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SHELLEY'S HEART: A MODEL OF MULTIUSER INFLUENCE IN LOCATION AWARE FICTION

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF BOURNEMOUTH UNIVERSITY FOR A MASTER OF RESEARCH

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Abstract

‘Shelley’s Heart: A Model of Multiuser Influence in Location Aware Fiction’ by Alexander Jones.

Location Aware Applications are those that utilise location to curate the scope and nature of the content that will be exposed to users. Location Aware Games and Location Aware Fiction are two of the sections into which research in this area has been divided.

One notable distinction between the two is that, while Location Aware Games are oriented towards multiuser experiences, Location Aware Fiction focuses principally on single-user experiences. The present study endeavours to establish the impact that multiuser interactions have upon Location Aware Fiction, specifically, the nature of the impact and its scale.

A model of multiuser influence has been developed, specifically to explore this research question. Moreover, a Multiuser Location Aware Fiction called ‘Shelley’s Heart’ has been produced, and an experiment to establish the impact of multiuser interactions has been carried out using this material.

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Acknowledgments

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Thanks to my friends who have aided me immensely: they suffered through my ramblings about locations and multiuser interactions.

Thanks to my parents who have supported me throughout this Master of Research (MRes) project: they have always been there and provided comfort in times of doubt.

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Author's Declaration

Some sections of this thesis have already been included in the following work:

Jones, A. *et al.,* 2018. 'Shelley's Heart'*: Experiences in Designing a Multi-Reader Locative Narrative.* Baltimore, USA, ACm Hypertext and Social Media, p. 5.

1 Introduction

Location Aware Applications are applications that use the Global Positioning System (GPS) or similar technologies to track the location of users. This form of application received wide attention following the successful launch of Pokémon Go[1] in 2016.

Pokémon Go, developed by Niantic and published by Nintendo for mobile devices, is a Location Aware Game that directs users to travel to real-world locations and 'capture' Pokémon. Although the game affords opportunities for indirect multiuser conflict (via so-called gym battles), the game is largely oriented towards single users. Nonetheless, since the game directs users towards real-world locations, it lends itself to several people playing at the same location, as shown in Figure 1.

Figure 1: People Playing Pokémon Go

The existing research into Location Aware Applications predates Pokémon Go and explores a variety of usages for location tracking. Within Location Aware Applications there are two fields that are relied upon in this thesis: namely, Location Aware Fiction and Location Aware Games. Packer *et al.* [1], who primarily address the development of a

[1] https://www.pokemongo.com/ [02/09/2018]

writers' toolkit, provide definitions for both Location Aware Games and Location Aware Fiction.

- Location Aware Games: This includes systems with game mechanics connected to user context as well as augmented reality experiences. The examples given are 'Viking Ghost Hunt' [2] and 'University of Death*'* [3].
- Location Aware Fiction: Focuses on delivering an engaging story within a place such as the iLand (*sic.*) of Madeira [4], San Servolo [5] or a collection of stories around Dublin [6].

Location Aware Games and Location Aware Fiction differ regarding one element of functionality, although they are similar in other respects. Location Aware Games have predominantly been researched as multiuser experiences [7, 8, 9, 10, 11, 12, 13, 14, 15] while Location Aware Fiction has been researched in terms of single user experiences [16, 5, 6, 4, 17, 18, 19, 20, 21]. Hence, the impact of multiuser experiences is much less well documented for Location Aware Fiction than for Games.

While there is scant research regarding the effect multiuser interactions have upon Location Aware Fiction, Spawforth and Millard [22] have begun to explore the effect that multiuser interactions have upon narratives in general. Spawforth and Millard's approach has been to analyse multiuser games, to establish what kind of interactions can occur between users. Although a framework of multiuser interactions has been derived from this approach, the framework does not address the impact of these interactions on each user's narrative. Therefore, while the framework of multiuser interactions provides some of the necessary vocabulary for discussing the effects of such interactions, it does not provide everything needed.

For this research project to explore the effect that multiuser interactions have upon Location Aware Fiction, a model of multiuser influence must be produced that expands upon Spawforth and Millard's [22] framework of multiuser interaction. The *effect* of interactions on narrative, rather than the interactions *per se,* will be the focus of this model. The model of multiuser influence will be developed through an analysis of existing Location Aware Fictions and Location Aware Games and of the related literature.

The development of a Multiuser Location Aware Fiction named ’Shelley’s Heart’ will provide a basis for testing the multiuser-influence model. ‘Shelley’s Heart’ was previously a play that an author envisioned as an example of Location Aware Fiction. For this research project, it will be implemented as such and also expanded to function as a multiuser narrative. ‘Shelley’s Heart’ will be deployed within an experiment to explore the effect that multiple users have upon the narrative and the users’ perception of the experience.

A previous publication, that outlined both ’Shelley’s Heart’ and the model for multiuser influence, contained some of the earlier work for this study and was presented at NHT [23].

1.1 Contribution

The contribution to academia is threefold: firstly, it comprises a new model of multiuser influence that describes the impact users have upon each other’s experiences in a Multiuser Location Aware Fiction. Secondly, it represents the development of ‘Shelley’s Heart’ into a Multiuser Location Aware Fiction; and thirdly, it contributes an analysis of the impact that multiuser interactions have upon Location Aware Fiction.

In service to establishing the exact impact that multiuser interactions have upon Location Aware Fiction, moreover, the following research questions will be answered:

1. Do multiuser interactions impact Location Aware Fiction?
2. What is the nature of that impact?
3. What is the scale of that impact?

These questions are relevant because (of course) they look to establish not only whether Location Aware Fiction is affected by multiuser interactions, but if so, how it is affected and to what degree.

1.2 Chapter Breakdown

Each of the research questions will be addressed in the course of six chapters that comprise this study.

Chapter 1: An introduction to the subject and an outline of the contribution.

Chapter 2: A literature review of theory regarding Location Aware Fiction, together with a review of current Location Aware Fiction systems, a review of current Location Aware Game systems, and a review of theory regarding Multiusers in narrative.

Chapter 3: A presentation of the model produced to describe the exchange of influence between users in a Multiuser Location Aware Fiction.

Chapter 4: The Location Aware Fiction ('Shelley's Heart') adapted for this study will be introduced, and its development will be examined.

Chapter 5: A presentation of the methodology used in the experiment for this research and the analysis of its results.

Chapter 6: The conclusions arising from this study will be presented, and potentially fruitful future work will be addressed.

2 Literature Review

The following Literature Review will address three phenomena in particular, namely: Location Aware Fiction, Location Aware Games and multiuser game narratives.

2.1 Location Aware Fiction

As defined in the introduction, a Location Aware Fiction is a Location Aware Application that focuses on delivering an engaging story within a set location such as the 'iLand (*sic.*) of Madeira' [4], 'San Servolo' [5] or 'Media Portrait of Liberties' [6].

There are several examples of Location Aware Fiction that may be found throughout academia, and the start of this section of the literature review will explore these examples and related theoretical perspectives. Next, an examination will be made of several Location Aware Fictions, which will in turn produce a synthesis of the broader trends within such material.

2.1.1 Theory of Location Aware Fiction

Generally, Location Aware Fiction has been subject to two interrogative approaches. The first approach looks at the patterns that naturally emerge within Location Aware Fiction using a hypertext perspective [24, 25], and the second looks to establish best practices for the development of Location Aware Fiction via a toolkit of considerations [1]. Within the following sub-sections, these two avenues will be interrogated separately. It should be noted that these theories or strategies are not being compared one against another, but rather their merits will be explored before they are used in conjunction.

