shows how many tasks have been completed so far. The progress bar and number vary based on the current number of tasks that have already been completed by  $p_1$ . The reward  $R_{t_i}$  is empty for all  $t_i$ , so the distribution  $d_{t_i}(R_{t_i})$  is also empty.

**5.3.3 Quest Definition Differences.** We roughly characterize the Valorant quest by seven different aspects based on the analysis provided by each of these definitions in the previous section. The seven aspects are (1) player, (2) narrative, (3) use ability action, (4) use an ability 200 times, (5) reward, (6) presentation and (7) challenge. We consider setting space, characters plot, causality, world, and landscape to be narrative because they all provide narrative context. There could be other aspects of the quest that are not considered by any of these quest definitions, and thus that aspect would just appear in the elements not captured column. These extra aspects would not help in the comparison of these specific definitions because all of the definitions lack the same aspect. Table 2 shows the

differences in the definitions applied to the Valorant quest. Overall, the amount of elements of the quest captured by each of the definitions are approximately the same.

Some elements were only considered to be partially captured in the definitions proposed by other authors. Ashmore and Nitsche's definition does not fully specify which actions are needed to complete the quest, because this definition has no notion of interaction. The definition proposed by Tosca does not fully explain the goal because the action is specified, but doesn't explicitly note that the player needs to use 200 abilities. The definition proposed by Howard does not partially capture any of the aspects. Additionally, this definition doesn't include the capability to include the interaction of a player outside of "collecting objects" and "talk to characters", which is problematic because there are many actions that could be taken outside of the two specified. Interaction is critical to video game quest theory because it is a major factor in the separation of video game quest theory and literary quest theory.

Our definition is able to partially capture the use ability action, because the action is implied by  $C$  and  $M$ . This is an intentional feature of the quest definition, because there are some tasks that might have multiple ways to complete it. There is a minor discrepancy with how the reward is given to the player. The game rewards the player with experience points when they finish the match, not when they complete the last task. However, the definition can still accommodate this reward through the set of rewards for the quest.

Our definition also does not capture the idea of challenge or narrative. Challenge is not a part of the quest definition because challenge is relative, unique to each player, and difficult to quantify. Players can consider "easy" quests hard, and "hard" quests easy. Additionally, the challenge of a quest can vary between playthroughs, because as the player gains skill, the challenge of the same quest will reduce over time. Quantifying challenge requires additional knowledge that is difficult to model. Our definition does also not

Valorant Quest	Elements Fully Captured	Elements Partially Captured	Elements Not Captured
Ashmore and Nitsche	(2) Narrative (4) Use an Ability 200 Times (7) Challenge	(3) Use Ability Action	(1) Player (5) Reward (6) Presentation
Tosca	(1) Player (2) Narrative (3) Use Ability Action	(4) Use an Ability 200 Times	(5) Reward (6) Presentation (7) Challenge
Howard	(1) Player (2) Narrative (3) Use an Ability 200 Times (7) Challenge		(3) Use Ability Action (5) Reward (6) Presentation
Yu et al., 2020	(4) Use an Ability 200 Times (6) Presentation	(1) Player (3) Use Ability Action (5) Reward	(2) Narrative (7) Challenge
Yu et al., 2021	(1) Player (4) Use an Ability 200 Times (6) Presentation	(3) Use Ability Action (5) Reward	(2) Narrative (7) Challenge

**Table 2: This table shows a high level overview of the differences between the quest definitions in the case of the Valorant Quest.**

attempt to contextualize the quest in a narrative format. This is because the quest is considered to be a “side quest” or a quest without narrative, because the quest does not explicitly further a narrative arc. Though it can be argued that every quest provides at least some amount of narrative, the idea of “quests without narrative” is commonplace within the academic and industry communities, so allowing for that kind of distinction is prudent.

Quest definitions proposed by Ashmore and Nitsche, Tosca, and Howard do not include a discussion of reward. Rewards are a tool for motivating gameplay and providing feedback to the player [23], which means that these definitions lack information about why a player would be playing the quest. Additionally, these definitions do not include any concept of presentation, which means that these definitions lack information of how a player knows what actions to take.

## 5.4 Complex Quest

Now, we analyze the complex quest, “The Easter of Elders”, from Monster Hunter: World.

