Amiais in Second Life™: the use of metaverse environments to disseminate Cultural Heritage

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Abstract

Amiais is a small Portuguese village located in the Aveiro district. It is also a virtual village[1] available in Second Life™. The recreation of Amiais in the metaverse is a part of the LOCUS project, which intends to use digital platforms to promote and disseminate local cultural heritage. Thus, a playful narrative was developed to explore the virtual territory and share cultural aspects of Amiais. The research presented in this article tested the users' response to the narrative, their immersive learning about cultural heritage, and the convergence between virtual and real territories. Users engaged with the narrative, interacted with the characters and scenario elements, and got curious about knowing the real territory after the virtual experience. The results confirm that using a metaverse with playful narratives and interaction encourages learning cultural heritage.

Keywords: Cultural Heritage; Metaverse; Virtual Territory; Playful Narrative; Immersive Learning; Digital Interaction

Introduction

Cultural heritage is a key component of any country. It comprises places and people who carry stories and histories that are the foundation of their experiences and existence. Through technological resources, it is increasingly easier to record and extend the existence of cultural heritage. This means contributing to disseminating heritage and cultural heritage (Oliveira et al., 2020). In this follow-up, advances in technology have become a turning point for developing methods and learning about ancient cultures. 3D visualization is thus one of the media that provides an opportunity to simulate cultural heritage (Bogdanovych et al., 2010), resulting in an experience that, although not entirely the same as a physical visit to a particular place, allows for visitor learning and entertainment. In this way, the amplification of three-dimensional virtual worlds and 3D MUVEs (multi-user virtual environments), as in the case of Second Life™, were conceived as innovative and immersive technologies that can be transformed, being able to translate into varied educational experiences (Chen, 2016a; Páscoa, 2016). Although it was not created as a virtual environment for learning, the Second Life metaverse can perform similar functions since its microenvironments allow public engagement (Mattar, 2008). This educational particularity is relevant for cultural heritage since it is

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[1] The virtual territory can be explored at: http://maps.secondlife.com/secondlife/AMIAIS%201/91/200/37

essential that the resident/visitor has a playful experience and, simultaneously, can absorb knowledge (Páscoa, 2016).

The LOCUS project was created to discover the culture, rituals, habits, and stories of Amiais, a village located in the interior of Portugal, in the municipality of Sever do Vouga, district of Aveiro. The resident population is comprised mainly of older adults, with around 15 inhabitants. These inhabitants are fundamental elements for the project's development, being considered team members due to the project's methodologies. Thus, the great challenge of the LOCUS project is to transpose and recreate the Amiais space in Second Life, not only at an architectural level (transposing the characteristics of the territory, the public spaces, the exteriors and interiors of all buildings and public structures), but also transpose the culture, tradition, and heritage related to the territory and the inhabitants to the virtual space in the Second Life metaverse. The main way of transmitting information is via interactivity, either through space and its elements or through NPCs (Non-Player Characters). These programmed characters are inspired in some of the inhabitants of Amiais. In this way, this environment is a way to preserve and disseminate the heritage and cultural heritage of Amiais, giving the possibility to be visited remotely.

This research aims to understand how Second Life can be a potential environment to disseminate and learn about cultural heritage by promoting cultural heritage sites and activities, in this case, focusing on the territory of Amiais in the metaverse. Thus, a narrative to explore the virtual territory of Amiais was developed and tested. Also, surveys were used to evaluate the playful experience, the cultural heritage learning, and the narrative itself. The goal was to analyze the behavior of users, their interaction with the virtual environment, and their learning about the cultural heritage of Amiais. The article is initially structured as a theoretical framework of the theme, approaching the Second Life metaverse as a potential medium for learning. Subsequently, the case study of Amiais is presented, along with the methodologies for the development of Amiais in the metaverse and the types of interaction used to promote heritage learning. Next, the results of the usability tests carried out in the virtual space of Amiais are exposed, followed by the conclusions of the research.

Second Life as a learning tool

Second Life was created and operated by Philip Rosedale's Linden Lab (Winkelmann et al., 2017a) in 2003 (Quintin et al., 2017a). It is a free, online 3D virtual metaverse in a multi-user environment (Chen, 2016b; Quintin et al., 2017b), characterized by being shared, interactive, immersive, and collaborative (Caulfield, 2021). This metaverse evolved rapidly and peaked in the late 2000s (Gent, 2021a); however, recent statistics show that in 2018 only about 500,000 users were monthly active, a number that has dropped significantly compared to previous years (Buscemi, 2020). The Second Life metaverse is not a game. There are no goals, levels, or central goals for its development (Robbins & Bell, 2011a). Instead, users create a representation of themselves through an avatar that assumes a different concept upon entry into the metaverse, and they are called residents (Berger et al., 2016). Residents are three-dimensional forms that can be customized with varied visual aspects: anthropomorphic, zoological, fantasy, or everyday objects (Abdullah, 2016). In this way, users or residents can explore the world, meet other users, participate in activities, and create and build 3D objects or their digital content once they enter the metaverse. They can also trade goods and

services through the currency created for the metaverse, the Linden dollar (Chen, 2016b; Gent, 2021b). In this context, residents have freedom and flexibility to live their "second lives" (Chen, 2016b), making it possible to make mistakes or make bad decisions without fear of consequences, as these do not exist, contrary to what happens in real Life (Quintin et al., 2017b).