2.1.1.1 'Canyons, Deltas and Plains' and 'Patterns of Hypertext'

'Canyons, Deltas and Plains' (CDP) is a conceptual model based around sculptural hypertext that aims to describe the general structures of Location Aware Fiction [25]. It is comprised by three potential node-based structures that describe the patterns that emerge in Location Aware Fiction – i.e., the so-called Canyons, Deltas and Plains.

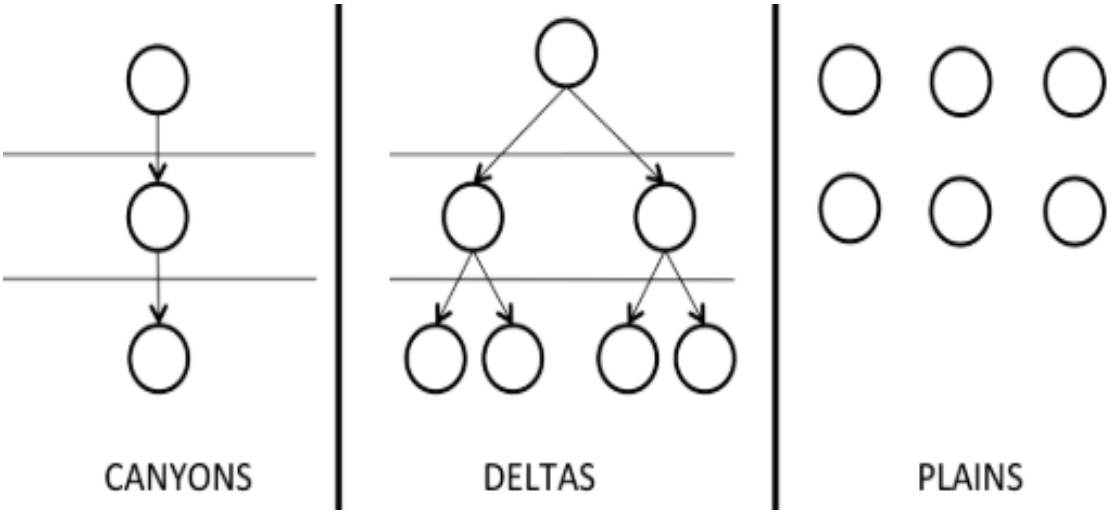

Figure 2: A representation of Canyons, Deltas, and Plains [25]

Canyons represent narratives that are a fixed sequence of nodes, while Deltas represent narratives that can 'branch' based on a user's interaction, and finally, Plains represent a narrative that is composed of nodes that can be explored in any order [25]. A visual comparison of the three high-level node-based structures is made within Figure 2.

Canyons, Deltas, and Plains [22] are considered to be the basic structures of Location Aware Fiction but there structures that emerge between only a few nodes: these are the patterns. Gating, Alternative Nodes, Phasing, Parallel Threads, Concurrent Nodes, Foldbacks and Unlocking are the principal patterns that emerge [24]. The requisite conditions for nodes to appear are set by these lower-level structures, and the relationships between nodes themselves are reflected by them. The patterns presented are the result of an examination of multiple Location Aware Fictions such as 'iLand of Madeira' [4], 'RIOT' [20], and 'San Servolo' [5]. The patterns can be seen within Figure 3.

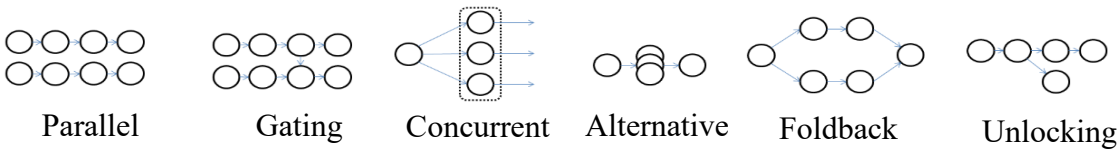

Figure 3: The patterns of sculptural hypertext visualised [24]

It is important that these structures, both high and low level, be clearly established within this research, as they afford a common vocabulary via which the structural designs of Location Aware Fiction may be addressed. Such an awareness also facilitates discussion

regarding the relative suitability of these structures in terms of Multiuser Location Aware Fiction.

2.1.1.2 Considerations of Location Aware Fiction

Examination and reflection regarding several Location Aware Fictions, driven by interviews with their authors and readers, produced a series of considerations for the development of Location Aware Fiction. The considerations are divided into three categories: Deal Breakers, Pragmatics, and Aesthetics [1].

- **Deal breakers** describe elements that will influence how likely users are to complete an experience. Deal Breakers comprise, for instance, the total amount of reading time required, the physical ability of users to reach certain locations, and practical concerns regarding arrival and departure points [1].
- **Pragmatics** describe how best to utilise and account for the environment regarding user movement. For example, using the landscape to influence a user's movement, considering the effort-cost of difficult terrain such as hills, and the viability of locations in terms of literal access or reader safety [1].
- **Aesthetics** describe how to utilise the physical environment to enhance the Location Aware Fiction's narrative elements. For example, using physical locations to separate stages of the narrative, making use of key landmarks to link the narrative to the location, and taking due care with references to physical elements of the environment that could change, such as trees [1].

These considerations may seem obvious, but the systems that will be presented in the next section of this literature review will show that some of these factors are often forgotten during development. Hence, the utility of a list comprising aspects that should be considered when developing Location Aware Fiction is readily apparent. Closer inspection indicates that, while the suggested model has not yet been deployed to develop Multiuser Location Aware Fiction, there is no reason why it may not be so used. It is likely that there will be elements unique to Multiuser Location Aware Fiction that will have to be considered, in addition to those aspects that have been specified already.

2.1.2 Examples of Location Aware Fiction

There are a variety of Location Aware Fictions that have been developed over the years, and this section will present examples, seek to learn their key lessons and provide a

synthesis of overarching trends. A soft divide will be made within this section between Location Aware Fictions specifically designed in tandem with the theory of Location Aware Fiction, and those that have been designed separately from it.

2.1.2.1 Theory Based Location Aware Fiction

The two Location Aware Fictions produced in line with the theories presented earlier are 'The Isle of Brine' [16] and 'Snow White is Missing' [21]. These research examples will be addressed together, rather than allocated separate sections, since there are only two.

'The Isle of Brine' is a narrative focusing on a single protagonist, a surveyor sent from the mainland to survey the Tiree. As the story progresses, it becomes clear that he is connected to the island, the line between myth and reality becomes blurred, and he is subsequently forced to 'confront' the decisions he has made [16].

'Snow White is Missing' is an easy-to-follow narrative that converts the traditional 'Snow White' fairy tale into a Location Aware Fiction aimed at dementia patients and their families. There are several narrative arcs, centred around dwarves, that subtly refer to issues those with dementia may encounter: being intelligent but forgetful, wanting to help but being too tired, being angry because you are labelled as angry, and another thread in which, by trying to be helpful, one dwarf makes another dependent upon them. The reason for this is that 'Snow White is Missing' is designed to be a Therapeutic Location Interactive Fiction (TLIF); in other words, it is an experience designed to aid in the care of those with an affliction (in this case, dementia) [21].

The conclusion that the considerations mentioned in section 2.1.1.2 are like features of games development, e.g. level design, is central to the research regarding 'The Isle of Brine'. Considerations of this type would be foreign to those authors who had not encountered such elements before; this is supported by 45 authors having manifested difficulties in appreciating the importance of such aspects when working with the researchers [16]. The effect of terrain on user behaviour would be an example of such 'level-design-reminiscent' considerations. Millard and Hargood [16] highlight the fact that if an author places a Plain of nodes from the CDP model [25] upon a physical path, users are likely to follow that path, even though a Plain of nodes does not have a fixed order. This has the effect of transforming the Plain into a *de facto* linear canyon.