**5.4.1 Quest Definition Application.** According to the definition proposed by Ashmore and Nitsche, the setting is the monster hunter world where players hunt magical creatures. The space is the location on the map that the Nergigante spawns in. The challenge is given by the star system, in this case eight stars, where more stars means that the quest is more difficult. The goal is to slay a Nergigante.

According to the definition proposed by Tosca, the plot is that the community wants to learn more about the Nergigante creature. The characters would be the player, the Nergigante, and any additional party members. The causality is that the player is the only hunter skilled enough to defeat the monster. The world is the island in which players hunt magical creatures. The interaction is attacking, trapping, or otherwise harming the Nergigante. The player is the player of the game.

According to the definition proposed by Howard, the landscape is the island that is inhabited by the monsters, as well as the level that the player is currently playing in. The player is the player of the game. To complete this quest, the player doesn’t have to collect objects or talk to characters, so there is no way to explain the interaction. The challenge is the eight stars. The goal is to slay a Nergigante.

**5.4.2 Quest Definition Differences.** We roughly characterize the Monster Hunter: World quest using eight different aspects which were derived in a similar manner to how the aspects were derived for the Valorant quest. This quest has the aspects of (1) player, (2) narrative, (3) Attacking, trapping or harming the Nergigante, (4) Slay a Nergigante, (5) reward, (6) presentation and (7) challenge and (8) failure conditions. Table 3 shows the high level differences in the ability for the definitions to accommodate the Monster Hunter: World quest. Our definition is able to fully specify twice as many elements as any of the other definitions. The definitions proposed by Ashmore and Nitsche, Tosca and Howard struggle to accurately represent the more complicated quest. The definition proposed by Tosca in particular has trouble with this quest, and cannot account for five out of the eight aspects.

The elements that are only partially captured by the definitions proposed by other authors are sometimes different when applied to the more complex monster hunter quest. The definition proposed by Ashmore and Nitsche partially captures the actions that are needed to complete the quest by implying it through the goal requirement. The narrative is also only partially captured because this definition has problems situating the narrative motivation, which is to learn more about the Nergigante species. The definition proposed by Tosca partially explains the player because it cannot accommodate multiplayer. We do not consider the goal to be partially captured in this case because the actions might not always lead to the slay Nergigante goal. In monster hunter, another valid quest goal is to capture the monster, which requires the player to attack the

Monster Hunter Quest	Elements Fully Captured	Elements Partially Captured	Elements Not Captured
Ashmore and Nitsche	(4) Slay a Nergigante (7) Challenge	(2) Narrative (3) Attacking, trapping or harming the Nergigante	(1) Player (5) Reward (6) Presentation (8) Failure conditions
Tosca	(2) Narrative (4) Attacking, trapping, or harming the Nergigante	(1) Player	(4) Slay a Nergigante (5) Reward (6) Presentation (7) Challenge (8) Failure conditions
Howard	(4) Slay a Nergigante (7) Challenge	(1) Player (2) Narrative (3) Attacking, trapping, or harming the Nergigante	(5) Reward (6) Presentation (8) Failure conditions
Yu et al., 2020	(2) Narrative (4) Slay a Nergigante (6) Presentation	(1) Player (3) Attacking, trapping, or harming the Nergigante (5) Reward	(7) Challenge (8) Failure conditions
Yu et al., 2021	(1) Player (2) Narrative (4) Slay a Nergigante (6) Presentation (5) Reward	(3) Attacking, trapping, or harming the Nergigante (8) Failure conditions	(7) Challenge

**Table 3: This table shows a high level overview of the differences between the quest definitions in the case of the Monster Hunter: World Quest.**

monster until they are at half health before laying a trap. In this case, based off of the actions that the player is taking alone, it would be impossible for to distinguish what the final goal of that player would be. The definition proposed by Howard partially captures the narrative, player and actions that are needed to complete the quest. The narrative is lacking the motivation of why the player is doing the quest, and the player does not fully accommodate multiplayer. The actions that are required to complete the quest are implied by the restriction of the goal.

Our definition only partially captures the actions that are required to complete the quest by implying it through *C* and *M*. Failure conditions are only partially captured because the player can fail the quest without completing the slay the Nergigante task. Challenge is the only aspect that is not captured by our definition. Challenge, as previously discussed, is intentionally excluded from the definition.