The Second Life environment is also characterized by being a popular media for learning and education as it allows the creation of playful places as a tool of information. In addition, it is also used as a source of study for education research (Zimmer & Vezzani, 2017). Through replicas of historical sites, students learn about their ancestors through site exploration (Winkelmann et al., 2017b). An example of this is the prototype that simulates the culture of the ancient city of Uruk in 3000 BC in the Second Life environment (Bogdanovych et al., 2010). Based on various written sources that address the type of culture and heritage of the place, Uruk's environment was built in the metaverse. The creators transposed what existed: a large flat desert area with few trees, the animals that were part of the place, a river with a wide variety of fish, the main historical points, and the appearance and behavior of the virtual inhabitants. To illustrate the local culture, the team created four NPCs with distinct social roles, representing members of two fishing families from ancient Mesopotamia. They can move around the world, perform animated behaviors on objects in the environment, and interact with users. In addition to focusing on replicating the place, the project creates a 3D virtual world that provides an environment for viewing cultures using interaction, in which NPCs are carriers and disseminators of knowledge.

Similar to the Uruk case study, the City and Spectacle project: a pre-earthquake Lisbon view, relating to the recreation of Lisbon in 1755, is also an example that allows the user to learn through the Second Life metaverse. The project's objective is to recreate and understand, historically, a reality that disappeared with the earthquake in the city of Lisbon at an urban, architectural, and social level (Câmara et al., 2009). Also, the project intended to explore the ability of the Second Life and OpenSim platforms to make information available, as well as to expose immediately recognizable forms to a non-expert audience, such as the "interpretive center", the "screen", and the "i" used to signal that information is available (*Cidade e Espectáculo: Uma Visão Da Lisboa Pré-Terramoto*, n.d.). In this way, the information can be disseminated to any public, contributing to the learning and understanding of Portugal's cultural heritage.

Other case studies that exemplify the use of Second Life to promote learning are medical and health education. Researchers at the Ohio University VITAL Laboratory created "The Nutrition Game" in Second Life to demonstrate to users the short and long-term side effects of fast food. The objective of the game is the player's healthy choices, which guarantee a high score in the game and, at the same time, the awareness of their health (Boulos et al., 2007; Team, n.d.). In the same area of study, the "Gene Pool" was conceived by Texas Wesleyan University. The Gene Pool is represented as an explanatory and interactive laboratory that promotes learning in genetics. Users can simulate laboratory experiments, make tutorials and watch videos. In addition, the space allows playing the game "Mating Game" (Boulos et al., 2007). Also, language learning can be improved through Second Life. Sarc developed an investigation to understand to what extent the Second Life metaverse could be a promising tool for improving language skills, in this case, at the English language level. According to the data collected, the main advantage of Second Life is that the user can adapt according to his needs. The environment is also an effective tool for sharing materials and improving the autonomy of students and teachers. This research shows that all participants from different universities in Turkey concluded that the skills improved by the metaverse are speaking and listening. (Sarac, 2014).

The effort that educational institutions make to use technology and communication for collaboration and learning is notorious. In this sense, Linden Lab intends to use Second Life to provide an improvement in world education. According to the company, "virtual worlds solve many challenges educational institutions face". The Second Life metaverse allows students to collaborate synchronously, individually, or as a team. It also appears that the learning space is constantly available, whether for groups that are regularly in the physical world or for geographically dispersed groups. There is also scope for flexible hours or to work asynchronously if necessary (Education, 2011). In addition to the benefits for education, it is essential to highlight the role of the metaverse in cultural learning. Virtual worlds such as Second Life can reconstruct material and immaterial places and objects close to cultural heritage (Freitas, 2011), as the two previously named studies regarding Uruk and the 1755 earthquake. LOCUS project uses the potential of the Second Life metaverse to promote learning about the cultural heritage of the village of Amiais.

Cultural Heritage learning through metaverses: The case study of Amiais

The village of Amiais in Second Life was built using modeling and programming as it is presented in a virtual world. In this way, its development was based on altimetric data extracted from several public and singular sources, making it possible to populate the virtual territory with models of typical vegetation, roads, walls, fences, rivers, and other small details, approaching visibly from the general appearance of the landscape of the region.

In this regard, as shown in figures 1 and 2, the replicas are as faithful as possible so that the user can fully experience their presence in the village. In addition to altimetric data, representations from public sources such as aerial landscapes were also used to determine where buildings were located accurately. Thanks to the detailed photos, these buildings are represented so that they are immediately recognizable. Thus, the territory of Amiais in Second Life is composed of about 30 houses within the village, as well as the granaries located near the threshing floor and elsewhere; the chapel of Nossa Senhora do Refúgio and São Francisco de Assis (with surrounding buildings); as well as streets and paths between these buildings. It is noteworthy that around the Amiais village area, there are some small landmarks of particular local importance, such as water mills, stone crosses, small shrines (alminhas), and similar elements. These were modeled based on photographs taken as part of the project.