To highlight the importance of this revelation, one should consider why an author might have chosen to use a Plain over a Canyon [25]. One possible reason would be to provide a reader with more agency, but should an author stick with the aforementioned example and place a Plain upon a road, they may have removed the feeling of agency a user would otherwise have acquired, since the road implies there is a route a user 'should' follow. To be clear, should one not consider the consideration within the toolkit, there could be scenarios in which the effect of the structural design is hampered.

'Snow White is Missing' [21] also approaches the design of Location Aware Fiction much like designing a level. 'Snow White is Missing' positions its nodes within a close vicinity to facilities its older audience is likely to require, and simultaneously avoids 'high cost' [24] areas that an older audience is likely to have difficulty traversing .

Both Narratives, 'The Isle of Brine' [16] and 'Snow White is Missing' [21], are deployed on the Storyplaces platform, which is an authoring tool available online. This platform is designed around the CDP model [25], and is designed to accommodate quick designation of the relationship between nodes. A story being read via the Storyplaces platform is shown in Figure 4.

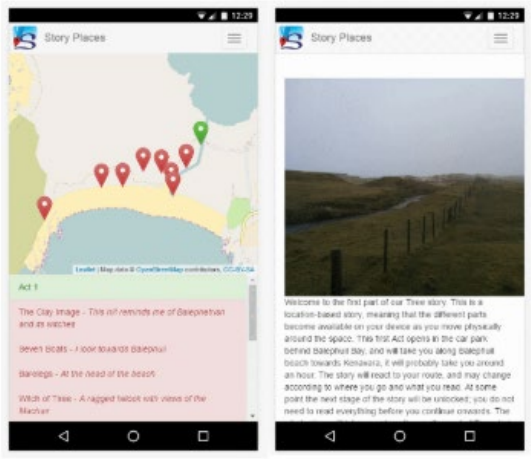

Figure 4: A story being read on the Storyplaces platform [16]

2.1.2.2 Other Location Aware Fiction

The theory cited earlier does not, however, underpin the following Location Aware Fictions. These will be examined to establish trends, and they will be analysed with a lens derived from CDP and the writer's toolkit, in preparation for the synthesis of Location Aware Fiction as a whole.

2.1.2.2.1 ‘Hopstory’

‘Hopstory’, the events of which unfold within a brewery over a single working day, is a historically inspired Location Aware Fiction; it focuses on four main characters. These four characters provide different perspectives on the narrative as each engage in different activities, encounter different secondary characters, and appear in different locations [19].

Each user was given navigational instructions for ‘Hopstory’ and presented with a keyring containing an Ibutton. The participants, while exploring the retired brewery, would encounter several sculptures that held Ibutton Receivers: when connecting an Ibutton to an Ibutton receiver the user would receive content [19]. Each of these sculptures are in effect functioning as nodes for the narrative and these nodes are structured as a Plain [25] - specifically, a Plain of Alternative Nodes [24] that can be visited in any order, but provide different content depending on when they are visited. The content changes on a seven-minute cycle and the change itself represents the four characters moving around the brewery according to their daily schedule. When content is received, an audio clip related to the content is played and a video clip is stored on the participant’s Ibutton. ‘Hopstory’ participants may view their video clips, in the same order in which they were collected, in a specially provided lounge area [19].

Nisi *et al.* made several observations about their participants’ experiences with ‘Hopstory’, and four of these observations are of particular note. Firstly, they stated:

> *'The audience was interested and curious about the distributed structure of the narrative; they appeared to find the concept of a location-based narrative fascinating.’ [19]*

This is evidence that Location Aware Fiction has a positive effect on the narrative experience, though it does not describe the degree of this effect or whether this effect will be diminished once users become more familiar with the concept of Location Aware Applications. Thus, any future research could potentially explore this impact in terms of a quantitative evaluation.

Secondly, they stated:

> *‘While some had difficulty relating the collected fragments to the experience, others reported a relaxed experience.’ [19]*

This indicates that a user's technical proficiency may have an impact on how a user experiences a technologically driven narrative, such as a Location Aware Fiction, although once again the degree to which this is the case has not been determined and should be accounted for using a quantitative analysis.

Thirdly, they stated:

> *'They pointed out that not having to stop and view the story at every node created a less disruptive experience that contributed to a more coherent plot.' [19]*

This may be an area for future exploration: namely, a comparison of Location Aware Fictions that provide most of their content at the end of the experience, versus those Location Aware Fictions that provide content while the experience is in progress. While this question lies beyond the scope of the present study, it would certainly appear to merit further analysis.

Fourthly, they stated:

> *'Few wanted to go back and experience more stories because they were aware the story was occurring in their time.' [19]*

This quotation is significant, as it implies that users did not wish to explore a different narrative each time, although they were afforded the chance to do so. One area to explore in the future would be to examine if any additional features should be proffered or if specific criteria must be met to entice participants into exploring a narrative further.

2.1.2.2.2 RIOT

'RIOT' is based around an actual historical event: to be precise, a 1931 riot that occurred in response to the rejection of a political bill for extending the franchise. It is set within the park where this riot took place, and rather than having a central character, it instead plays audio clips representing the various actions undertaken during the riot. For example, participants may listen to sound clips that represent rioters plundering buildings, merchants running for their lives or guards cutting down rioters [20].

Participants were issued with a small backpack containing an iPAQ Personal Digital Assistant (PDA), a GPS receiver, and headphones. Audio clips were triggered in response

to particular locations as participants explored the area. There were 34 areas that could each trigger up to three audio clips: the audio clip that would play was randomly selected upon entering the area, except for a few audio clips that had specific logical associations. For example, one audio clip involves the rioters moving a piano from location A to B, and another has rioters playing the piano at location B; hence, a user would be unable to hear the first audio clip if they had already heard the second, as it would not make sense to hear the piano being moved after a user has already heard it being played at its new location [20].

As with 'Hopstory', this form of content presentation evokes a Plain, wherein different regions fulfil the functions of Alternative Nodes. Interestingly, 'RIOT' makes use of a pattern not explicitly defined in the CDP model [25] or the patterns of hypertext [24]. Specifically, as we saw with the piano scenario, 'RIOT' sometimes locks access to content. The regions of 'RIOT' can be seen in Figure 5, below.

Figure 5: The regions of 'RIOT' [20]

Participants in the 'RIOT' study derived enjoyment from several facets of the Fiction. For example, they appreciated being able to walk around the square without the obtrusion of a physical user interface. They also enjoyed hearing regional dialects or references to local landmarks, if they had an affinity to the area. The actual square itself was described as being a comfortable place for walking, and lastly, some users described enjoyment at being detached from others as they became immersed in the experience [20] .

The fact that users specifically enjoyed a sense of separation deriving from narrative immersion is significant to this study. If this enjoyment is not surmounted by potential enjoyment given by the addition of multiuser interactions, it may be hard to justify the addition of multiuser interactions, as these may prevent participants from experiencing a similar stimulus from their narrative immersion. This aspect is captured by users making

comments such as, ‘I didn’t even see people. I kind of switched off and I was there at the riots’, and ‘No, you feel you are more in it not playing a part or anything but in it’ [20].

Blythe *et al.* [20] further highlight the following:

> *‘Most interviewees realised that the play was based on real events, but the absence of any temporal sequencing was problematic and confusing. Some scenes took place inside buildings, some were of conversations or events in the square, and some were events that happened just off the square. The loose coupling between the scene and the location in the square was a disappointment to some people.’*

The significance of the aesthetic considerations comprised in the writer’s toolkit is emphasised by the passage above [1]. To be precise, in this instance, the physical reading environment should correspond to the narrative. By contrast, ‘Hopstory’ [19], which linked narrative to location, did not receive negative feedback of this kind.