## 6 LIMITATIONS AND FUTURE WORK

The modifications we made to the quest definition allow it to more fully explain the key gameplay elements of multiplayer and randomized rewards. However, our quest definition still has major limitations that are not addressed in this paper. One of these limitations is the issue of concurrent tasks. In Portal 2, the quest definition had difficulty modeling when two different players would be completing different tasks simultaneously. Monster Hunter: World highlighted the case where a single player could be completing two tasks at the same time, with the failure criteria tasks being completed at the same time as the slay Nergigante task, and the optional tasks of carving the monster being completed at the same time as the

final timer task. A partial ordering cannot fully explain these kinds of simultaneous task completion, and the quest definition may be more general if we use a different representation. One possible solution to this would be to model the tasks as a hierarchical task network (HTN), where tasks that have to be completed at the same time could be considered compound tasks. However, compound tasks could also be composed of quest tasks that both need to be completed, but not necessarily at the same time. This second way of representing compound tasks is how HTNs function in other quest definitions [15]. It would be potentially confusing to be applying an HTN to quests in a two different ways. Another possible solution to the simultaneous task problem would be the inclusion of a time parameter that denotes when tasks can be completed.

Another limitation highlighted by this work has to do with the tasks that are given to the player. In our current quest definition, we assume that the player must complete every task in the quest. However, games commonly include optional tasks. In the Monster Hunter: World quest, most of the tasks are optional and do not have to be completed in order for the quest to be completed. One naive solution to this problem is to create a quest for every possible variation of the optional tasks. For the monster hunter world quest, there are five optional tasks, which means that  $2^5$  quest variations must be defined in order to fully explain this single quest. We do not consider this to be an ideal solution because it creates a combinatorial explosion for the number of quests that have to be created for a single quest idea. This could be useful in some cases, such as procedurally generating quests, where the goal is to provide as many variations as possible. However, in the case of personalization research, having to wade through many variations on the same

quest can be tedious and overly complicates the problem. It also has the issue that it would be difficult to use from a design standpoint, because it requires a designer to specify all of the possible combinations of tasks that the player could complete to finish a quest. This naive solution also has problems modeling quests when all of the possible tasks to complete the quest are unknown. In a game like Portal 2, there is a solution that the designers have in mind, but there are also solutions that the designers did not know were present in the game. Thus, for these situations it would be impossible to write out every single variant, because some variants are unknown.

Both of these problems have non-obvious solutions. For these reasons, we would like to tackle both of these challenges in future work.

## 7 CONCLUSION

This paper contributes to general video game quest theory. A general quest definition provides value by establishing common language for referencing quests as a technical term, allows us to compare quests from different game genres, and encourages collaboration between research fields. In this paper, we advanced prior work to create a general quest definition. We started by analyzing various quests in games using the 2020 version of our quest definition. This highlighted some limitations. We introduced modifications to gain expressibility in the amount of quests that the definition can accurately represent. We compared our definition against prior definitions proposed in academic papers to understand its strengths and weaknesses. This comparison indicated that our definition is able to more fully represent complex quests. Finally, we provided a discussion of limitations that still exist within the quest definition, as well as plans for future work to address these issues.

## ACKNOWLEDGMENTS

This work was funded by the Mathematics of Information Technology and Complex Systems (MITACS) Association and Improbable io.