Figure 1: Real image of Amiais village took in 2019 by the Locus Project researchers

Source: LOCUS Project

Figure 2: Image of the virtual Amiais village in Second Life

Source: LOCUS Project

It is important to point out that following the narrative built for the exploration of Amiais, human NPCs were also created (see fig. 1) that symbolize the inhabitants of the village; various domestic animals (cats, chickens, cows, etc.) and mythical creatures (werewolf). All these characters give information about Amiais and encourage the user to explore the territory through clue sharing. Thus, they are a key interactive medium for the dissemination of information about the culture of the village.

Figure 3. Characters of Amiais in Second Life (NPC)

Source: LOCUS Project

Through visits and creative co-design sessions with inhabitants and stakeholders, all the work previously developed by the project was channeled into developing scenarios, narratives, and interactive logic based on information collected from the inhabitants of Amiais (NPC). In these sessions, people were encouraged to share aspects related to their culture: "stories about the place, ways of doing things, traditions, games, crafts, the importance of religion, the main festivals, [...], among many others" (Oliveira et al., 2020). The narrative was formulated similarly to a geocaching game. Clues were created to allow the visitor/user to explore, interact, and learn. Although Second Life does not include missions or goals (Robbins & Bell, 2011b), the LOCUS project used interactivity as the central resource to construct the narrative and transmit knowledge regarding the village. Interactivity can be understood through the concept of communication, that is, checking, sharing, associating, and exchanging opinions. This implies participation, interaction, and message exchange (Rabaça & Barbosa, 2001).

One of the common forms of interactivity in the Second Life metaverse is communication between residents. Communication can be carried out at the linguistic level, i.e., text chat, instant messaging (IM), voice-over IP, note cards, action guides, billboards, or road signs. At the level of residents, communication can be done through movements and gestures: dancing, yawning, laughing, teleporting, and flying to different locations (Liang, 2021). Referring to the case study of Amiais in terms of linguistic communication, it will focus on the reception of text messages and note cards by NPCs, objects (see fig. 2), and animals (see fig. 3). In terms of communication through the avatar, the resident/visitor is free to do everything except fly. In this way, the user will be motivated to walk or run in the village, see the environment details and acquire knowledge throughout the exploration.

Figure 4. Message received through the billboard "Amiais" [2]

Source: LOCUS Project

Figure 5. Message received through the cat present in the territory [3]
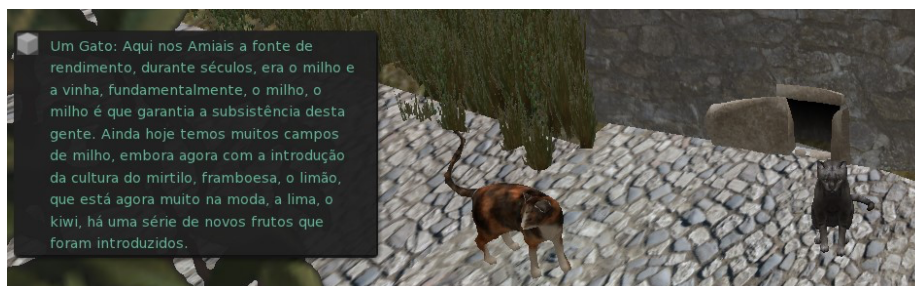
Source: LOCUS Project

Another form of interactivity in Second Life is the possibility of listening to music, watching videos, or watching streaming through multimedia surfaces (Griol et al., 2019). The LOCUS project also implemented videos to disseminate information about Amiais. Through panels, the resident can click and view videos about Amiais. In this case, there are two videos: one of them presents the village to the sound of a small dialogue of an inhabitant, and the other, has a musical performance of the local event Desfolhada (see fig. 4). There are other panels where aerial images of the plantations and the Desfolhada festival can be observed. Finally, the music was also implemented through a radio that plays the Rádio Ovos Moles. It is a district radio station that broadcasts traditional Portuguese music.

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[2] The message is written in Portuguese, since it is a Portuguese village. The translation for this message is "Amiais: Portuguese village. Name of the resident, to speak with Ms. Rosa just click on her"

[3] The translation to this message is "A cat: Here in Amiais the source of income, for centuries, was the corn and wine production. Mainly the corn was the people's subsistence. Still today, we have several cornfields. Although currently, with the cultivation of blueberries, raspberries, lemons, limes, and kiwis, several new fruits have been introduced into local agriculture.

Figure 6. Billboard with a video of the traditional festival Desfolhada at Amiais

Source: LOCUS Project

In sum, the interactivity present in the virtual world of Amiais aims to allow the user/resident to explore the territory through small missions and interactions between NPCs in a playful way. The projection of Amiais in Second Life aims to provide a gamified experience engaging the user who visits the place to learn about the cultural heritage of Amiais, motivating them to visit the place physically.