It was also noted that:

> *‘Although the designers did not deliberately structure goals or objectives for users, some imposed their own goals. Examples of these self-imposed goals were: to hear every file; to cover the entire square; to walk along each path; to understand what happened in the riot; to understand the system; to find particular files.’ [20]*

This observation is highly important, as it reveals that participants may autonomously incorporate mechanics into their game interactions, even when game mechanics are not overtly part of the system. It seems reasonable to hypothesise, then, that users’ enjoyment would be enhanced if such self-imposed mechanics were enabled in a systematic manner.

2.1.2.2.3 ‘Media Portrait of Liberties’

‘Media Portrait of Liberties’ is set within a disadvantaged inner-city Dublin neighbourhood called Liberties, and presents the stories, anecdotes, and memories of its residents. Their topics ranging from changes in local architecture to the supernatural, the narratives are presented on a location-sensitive handheld computer and take the form of short video clips [6].

Like ‘RIOT’ [20], ‘Media Portrait of Liberties’ made use of an iPAQ handheld computer and GPS, and a large SD card was also used to store the videos. The map displayed on the ‘Media Portrait of Liberties’ iPAQ is a hand-drawn depiction that exceeds the bounds of the screen and therefore users must scroll around the map by dragging the iPAQ stylus across the screen. The hand-drawn map was intended to distinguish ‘Media Portrait of Liberties’ from route-finding applications, guidebooks and other map-based interfaces [6]. The map can be seen in Figure 6, which shows a close-up of the icons and illustrates how they were placed on the hand-drawn map.

Figure 6: Two views of the ‘Media Portrait of Liberties’ map [6]

It appears that the stories, anecdotes and memories that exist within ‘Media Portrait of Liberties’ [6, 18] are presented to users using a Plain structure [25] but not enough detail is given to determine the specific patterns used [24].

Within the research, the analysis of the results showed a high level of interest and engagement of the project among all participants, but it also showed that the experience of those that were ‘local’ to the area was very different from the experience of participants who were less familiar with the neighbourhood [6].

The first difference, perhaps unsurprisingly, was that locals manifested a more relaxed attitude than non-locals. To be precise, the research indicated that non-locals felt uneasy in a ‘deprived’, unfamiliar neighbourhood. The community members, who were relaxed, therefore experienced more positive interactions with members of the community who were not participating in the experience.

The next difference was that the participants local to the area were able to relate directly to the content they were experiencing, as they remembered the events, places and people involved in the narrative.

> *'Finding a character the audience members could relate to in real life released a sense of confidence and achievement in the participants and pulled them right into the story, connecting the anecdote and the history of the place to their actual lives' [6].*

In contrast, participants who were not local to the area generally commented that the experience was interesting, as it let users roam in and explore an area that they would never have got to know otherwise. This is significant, as it suggests that many would generally refrain from entering a poorer district such as the Liberties, despite it being relatively well known [6].

Since participants from and not from the area report different experiences, as shown by this research, it would be important to control for such discrepancies when evaluating the scale of the impact of any feature. This would also apply to the principal focus of the present study, i.e. multiuser interactions.

Of key interest is the interaction that 'Media Portrait of Liberties' facilitated between those who were local to the area and those that were not. For example, as participants that were not local wondered about specific dates or facts regarding local monuments, such as the statue of Jesus, participants who were local to the area would respond with the relevant information [6]. The phenomenon of users autonomously interacting among themselves, without being prompted to do so by the system, mirrors the spontaneous addition of mechanics to 'RIOT' by its participants [20]. Such additions, as stated above, suggest this may be a potential system that would be of interest to users. Moreover, it provides additional evidence for the potential positive impact of the addition of multiuser interaction.

As with 'RIOT' [20] and 'Hopstory' [19], users highlighted the fact that the links between the narrated events and the physical story site were not always clear. Within the research, Nisi *et al.* [18] propose two possible remedies:

- Having the narrator of the story directly state the location to which the story relates before proceeding with the narration itself.

- Placing visible marks upon the physical locations or landmarks that the narrative is referencing.

The first of the two approaches has not been tried in research covered by this literature review, but as previously mentioned, 'Hopstory' [19], which included sculptures at its physical locations, reported similar complaints from participants, and this is therefore unlikely to be a suitable solution unless accompanied by additional interventions.

2.1.2.2.4 'iLand of Madeira'

'iLand of Madeira', like 'Media Portrait of Liberties' [6, 18], is based upon a collection of stories from one area [4]. In total, eight narratives were produced that were set within Rua Santa Maria in Funchal. The location was chosen for its 'mysterious but traditional' feeling that matched the ambience that the authors were trying to portray within their narrative. As noted earlier, the association of narrative themes with themes of physical locations is a consideration highlighted in the writer's toolkit [1].

The authors of the research on 'iLand' noted various narrative strengths, but also observed some problematic issues. The location tracking was positively received, which matches the points made earlier in this literature review. There was an occasional disconnect between physical location and the narrative, which matches the issues reported in 'RIOT' [20] and 'Media Portrait of Liberties' [6, 18], and there were further concerns about the danger caused by road traffic. The two principal concerns that were presented, however, once more highlight the considerations foregrounded via the writer's toolkit [1].

2.1.2.2.5 'San Servolo'

'San Servolo' [5], set within Venice Lagoon near San Marco Square Park, focuses on the life on the island during the period of the sanatorium. 'San Servolo' uses eight locations that are linked to ten potential nodes; six of the locations are tied to one node each and two locations host two nodes. In terms of the CDP model, this would be a mixture of a Canyon in nodes 1,2 and 3 and a Plain in the form of 4, 5, 6, 7, 8, 9 and 10. The main pattern employed is an unlocking pattern for 2, 4, 5, 6, 7, 8, 9 and 10 with 1 being the trigger. The nodes can be seen in Figure 7.

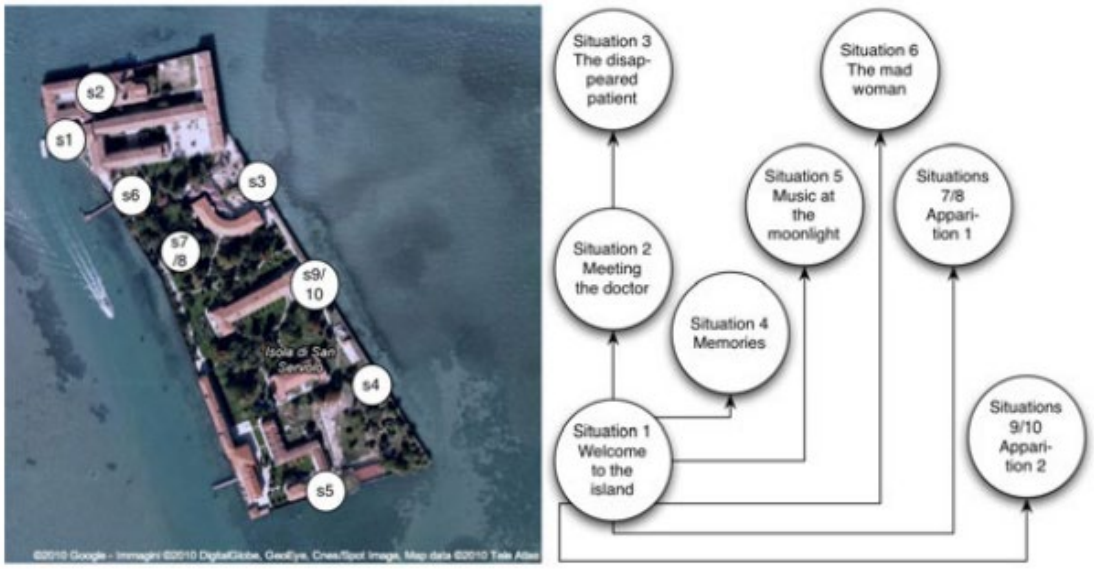

Figure 7: The layout and nodes of 'San Servolo' [5]

Users gave positive feedback regarding 'San Servolo' – as indeed, they did to the other Location Aware Fictions, which provides further evidence of the general viability of the format.