## REFERENCES

- [1] Espen Aarseth. 2005. From Hunt the Wumpus to EverQuest: Introduction to Quest Theory. In *Entertainment Computing - ICEC 2005*, Fumio Kishino, Yoshifumi Kitamura, Hirokazu Kato, and Noriko Nagata (Eds.). Springer Berlin Heidelberg, Berlin, Heidelberg, 496–506.
- [2] Calvin Ashmore and Michael Nitsche. 2007. The Quest in a Generated World. In *Proceedings of the 2007 DiGRA International Conference: Situated Play*, Vol. 4. The University of Tokyo, Tokyo, Japan, 503–509. <http://www.digra.org/wp-content/uploads/digital-library/07311.20228.pdf>
- [3] Bethesda. 2011. *The Elder Scrolls V: Skyrim*. PC, PS3, Xbox 360.
- [4] Capcom. 2020. *Monster Hunter: World*. Windows PC, Playstation 4, Xbox One.
- [5] Gail Carmichael and David Mould. 2014. A Framework for Coherent Emergent Stories. In *In the Proceedings of the 9th International Conference on the Foundations of Digital Games*. Society for the Advancement of the Science of Digital Games, Liberty of the Seas, Caribbean, 49:1–49:5.
- [6] Jonathon Doran and Ian Parberry. 2010. *Towards Procedural Quest Generation: A Structural Analysis of RPG Quests*. Technical Report LARC-2010-02. University of North Texas.
- [7] Jeff Howard. 2006. Designing interpretative quests in the literature classroom. In *Proceedings of the 2006 ACM SIGGRAPH symposium on Videogames - Sandbox '06*. ACM Press, Boston, Massachusetts, 133–138. <https://doi.org/10.1145/1183316.1183335>
- [8] Jeff Howard. 2008. *Quests: Design, Theory, and History in Games and Narratives*. A K Peters Ltd, Natick, Massachusetts. <https://doi.org/10.1201/b10929>
- [9] Kiranico. 2021. *The Eater of Elders*. Kiranico. <https://mhworld.kiranico.com/quests/nZ5jr/the-eater-of-elders>
- [10] Kiranico. 2021. *Nergigante*. Kiranico. <https://mhworld.kiranico.com/monsters/aYaUV/nergigante>
- [11] V. A. (Vladimir kovlevich) Propp, 1895–1970. 1968. *Morphology of the folktale*. Second edition, [revised and edited with a preface by Louis A. Wagner [and a] new introduction by Alan Dundes. Austin : University of Texas Press, [1968], Austin, Texas. <https://search.library.wisc.edu/catalog/999539245202121>
- [12] Psyonix. 2015. *Rocket League*. PC, PS4, Xbox One, Xbox Series X/S, Nintendo Switch.
- [13] Riot Games. 2020. *Valorant*. Windows PC.
- [14] Nathan Savant. 2021. *Quest Design in Linear Media*. Gamasutra. [https://www.gamasutra.com/blogs/NathanSavant/20210111/376020/Quest\\_Design\\_in\\_Linear\\_Media.php](https://www.gamasutra.com/blogs/NathanSavant/20210111/376020/Quest_Design_in_Linear_Media.php)
- [15] Edirlei Soares de Lima, Bruno Feijó, and Antonio L. Furtado. 2014. Hierarchical generation of dynamic and nondeterministic quests in games. In *Proceedings of the 11th Conference on Advances in Computer Entertainment Technology*. ACM Press, Funchal, Portugal, 1–10. <https://doi.org/10.1145/2663806.2663833>
- [16] Leszek Szczepanski. 2017. *Building Non-Linear Narratives in Horizon: Zero Dawn*. GDC. [https://www.youtube.com/watch?v=ykPZcG8\\_mPU](https://www.youtube.com/watch?v=ykPZcG8_mPU)
- [17] David Thue. 2007. Interactive Storytelling: A Player Modelling Approach. In *AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment*. AAAI, Stanford University, Stanford, California, United States, 6.
- [18] David Thue and Elin Carstendottir. 2018. Getting to the Point: Toward Resolving Ambiguity in Intelligent Narrative Technologies. In *Proceedings of the Joint Workshops on Intelligent Narrative Technologies (INT) and Intelligent Cinematography and Editing (WICED)*. INTWICED18, University of Alberta, Edmonton, Canada, 9.
- [19] Susana Tosca. 2003. The quest problem in computer games. In *Technologies for Interactive Digital Storytelling and Entertainment conference*. TIDSE03, Darmstadt, Germany.
- [20] Valve. 2011. *Portal 2*. PC, PS3, Xbox 360.
- [21] Juha-Matti Vanhatupa. 2011. Guidelines for personalizing the player experience in computer role-playing games. In *Proceedings of the 6th International Conference on Foundations of Digital Games - FDG '11*. ACM Press, Bordeaux, France, 46–52. <https://doi.org/10.1145/2159365.2159372>
- [22] Kristen Yu, Nathan Sturtevant, and Matthew Guzdial. 2020. What is a Quest?. In *In the Proceedings of the Intelligent Narrative Technologies Workshop*. INT20, Online.
- [23] Robert Zubek. 2020. *Elements of Game Design*. The MIT Press, Cambridge, Massachusetts, United States, Chapter 1-7, 1–256.