Methodology

At the methodological level, an evaluation model was designed to observe the exploration of Amiais in Second Life and the associated heuristics, allowing the narrative and user experience evaluation in the digital scenario. According to Pinelle et al. (2008), heuristic evaluation is characterized by being an effective method used in the game development process to identify usability flaws (Barcelos et al., 2011). It should be noted that the narrative created calls for interaction with the digital territory/scenario and with the characters. Thus, the narrative was subdivided into 14 moments, requiring the completion of small tasks and/or interactions with the NPCs. The narrative gameplay tests were based on these 14 moments when the user should interact with the digital environment. The evaluation was carried out through direct observation of the exploration of the territory, the narrative, and the user behavior. Then, the user's perception regarding the convergence of the physical territory and the virtual scenario and the cultural heritage transmitted through the narrative was tested through a questionnaire. The questionnaire has 21 questions: multiple choice (19), agreement scale (1) and open answer (1). The tests lasted 30 minutes, followed by 10 minutes to answer the questionnaire.

The tests took place between the end of April and the beginning of May, carried out both remotely and in person. In both, interactions between the researchers and the participants were avoided. The analysis was conducted by direct observation of the virtual Amiais exploration, recording actions, and user feedback. The concepts of Immersion and Interaction were analyzed throughout the dimensions analysis Scenario, Characters, Narrative and Cultural Heritage. Particularly, the following indicators were observed: interaction with NPCs; the understanding and interaction of the narrative; the understanding of the contents of the cultural heritage of Amiais. A quantitative methodology was used to analyze the questionnaires using the descriptive analysis of the quantitative data.

Results analysis and discussion

The present investigation had ten participants testing Amiais' exploration narrative in Second Life, seven men and three women, aged between 20 and 60 years (Graphic 1). Most have already experienced living in rural contexts similar to Amiais or have had contact with nearby realities through family members. Most participants also revealed that they had already participated in cultural traditions and festivities in small communities, similar to the one portrayed in Amiais' narrative in Second Life (Graphic 2).

Graphic 1. Testers' biological characteristics
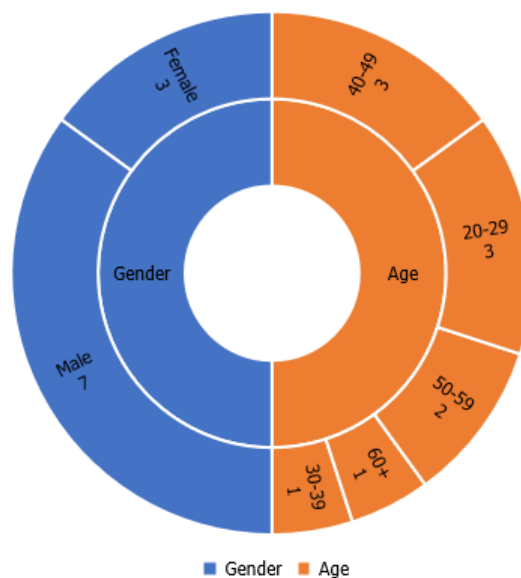
Source: LOCUS Projec

Graphic 2. Testers' familiarity with local cultural traditions
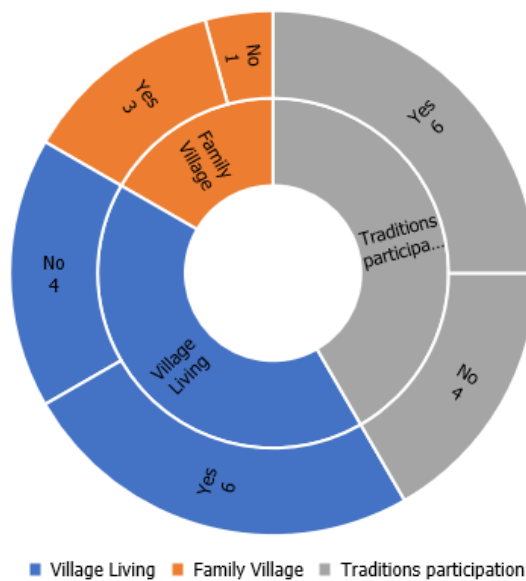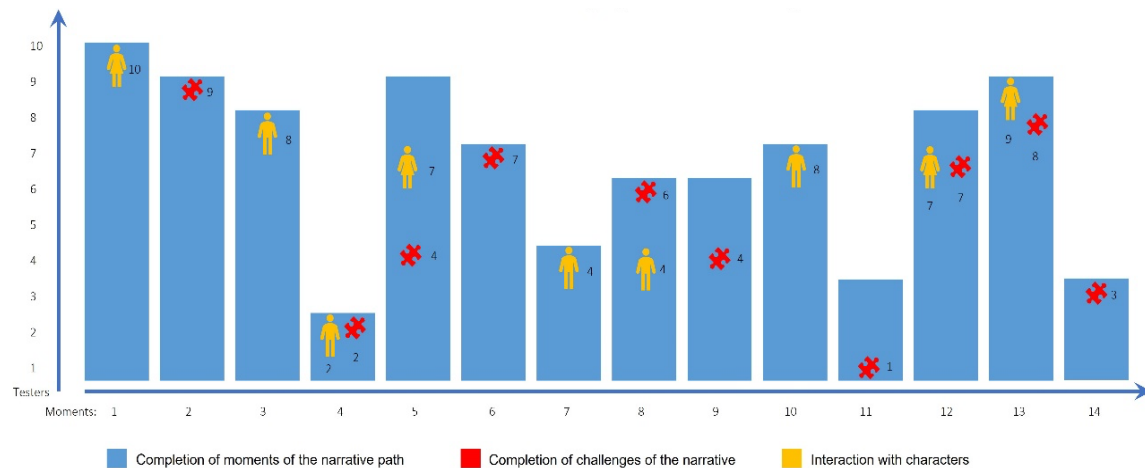

Source: LOCUS Project

Three indicators were analyzed concerning immersion in the scenario and the narrative: the number of moments in the narrative path that the user managed to complete in 30 minutes, the number of completed challenges, and the interaction with the characters in the narrative (see Graphic 3).