From the perspective of the present study, however, the main point is as follows:

> *'While in the previous work we described stories designed for single user interactions, in this paper we considered the possibility for the author to deliver a story for a community of users. The primary role for this community is the sharing of the users' experience, not only for helping other users to discover fragments of content available in specific context conditions, but also for achieving a deeper cognitive and emotional comprehension of the experiences lived by its members… The community represents also an additional dimension of the context that may be used by the story creator for enabling the access to specific fragments of the narration depending on the actions of the community members' [5].*

This shows some consideration for the potential of multiuser interaction within Location Aware Fiction, although it should be noted that while multiuser interaction was supported by the software developed for 'San Servolo', the student authors involved in the project did not choose to use it to influence the story, and it is therefore only an avenue for sharing

experience. Nonetheless, this still evinces potential interest regarding the inclusion of multiuser interactions in expanded forms of Location Aware Fiction.

2.1.3 Observations of Location Aware Fiction

All the Location Aware Fictions explored in this literature review are single-user experiences [16, 19, 6, 4, 18, 20, 5], with the exception of 'San Servolo', which incorporated social media for users to share their opinions and interact. 'Hopstory' [19], 'Media Portrait of Liberties' [6] and 'Snow White is Missing' [21] all had some form of interaction between participants. (Albeit these systems *per se* did not support or encourage such interaction.) For example, 'Hopstory' allowed participants to view the stories that others had collected by staying in the lounge area. 'Media Portrait of Liberties' [6, 18] saw locals exchanging information with those new to the area, and 'Snow White is Missing' was intended to be read by both the elderly and their younger relatives from the same device. This reflect a general trend for participants in Location Aware Fiction mutually to interact. This is likely to happen, as connecting content to physical locations provides opportunities for interactions between participants at those locations, but the literature does not explore how this interaction between users affects the experience - hence the need for work in this area.

All the Location Aware Fictions [16, 19, 6, 4, 18, 20, 5] saw the majority of their users reporting a positive experience, but none of the literature has sought to provide a quantitative evaluation of the impact that location tracking features had on narrative. To be clear, it is known that participants report a positive experience, but it is not known how much of that positivity can be attributed to the location tracking features, or indeed, if other factors will change the effect. While research is undertaken into the addition of multiuser interactions to the Location Aware Fiction, this factor should be addressed via the publication of a quantitative analysis that attempts to isolate and assign a numeric value to the effect. A coherent means of measuring that effect is necessary, because it would facilitate comparison between differing methods of implementing location tracking technology.

The perception of discrepancy or disconnect between narrative and environment was a common phenomenon among users of the Location Aware Fictions observed. 'RIOT' [20], 'Media Portrait of Liberties' [6, 18], and 'iLand of Madeira' [4] all reported such findings.

This is important because it relates to the Aesthetic Considerations of the writer's toolkit [1], which specifically focus on ensuring a connection between environment and narrative. It will be essential therefore to pay full attention to Aesthetic Considerations so as to avoid similar complaints of a disconnected location and narrative.

Lastly, the early works of Location Aware Fiction seemed to focus on a Plains-style structure [5, 6, 18, 19, 20] as defined in the CDP model [25, 24]. Conversely, subsequent works began to deploy Plains merely for non-essential content, while conveying overarching narrative via Deltas or Canyons. This is a shift in focus from simply exploring how users interact with physically distributed content, which is essential when incorporating such a new concept, to trying to explore which narrative structures suit Location Aware Fiction best.

In summary:

1. There is a clear trend towards single-user focused research in the field of Location Aware Fiction.
2. There is a reported positive experience with Location Aware Fiction, but the scale of this impact has not been measured numerically.
3. Disconnects between environment and narrative are frequently noted and commented on by participants in Location Aware Fiction.
4. Over time, research in Location Aware Fiction has moved from a Plain approach to a more complex structure that incorporates Canyons and Plains.

2.2 The Framework of Multiuser Interaction in Games

This section will examine theories regarding how multiuser interaction can be modelled within Interactive Digital Storytelling (IDS). IDS is defined as interactive stories that exist within digital platforms such as video games, and this means it can both be applied to Location Aware Games and can also be used in the development of a model for Multiuser Influence. Indeed, the subsequent two sections will interrogate these possibilities in detail.

In an attempt to develop a suitable framework, Spawforth and Millard [26] analysed multiplayer video games and the multiuser interactions that occur within them. Their earlier research focused on the game 'Dark Souls' but also provided several minor examples from other games such as 'Space Station 13' and 'World of Warcraft'. The narrative generated

via multiuser interaction would be reflected in a sculptural hypertext methodology, which was deployed to model the interactions in 'Dark Souls'. This can be seen in Figure 8.

```
Ghost Encounter:
  Conditions:
    - {player1} at {location1}
    - (other conditions that indicate an
      encounter should happen)
  Effects:
    - (∀Players) ghost seen at location1

Description of Garden:
  (Text describes warm and vibrant garden)
  Conditions:
    - {player2} at {location1}
    - NOT ghost seen at location1

Description of Garden:
  (Text describes cold and drab garden)
  Conditions:
    - {player2} at {location1}
    - ghost seen at location1

Romeo rejects Rosaline:
  Conditions:
    - {player1} follows Romeo
    - (other narrative conditions...)
  Effects:
    - (∀Players) Romeo has rejected Rosaline

Juliet and Paris meet:
  (Text has Paris mentioning Romeo and Rosaline)
  Conditions:
    - {player2} follows Juliet
    - NOT Romeo has rejected Rosaline
  Effects:
    - (∀Players) Juliet is unsure of Romeo

Juliet and Paris meet:
  (Text makes no mention of Rosaline)
  Conditions:
    - {player2} follows Juliet
    - Romeo has rejected Rosaline
  Effects:
    - (∀Players) Juliet is intrigued by Romeo
```

Figure 8: 'Dark Souls' as sculptural hypertext [26]

To expand upon the modelling of 'Dark Souls', Spawforth and Millard [22] go on to provide a framework of multiuser interaction based upon interactions they observed within a sample of 17 games spread across 17 of Metacritic's listed genres. Metacritic is a highly popular reviewing service for a variety of media. The framework of multiuser interaction is a taxonomy that explores the 'General Characteristics', 'Recipient Characteristics', and 'Initiator Characteristics' of interactions.

2.2.1 General Characteristics

As the name implies, shared aspects of an interaction – i.e. elements that are unique to neither initiator nor recipient – are those referred to as General Characteristics. General Characteristics consist of the 'Likelihood', the 'Type' and the 'Synchronicity' [22].

'Likelihood' refers to the probability of an interaction occurring – and this might be either possible or certain [26]. An interaction is guaranteed if the recipient can notice the effect regardless of their current situation or state. For example, if one user kills another, the user that has been killed will always notice this has happened, but by contrast, if one user collects an item, another will only become aware should they either see the collection or find the item missing when they go to collect it.

'Type' describes the nature of an interaction [22]; an interaction can either be informational or mechanical. Informational interactions provide information to other users while mechanical interactions can alter the state of play for other users. For instance, an informational interaction occurs in 'San Servolo' when public feedback from previous users may be read. Conversely, had the ability for comments to change the story been implemented it would have been an example of a mechanical interaction.

'Synchronicity' refers to the chronal aspect of the user's interactions [22]. Specifically, an interaction can either be synchronous or asynchronous. An example of synchronous interaction would be one in which users are playing an online shooter. Here, the user's actions are synchronised with other users; a user would need to be present in a game when an interaction occurs in order to experience it. An example of asynchronous interaction would be from 'San Servolo' [5], when users post comments any future reader can access, despite their not being present at the time of the interaction.

2.2.2 Recipient Characteristics

Recipient Characteristics, as the name implies, focus upon the potential recipient of any interaction. It is important to note - as some interactions are indirect, as is the aforementioned example of picking up an item - that the recipient can be accidental and does not have to be expressly targeted for the purposes of this framework. Recipient Characteristics are composed of 'Explicit Awareness', 'Deductive Awareness' and 'Initiator Identifiability' [22].

Explicit Awareness refers to a situation whereby the effect caused by another user is overtly explained to its recipient. Explicit Awareness can be described in three ways: 'always', 'possibly', or 'never'. For example, should a user score a point in an objective-based game, there are three scenarios that would match these descriptions. Users would 'always' be explicitly aware, for example, if the scoring of a point resulted in a screen prompt being sent to all participants. If, when users score, there is a location within the digital game world where this fact is displayed, one would say it is 'possible' for users who have visited that location to be made explicitly aware; and should the score be displayed nowhere within the game, it is 'never' possible for users to become explicitly aware.

Deductive Awareness describes whether or not a recipient can deduce that an interaction has occurred within the system, and as with explicit awareness, this can be defined as

‘always’, ‘possibly’ or ‘never’. For example, if a user is harmed within a game in which such harm can only be inflicted by another user, it is always possible to deduce that a user is responsible. If the game comprises both environmental damage and user damage, it may only be possible to deduce whether user interaction caused the damage. Lastly, if a game comprised both an AI that was human in behaviour *and* inter-user damage, it might never be possible to deduce if user interaction occurred.

A situation whereby a recipient is able to identify the user who triggers or begins an interaction is called Initiator Identifiability. This can, once again, be defined as ‘always’, ‘possible’ and ‘never’. For example, one might picture a situation wherein several users participate in a video game’s death-match mode. If the game camera showed the recipient who ‘killed’ a user, the latter would always be able to identify them, but if the game camera hovered over the participant’s deceased character, it would be possible to identify the initiator only if they walked in front of the camera. Lastly, it would never be possible to identify the initiator if the camera went directly to black upon the character being killed.

2.2.3 Initiator Characteristics

Initiator Characteristics, as the name implies, focus upon the initiator of any interaction. The Initiator’s Characteristics are composed of ‘Explicit Feedback’, ‘Deductive Feedback’ and ‘Recipient Identifiability’. Each functions in a way reminiscent of the associated Recipient Characteristics, but in the other direction.

2.2.4 Observations

The main area of criticism that Spawforth and Millard [22] provide regarding their own work is that some of the categories can suffer from ambiguity when specific mechanics are introduced. For instance, voice chats and other types of free-form communication allow users to inform each other of potential actions. Such access to communication could alter the value of awareness, visibility and identifiability as the participants can convey information to one another. This is an issue in more complex games that have several overlapping systems intended to convey information to a user about the same interaction, although the framework is still an effective tool to examine individual mechanics, rather than an entire system.

Spawforth and Millard [22] also highlighted the fact that three-way interactions were not considered: for example, one user saving another from a third user. Nonetheless, if this

framework examines interactions, which it does, then this is not a weakness, as such a scenario could be described as a series of interactions rather than one.

This framework is an effective basis for describing the interactions between users. It therefore represents a logical progression from the earlier observations regarding 'Dark Souls' made by Millard and Spawforth. Nevertheless, the framework does not describe the narrative that interactions create, and so an expansion to this model would have to focus on this shortcoming.

2.3 Location Aware Games

There are several examples of Location Aware Games that can be found throughout academia. 'Pirates!' [7], 'ARQuake' [8], 'Can You See Me Now?' [9], 'Hitchers' [13], 'Mobi-Missions' [14], 'Bills' [10, 11], 'Tycoon' [11], 'City Explorer' [15] and 'Viking Ghost Hunt' [2] will all be explored within this section.

'Pirates!' [7] and 'ARQuake' [8] were some of the first attempts at location-based games but they took two different approaches, 'Pirates!' attempted to relate physical locations to a game that would be placed on a screen while 'ARQuake' attempted fully to integrate its users into an augmented reality world that would overlay the real world via the use of a headset. In effect, one did not attempt to use an augmented reality overlay while the other did.

'Pirates!' [7] was a game in which a map of the game's world was digitally overlaid over a room, and as users physically moved around the room their location in the game would update in relation. To undertake so-called missions, the users moved between various islands that were represented on a map; on completion of a mission, participants returned to a hub. Moreover, users were able to harvest certain resources from the islands that could then be exchanged for gold or other valuables. To supplement the player-versus-environment content, there was also player-versus-player content which allowed the users to attack each other's ships while at sea. To engage another user, a user must be within range, just as when they are visiting an island. Also of note is a large score board that was placed in the room, so users could track their scores. While users generally enjoyed the game, they did not engage with the player-versus-player content. This was probably because a defeat automatically terminated a game – a prospect users did not wish to risk.

‘ARQuake’ [8] used various augmented reality equipment to project the game ‘Quake’ over the real world; hence, this was an augmented reality experience. The user’s position in the real world was tracked and related to their position in a custom-generated Quake map to achieve this result. In addition, the game allowed a cross-platform for play between those on a PC and those using ARQuake. The imitation of the real-world play area by the custom map facilitated this cross-platform interaction.

Although only ‘Pirates!’ [7] evaluated user feedback, both these games are of note because their concepts went on to inspire future Location Aware Games that utilised augmented reality - such as ‘Can You See Me Now?’ [9] - or tracking in general, such as ‘Hitchers’ [13].

‘Can You See Me Now?’ [9] exploited the earlier research of ‘ARQuake’ [8] and ‘Pirates’ [7] but placed an emphasis on the cross-platform interactions seen in ‘ARQuake’. Fifteen different users, each logged in via the internet, comprised the participants of ‘Can You See Me Now?’ at any one time. The online users are chased through a virtual city by three runners who move around the city while using GPS receivers. The users can only move at a fixed speed but have a map view of the city and can see the locations of both the chasers and the other users. All the users can exchange messages via text. The runners move through the streets in pursuit of users by following handheld digital maps. They have walkie-talkies for communication and can access the users’ text messages. The runners’ walkie-talkie communication is also broadcast to the users so that the latter can get a sense of the real-world situation.

During the test phase of ‘Can You See Me Now?’, problems generated by poor connectivity were highlighted by runners and users alike, and this became a notable issue. The author of ‘Can You See Me?’ proposed two solutions to deal with this uncertainty. The first was to improve GPS tracking technology by utilising various validation techniques, and the other was somehow to incorporate the effects of uncertainty into the game’s design to mask it from users.

The games ‘Bills’ [10], ‘Hitchers’ [13], ‘Mobi-Mission’ [14] and ‘Tycoons’ [11] were all designed around the concept of Seamful Design. Seamful Design is the concept of anticipating poor signal strength and accommodating for that issue by integrating it into the mechanics. This is, in effect, acting on the second solution for uncertainty proposed in the

research for ‘Can You See Me Now?’ [9]. In order to attain this objective, the games deploy three distinct strategies. ‘Bills’ makes use of low- and high-signal areas by relating them to aspects of the game; ‘Hitchers’ and ‘Mobi-Mission’ do this by users asynchronously depositing and collecting data from the server, and ‘Tycoon’ is designed to have users swap between online and offline play.