The narrative includes 14 moments. It starts with interaction with Ms. Rosa, who welcomes the user and indicates that the Desfolhada party is being organized in Amiais. She kindly suggests to the user that he can help the locals with the party preparations while visiting the village and tells the user to follow the path with chickens and watch the panel video. From there, the user has to look for Mr. Vítor, who explains how Desfolhada used to be in the past. Then the user must look for Marco, who is fishing by the river. He talks about the traditions of red maize and gives him a love letter to Maria. The user finds Maria, who asks to decorate the alminhas and the church. On the way to the church, the user meets the werewolf, who tells some myths about the village. At the church, the user finds Mr. José, who asks for help to find the Desfolhada party musicians and suggests practicing the dance steps on the threshing floor. Next to the river area, the user can do yoga. Then, s/he receives the indication that he must help Dona Emília to collect corn and fruits for the party. On plantations, the user can also milk the Mimosa cow and send it to Ms. Emília. Back in the center of the village, the user can collect cornbreads to give to Ms. Ana, who is on the threshing floor organizing the party. Once here, the challenges end with the user filling the baskets with corn and lighting the fire for the party.

The first moment of the narrative concerns the starting point. All users started from the same point. Arriving at the "region" of Amiais in Second Life at the exact location, users received a welcome message with instructions to start the game/narrative. In this narrative first moment, it was necessary to interact with the NPC, Ms. Rosa, who was precisely at this starting point of the route. The NPC would then indicate to the user that the annual Defolhada party was being organized in the village and that the user could collaborate with the residents by performing some tasks to help with the party while visiting Amiais. From there, it indicated what the user should do next. All players interacted with Ms. Rosa at the beginning. From here,

the remaining moments were completed by most players. There were only four narrative moments that most users did not complete: moments 4, 7, and 11 correspond to parts of the narrative that passed through areas of the scenario further away from the central area of Amiais. Moment 4 required users to move to the other side of the river; moment 7 corresponded to the most isolated path to the church; and moment 11 also corresponded to a more remote area, next to the Amiais river beach, where users could do yoga. In all three cases, the directions to reach these areas, through clues in the narrative, were not direct and always implied that the user was willing to explore the scenario independently. At the last moment (14), despite being located in the central village area, and many users have passed through this area, they did not complete the moment due to lack of time. Thus, most users could not fulfill the 14 moments in 30 minutes, requiring more time to explore the narrative and the scenario fully.

Graphic 3: Immersive Scenario and playful narrative testing

Source: LOCUS Project

As for the challenges of interacting with the scenario and contributing to the Desfolhada party, most users who completed the narrative moments also completed the challenges. However, in moments 9 and 11, the challenges were merely playful (dancing and doing yoga, respectively), not necessarily contributing to the narrative's continuity and to the party's organization, which may justify a lower realization of these challenges. On the other hand, moment 5 – which involved the delivery of the love letter from the character Marco to the character Maria and responding to the coded message – has a low execution rate because it is a consequent challenge, i.e., it can only be carried out if the users had completed the previous moment. Even so, several participants who interacted with the character Maria in Moment 5, even without the secret message delivered by the character Marco, managed to guess the answer.

Regarding the interaction with the characters throughout the narrative, it was possible to observe that most users interacted with almost all the characters they found through the narrative. It should also be noted that along the various paths of Amiais, there were several extra NPCs with human and animal forms (cats, goats, cows, chickens…) that, despite not having an active role in the continuity of the narrative, were used to convey a set of information about Amiais, about the traditions, histories, and ways of life of the village. Thus, these NPCs had the purpose of simultaneously inducing the user to interact with the scenario elements

and integrating into the virtual environment an informative layer about Amiais, also complemented by several informative panels with videos and photographs of real Amiais. The participants understood this kind of interaction at the beginning when they touched the cats at the first moment of the narrative. From there, all participants interacted with the NCPs in the scenario, receiving information about Amiais.

Regarding the narrative and challenges' understanding (see graph 4), the test observation showed that it was clear from the beginning what the purpose of the narrative was for most users. From the moment users read the NPC's instructions in the chat, they did not make any comments with doubts about the steps to be taken and started exploring following the instructions given at the beginning of the game. Concerning the users' motivation throughout the narrative, it was found that the initial motivation was decreasing as the game progressed and/or that users faced difficulties throughout the play, for example, difficulty completing challenges, being lost in space, difficulty in "handling" the Second Life controls, difficulty in accessing information due to the technical unavailability of the system, etc. Below are some comments from users that show some lack of motivation throughout the narrative:

"This is not playing music! I wanted to hear it!"

"I'm here inside the house, but I can't get out of here. I think I have to turn this off."

"I feel lost without a map!"

"Well, I already have four things hanging up here to do."