The world of ‘Hitchers’ [13] is empty at first, and over time characters that are trying to hitch-hike appear. The characters appear as users create new hitchers; they are given a name, a destination and a question to ask users that later collect them. After creating a hitcher, the user ‘drops them off’; the hitchers then wait in the same location to be picked up by another user. Whenever a user drops a hitcher they will be asked, ‘What location is this?’ and the answer will be tagged to the location where the hitcher has been dropped. Users can search their current location for nearby hitchers that may want a ride and those nearby hitchers will be divided into a list of hitchers they have never met and those they have met before. Whenever a hitcher is picked up by a user, the latter can determine the former’s destination, name and associated question – which they may answer if they wish. Users can drop the hitcher at any location, regardless of whether it is closer or further to the location specified by its creator, and when dropped the hitcher will once again ask ‘What location is this?’ Lastly, a website associated with the game enables users to look up any hitcher they have interacted with or those they created. The website will list who the hitcher has met, where they have been and what answers they have received to their question.

In ‘Mobi-Mission’ [14] users can create and complete missions, and a mission is defined by up to five photographs and five sections of text. Users create missions by taking five pictures and entering related segments of text. Users then ‘drop’ the mission, and it is tied to the cell to which their mobile phone was connected at the time of dropping. When users drop a mission, they will be prompted to give a brief hint about it. If a user wants to find a mission to play with, they can search for missions tied to their current cell. If there are not enough missions, 10 generalised mission have been created and will be shown in the selection. Users complete missions by collecting five pictures and adding five of their own text segments - just as when the mission was created. On completion of a mission, users are invited to evaluate it and to input the details of any users who collaborated with them.

In ‘Bills’ [10] coins are distributed around a pre-defined area and the aim of the game is to be the user that turns in the most coins by the end of the game session. The coins can be collected in areas with poor signal strength but can only be turned in in areas with high signal strength. In areas of high signal strength users can steal each other’s coins, and this is relevant as limiting the stealing of coins to high-signal areas deals with latency issues that might occur from users ‘running around’. Hence, ‘Bills’ both creates an appealing dynamic for the process of ‘turning in’ coins, and resolves latency issues, by the expedient of restricting coin theft and coin ‘turn in’ to specified areas.

‘Tycoon’ [11] iterates on ‘Bills’ [10, 11] but instead of using signal strength, it has divided the content between activities that must completed while connected to the game server and those that can be completed on the local client alone. ‘Tycoon’ has users collect resources and exchange them for unique items; there will be different unique items and two different resources per cell tower. Users need to be connected to the server to swap resources for unique items, but such a connection is not necessary merely to collect the resources. The user with the most unique items at the end of the game wins.

Both ‘Bills’ [11, 10] and Tycoon [11] are examples of how Location Aware Games can be implemented, but an evaluation of user feedback was not undertaken with them. In contrast, ‘Hitchers’ and ‘Mobi-Missions’ [14] did pursue user feedback. Both games received a large amount of engagement from their users but there was a common complaint, apart from mere technical issues. Specifically, users were displeased that it was impossible to connect the originators of user-generated content to the content itself.

‘City Explorer’ [15], in contrast to the development of Seamful Design [11, 10, 13, 14], adapts gameplay elements from the board game Carcassonne in a Location Aware Game. In Carcassonne, the game starts with a single tile of the fragmented and hidden game board: users take turns to draw a new tile and lay it down to extend the land of Carcassonne. Users can put their individual game markers, styled ‘followers’, on a particular tile when it is placed, but only if the follower’s pre-determined preferences match the tile. In ‘City Explorer’, each user proposes an equal number of categories that relate to places in a city such as ‘Food’, ‘Bar’ or ‘Café’. Users then attempt to visit places that match as many of these categories as possible and do the following at each: take a photo, type the name of the location and capture the GPS location for it. Once a user has found places for each

category, they can upload their markers for review, and after two confirming reviews they receive points for their locations. Users themselves undertake the reviews, and users that do so are rewarded with bonus points.

'Viking Ghost Hunt' [2] is the only Location Aware Game in this literature review that was not multiuser in nature. Rather, it was much more similar to a Location Aware Fiction such as 'Snow White is Missing' and 'Tiree Tales' in design. In 'Viking Ghost Hunt', users were tasked, as ghost hunters, to solve a mystery, and along the way, to do so, they must collect various objects that are scattered around. Its only mechanic, unlike the other Location Aware Games in this section, is collection, but as it has a mechanic it was classified as a Location Aware Game for this literature review, rather than a Location Aware Fiction.

All the Location Aware Games explored in this literature review are multiuser experiences, except for 'Viking Ghost Hunt' [2] which was closer in form to a Location Aware Fiction with a heavy focus on narrative. Unlike Location Aware Fiction, Location Aware Games evince (according to the research) a distinct trend towards multiuser experiences – as noted earlier.

It seems that multiuser Location Aware Games originally started with complex games such as 'Pirates!' [7], 'ARQuake' [8], and 'Can You See Me Now?' [9] but over time the complexity was reduced in games such as 'Hitchers' [13], 'Mobi-Missions' [14], 'Bills' [11, 10], 'Tycoon' [11], and 'City Explorer' [15]. This shift is most significant within the synchronicity characteristic of the framework of multiuser interactions, and there was a clear shift from synchronous interaction to the simpler style of asynchronous interactions within 'Hitchers', 'Mobi-Missions', 'Tycoon' and 'City Explorer'. Interactions within these games were typically of three basic varieties: picking up content, dropping content and inputting information. An example of this is given regarding the game 'Hitchers', in Table 1. From the literature, it seems that the uncertainty cited by Benford *et al.* [9] was the primary reason for this change.

In addition to the trend towards simpler asynchronous interaction, there was a trend towards user-generated content as shown by 'Hitchers' [13], 'Mobi-Missions' [14] and 'City-Explorer' [15]. Amongst these games it was a common complaint that users were unable

to identify which user had created the content; the only time it was possible for a user to identify the creator was if they knew them.

Table 1: Multiuser Interactions of 'Hitcher'

Framework Information		Example Interaction	
Characteristic	All Values	Dropping off or picking up the Hitcher	Telling the Hitcher something
General Characteristics			
Likelihood	Guaranteed	Possible	Possible
	Possible		
Type	Mechanical	Mechanical	Informational
	Informational		
Synchronicity	Synchronous	Asynchronous	Asynchronous
	Asynchronous		
Recipient Characteristics			
Explicit Awareness	Always	Never	Never
	Possibility		
	Never		
Deductive Awareness	Always	Always	Always
	Possibility		
	Never		
Initiator Identifiability	Always	Never	Possibility
	Possibility		
	Never		
Initiator Characteristics			
Explicit Feedback	Always	Never	Never
	Possibility		
	Never		
Deductive Feedback	Always	Never	Never
	Possibility		
	Never		
Recipient Identifiability	Always	Never	Never
	Possibility		
	Never		

It should be noted that Table 1 assumes that users do not access the website provided alongside the various asynchronous games, as all these pieces of research suggested that users were reluctant to use such a separate service and therefore opted not to.