"I've lost myself again!"

However, most users broke the moments of demotivation whenever they performed a challenge and were given the proper reward, for example, seeing panels, picking up cornbreads, dancing, or interacting with characters. Below there are some comments from users that denote motivation:

"so cute the images of the processions..."

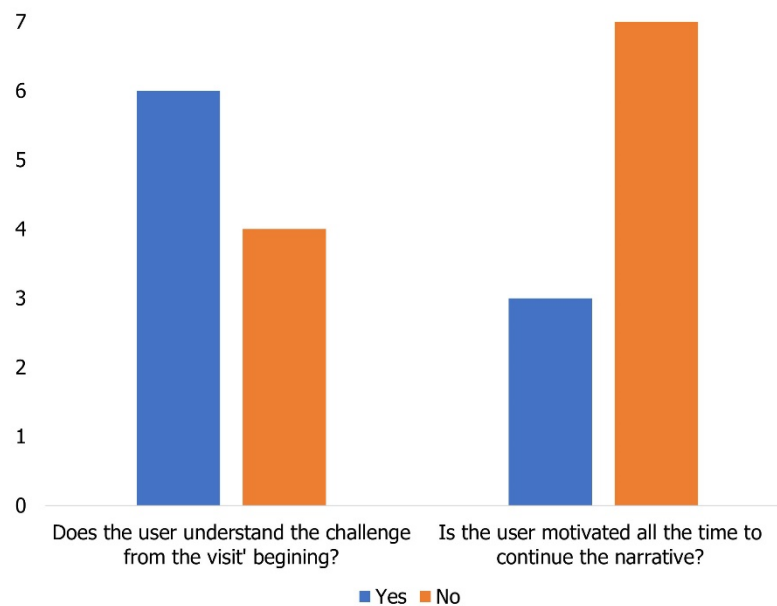"I like the cornbread, this is cool!"

"It's Mr. Victor! Let's be BFFs!"

"Oh, now I understand why Mr. Vítor said to not walk alone..."

"I'm only going to dance because we're in a game, because in real life I don't know how to dance at all!"

"Oh, another musician! Good, he's singing!"

Graphic 4: Narrative Comprehension and Motivation

Source: LOCUS Project

It should be noted that several users felt lost after the beginning of the narrative, and in several tests, it was found that users decided to freely explore the scenario and interact with the elements and characters, even if they did not follow the path previously established in the narrative. This did not imply a negative test evaluation since it was always told to users that the narrative served only as a guideline for the virtual Amiais exploration. The moments, interactions, and challenges were categorized as complete whenever the user concluded them, even though not on the pre-established trajectory.

The narrative proposed for the exploration of Amiais in Second Life was intended to meet several objectives. In the first instance, the main goal was to lead the user to explore the space and receive information about Amiais and its cultural traditions. On the other hand, the intuitive and fluid challenges were intended to enhance the user's immersion in the scenario without imposing strict rules on the use of space and simultaneously engaging the user in one of Amiais traditions. Thus, it was anticipated that the narrative could be adapted to users with a greater tendency toward gamification processes, which are stimulated by the challenges, and to users with a more free user profile, who feel more motivated by exploring the digital scenario in itself and not so much for the gameplay challenges of the narrative.

In this context, the narrative tests showed that the participants with a greater tendency towards gamification felt more easily demotivated throughout the exploration narrative. This was mainly due to the way the narrative was structured. The narrative was not linear in space, which means it did not follow a direct and linear path and implied that users would pass through different areas of Amais more than once. As shown in Figure 5, the dispersion of characters in the narrative is indicated by the green dots, and it does not follow a linear path. In the same sense, the challenges were also not necessarily consequential and interdependent. This narrative format was designed to suit different types of users and stimulate a deeper exploration of the

virtual territory of Amiais. However, with this narrative typology, some participants feel disoriented in space and unmotivated when they cannot complete challenges.

On the other hand, the participants whose usage profile focused on a freer space exploration did not lack motivation during the tests. However, they were also not so engaged in the narrative, with the characters and the tradition of the Desfolhada party, which is an Amiais cultural heritage landmark. Below there are some comments made to the test as a whole, which mainly highlight aspects related to the typology of narrative adopted:

"As I expressed it live, I missed a global map and a more global contextualization of the game's sub-objectives format, but I found the experience well accomplished and quite immersive."

"I suggested adjusting some challenges that involve taking long journeys to reach characters. Missing some tips and clues to find some people (e.g., Marco)."

Figure 7: Amiais Region in Second Life with green points marking narrative characters

Source: LOCUS Project

From another perspective, some technical difficulties made the immersion experience less stimulating. In some tests, there were system errors. For example, some NPC were incomplete (missing clothes or body parts); in some information panels the videos and images took a long time to load; in some challenges the tasks and/or or rewards did not work entirely (for example, when collecting the cornbreads there was no indication of the completed task, in some of the crop fields the agricultural products could not be collected, etc.). Thus, in the tests where some of these difficulties were verified, the participants were less motivated to continue exploring the virtual Amiais territory. Some of the following comments denote this lack of motivation:

"This has no music. I wanted to hear it!"

"But without picking up the cornbread, how do I give it to Ms. Ana for the party?"

"It is not loading any images. Do I have to stay here until I can see it?"

Regarding the users' perception of the real territory through the virtual experience of Amiais in Second Life (see graph 5), this was measured through the questionnaire. It should be noted that only one of the participants knows the physical territory of Amiais, having recognized it in the recreation made in Second Life. Thus, the participants were unanimous in considering that the virtual experience allowed them to get to know Amiais better, that they felt welcome in the village, and that the characters were welcoming. One of the participants' comments focused precisely on the characters and their importance to the narrative:

"It would be interesting to get to know the people who live there. At the same time, I think it is interesting not to characterize people too much to create an interest in visiting the physical site."

After the virtual experience, most participants stated that they would like to visit the real village, participate in the festivities, and socialize with the inhabitants to understand the local traditions. More than half of the participants also considered that after this experience, they would like to know other traditions of Amiais and other rural places. Below are some of the users' comments that reveal their positive perceptions regarding the virtual experience:
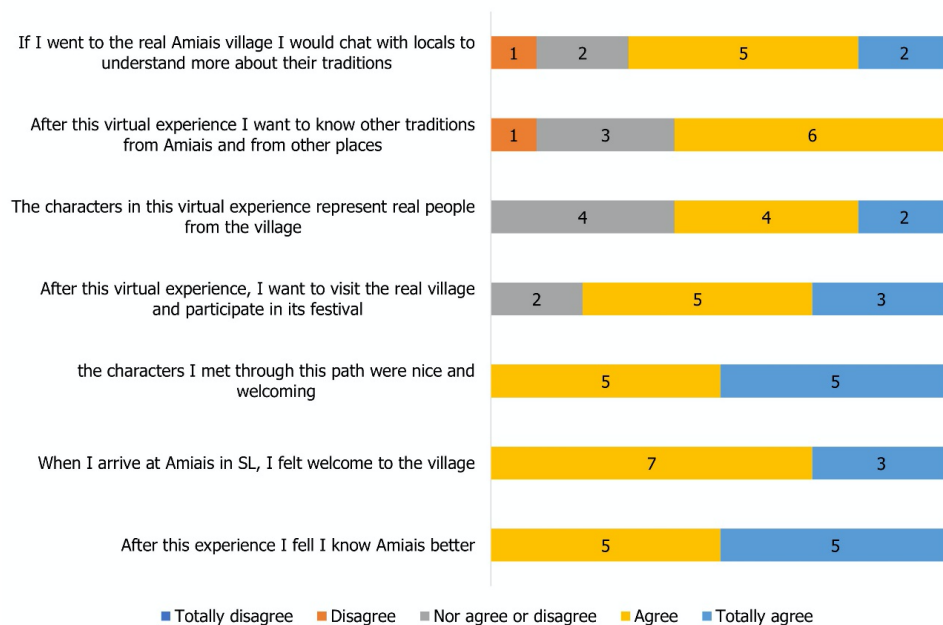
"The space is really cool! It feels like we're really in a village."

"Well, after this I really have to go to Amiais to see the village and see if it's the same as here!"

"The buildings are really cute and create a good atmosphere."

"After all this exploration, I really have to go to Amiais."

Graphic 5: Perception about real territory and virtual experience of Amiais

Source: LOCUS Project

To verify the convergence of virtual-real (see graph 6), the participants were also asked about the potential of visiting the real territory of Amiais after the virtual experience. The responses were unanimous, and all expressed a willingness to do so. In the same way, the majority indicated that they would participate and help prepare the Desfolhada party in the real territory if they had the opportunity. However, most participants did not feel integrated into the Desfolhada party through the proposed virtual narrative.

Graphic 6: Virtual-Real Convergence
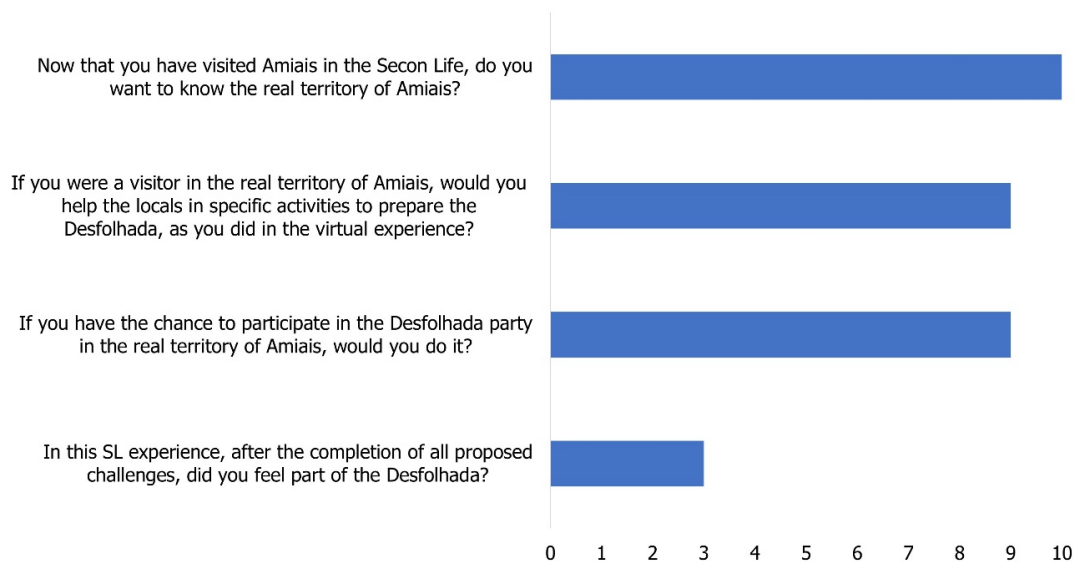
Source: LOCUS Project

Finally, the last topic analyzed in these tests was Cultural Heritage. Throughout the exploration of the virtual territory and the immersive narrative, users were presented with various information about the cultural aspects and traditions of Amiais. Desfolhada itself, which is the central theme of the immersive narrative, is itself one of the landmarks of Amiais' cultural heritage. Thus, to test the learning of the contents and the transmission of the cultural heritage through the narrative, four questions were asked in the questionnaire related to the information present in the exploration of Amiais in Second Life: "What is the name of the village festival?"; "When does the village festival take place in the physical territory?"; "Whose granaries are on the community threshing floor?"; and "What is threshing corn?". Nine out of ten users correctly answered all the questions, revealing that users were attentive to the information they received during the game and apprehended the cultural contents transmitted throughout the narrative.

When asked if "After this experience in Second Life, do you think you got to know the traditions of Amiais?", nine of the ten participants also answered in the affirmative. However, if we check the previous graph, the participants did not feel part of the Desfolhada party through this immersive virtual experience. One of the participants justified the answer by saying that "I missed being at the party itself, despite feeling like I was contributing to it". In other words, the narrative itself gives participants a set of information and content related to the traditions and cultural heritage of the village of Amiais, which users consume and learn throughout the immersive virtual experience. However, the feeling of belonging and integration into local

traditions could only happen if the tradition itself (in this case, the Defolhada party) actually took place in the virtual experience.

Conclusion

The present LOCUS project research focused on the Second Life metaverse, where the village of Amiais was virtually recreated. The objective of the investigation was to understand the potential of using digital environments of the metaverse type for the dissemination and learning of cultural heritage. To this end, the first challenge concerned the architectural recreation of Amiais in Second Life. Here, it is considered that the challenge has been overcome since the virtual scenario very accurately integrates the characteristics of the territory, the public spaces, and the exteriors and interiors of all buildings and public structures.

In addition to recreating the territory, the second challenge was to present in the virtual space the culture, tradition, and heritage related to the territory and the inhabitants of Amiais. To this end, virtual activities were developed to promote the local cultural heritage, based on interactivity, which allowed visiting users to explore the space and learn about the culture and traditions of Amiais while enjoying an immersive entertainment experience.

Thus, a narrative to explore the virtual scenario was developed, centered on gamification elements, with several challenges based on the interaction with local characters (NPC) and elements of the scenario. The narrative was developed to encourage the user to get engaged in one of the local traditions of Amiais (the annual Defolhada party), carrying out challenges that would allow both to contribute to the celebration of the party and explore virtual scenario. However, the narrative was also developed to integrate a free exploration by the user, who could choose to interact with different characters and elements without following the challenges. Thus, the narrative did not present a linear path and structure, having been designed precisely to allow the exploration of the virtual village of Amiais more freely or with the orientation of the proposed challenges.

In this sense, the challenges were dispersed in space, and the path was not structured, which led several participants to feel lost in the virtual space and the narrative itself. Given these data, the research project intends to keep the narrative open enough to allow both types of exploration. However, it will be considered to integrate new mechanisms that guide the user in the different challenges in the virtual territory (for example, maps of the village, more precise directions, or the incorporation of guiding characters for an escorted narrative exploration). In the same logic of improving the narrative to keep users motivated throughout the virtual village exploration, technical aspects that showed some difficulties during the use tests will be improved.

On the other hand, all users had a high level of interaction with the characters and the different elements of the virtual scenario. Similarly, several pieces of information and content about the traditions and cultural heritage of Amiais were also shared. This confirms the trends evidenced in the literature on the potential for learning and entertainment that three-dimensional virtual environments can have in educational, recreational, and cultural experiences such as the present one.

In addition, the contact with the virtual territory and cultural contents also aroused the participants' curiosity and desire to visit the real territory and know and participate in the local traditions. The participants' immersion in the virtual territory of Amiais, the interaction with village characters, and the scenario elements

provided forms of playful learning that allowed sharing of information about traditions and local culture, which relate to the main goal of this research on the potential of using a metaverse for sharing and disseminating cultural heritage.

Therefore, it is considered that the experience of virtualizing the territory of Amiais in a metaverse like Second Life presents itself as an adequate tool for the preservation and dissemination of local and cultural heritage, and therefore its use should be promoted. Future work should rely on developing more immersive narratives to explore the virtual territory of Amiais. Those should integrate new cultural experiences for users related to traditions (for example, experiencing the Desfolhada party itself). Also, based on the interaction with elements of the territory, it should add more informative layers to disseminate more content about Amiais that simultaneously create more significant learning and knowledge in the user and arouse greater curiosity in visiting the real space of Amiais.

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