In Summary:

1. Extensive deployment of multiuser interaction is a feature of Location Aware Games, in contrast to Location Aware Fiction.
2. Over time, Location Aware Games have moved towards less complex games that make use of a few core interactions, specifically, two mechanical interactions for placing and picking up content, and one informational interaction.
3. Complaints regarding the impossibility of identifying user 'content creators' were characteristic of those Games that failed to provide an overt 'always' for Initiator Feedback - and that provided a greater degree of freedom.

3 A Model of Multiuser Influence

As previously mentioned, Spawforth and Millard [26] have developed a taxonomy that describes the interactions that can occur between users. Nonetheless, the impact on the overarching narrative exercised by these interactions is not accounted for by this taxonomy. To explore the effect of interactions upon the narrative, a model of multiuser influence has been developed over the course of this project, and the model was presented previously at NHT [23].

The model of multiuser influence can be broken down into several sub-sections: influence selection, influence timing, influence target and influence method. The subsequent sections will proceed to address each of these facets of multiuser influence.

3.1 Influence Selection

Influence selection refers to the method used by an application to determine which user or users will be given the ability to influence others. There are two types of influence selection – namely, autocratic influence and democratic influence. Autocratic influence is when a single user's interaction can influence others. When the combined interactions of a group of users have an impact on other uses, this represents a case of democratic influence.

To provide examples using the game ‘Hitchers’ [13], as seen in the literature review: when a user drops a Hitcher off at a location they are exerting a form of autocratic influence, as they alone choose where the Hitcher is located, without the input of other users. Conversely, if (hypothetically) users were each to state a location for the Hitcher to be placed at, and it was placed at the most popular location, then that would be a form of democratic influence.

3.2 Influence Timing

Influence timing refers to the amount of time that passes between an interaction occurring and the influence being experienced. Specifically, it refers to instant influence or delayed influence. Instant influence, as one might imagine, describes those occasions when an interaction’s influence is immediately experienced by other users. Delayed influence describes cases when time passes between an interaction occurring and the influence being experienced.

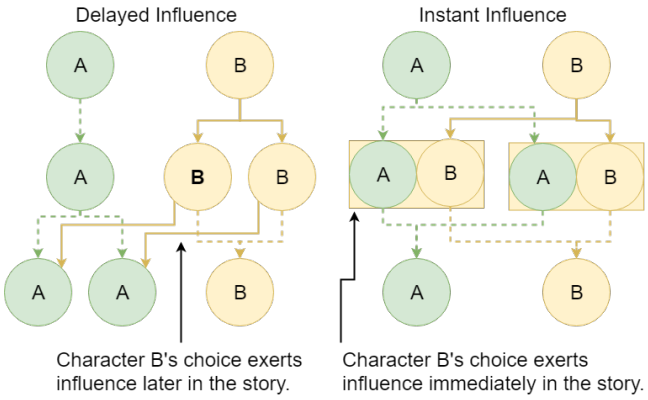

Figure 9: Examples of instant and delayed influence

In Figure 9, the concept of influence timing is represented. Instant influence and delayed influence are represented by discrete flowcharts within the diagram. In this diagram, the thick lines represent occasions when a user is making a decision, while dotted lines represent instances when a user has their story determined by another. Moreover, in the same diagram, when nodes are paired within a box, they are 'linked': the occurrence of one implies the occurrence of the other. In the flowchart representing delayed influence, user B makes a decision on the second level of nodes, but this is not experienced by user A until the third level of nodes: this is an example of delayed influence. In the flow chart representing instant influence, user B makes a decision at the second level, but this time it affects user A's narrative at the second level of nodes: this is an example of instant influence.

3.3 Influence Target

An influence target refers to the element of the narrative that is being influenced: specifically, it describes whether the influence being exerted by a user will alter the fabula or the discourse of the narrative. Fabula refers to the events of the narrative and the chronological order they occur in, while discourse represents how these will be presented to the user.

If one takes an example from 'Hitchers', one may imagine a user adding a name to the location where they drop a hitcher off [13]. In the case of dropping the hitcher, this would be exerting an influence over the fabula, as the user is determining the actual location where the hitcher will appear and the time at which it arrived at that location. In contrast, the act of naming the location would be exerting influence over the narrative discourse, as this is

not actually changing anything about the narrative, but instead presenting a different name for the same physical location.

3.4 Influence Method

The manner in which an interaction is undertaken within a narrative might take the form of either generative or guiding influence: both are known as influence methods. A guiding influence is one that restricts which options other users can select, and it therefore guides them, while a generative influence, conversely, adds entirely new content to the narrative.

One may refer once again to 'Hitchers' for a useful example of generative content. In 'Hitchers', whenever a user adds content to a hitcher this would be considered as exerting a generative influence, as the content would not be designed by the developers but would be added to the narrative by a user.

In contrast, if users were only allowed to select from pre-designed segments of text or to drop the hitchers at specific locations, this would be considered as exerting a guiding influence, as the users are not creating new content but are instead selecting what someone else will 'receive' from pre-designed options.

3.5 Industry Example

To present an example from the game industry, 'Star Wars: The Old Republic' has a system in which a group of four users can complete a pre-designed adventure called a 'flash-point'. Figure 10 shows the users coming across a traitor and shows the options they can select: capturing or killing the traitor.

Figure 10: Traitor dialogue options

Each member of the party of four selects an option, but the decision as to whether subsequent events will be determined by all four users or by one alone is made by the game: this is termed Influence Selection. In the case of 'Star Wars: The Old Republic', the game rolls a dice for each user once they have selected an option, then the user with the highest dice roll will have their option selected; this is a form of autocratic influence as only one user decides. As Figure 11 illustrates, the dice rolls are visible to all participants, and the player who rolled 79 autocratically influences (i.e. decides alone) what will happen.

Figure 11: A user makes an autocratic decision

As the full group immediately experienced the results of the decision for the narrative, this was a case of instant influence timing. In contrast, at the start of the game a user of 'Star Wars: The Old Republic' can choose between several classes of player. In this example, the user who won the dice roll selected to play as a 'Sith', and because of that decision the other users see a 'Sith' character force choking the traitor rather than a Bounty Hunter shooting him. The decision of what character to play has an effect upon what other users see later in the game, so this would be an example of delayed influence.

The decision made was to kill the traitor as enacted in Figure 11, and this changes the fabula of the narrative as the traitor is killed rather than arrested; hence, this is fabula influence. If the user had chosen (at the outset of the game) to be a bounty hunter, for instance, this would be a case of discourse influence. In that case, the traitor's death would still occur but in a slightly different way.

Lastly, this entire sequence has users select from pre-defined options, and this would be considered as a form of guiding influence since the user that won the dice roll did not create new content, but rather made a selection between two options.

4 Shelley's Heart

The story of 'Shelley's Heart' follows four protagonists; Mary, Byron, John and Percy. The former three are modern reincarnations of Mary Shelley, Lord Byron and John Keats, while the latter is the ghostly manifestation of Percy Shelley, who has been bound to this earth until he reclaims his heart from within Shelley's Tomb. The story is prompted to begin via to a chance encounter between the spectral Percy and Mary, which provides the motivation for Mary to seek Byron's and John's aid in pursuing Percy, who resides within St. Peter's Church.

Within St Peter's churchyard, each of the four protagonists undertakes a distinct journey. At certain points the cast's paths will intersect, they will be faced by ghosts of the past and they will have to face Mary Shelley's monster. During the experience readers of each protagonist will be able to make decisions that alter the journey for themselves, but they will also be able to make decisions that will affect future readers' journeys.

The present chapter will focus on the technical implementation of 'Shelley's Heart', as well as on its narrative design and content positioning. This section will also cover the experience of reading 'Shelley's Heart'.

4.1 Developing the Narrative of 'Shelley's Heart'

While 'Shelley's Heart' was originally envisioned as a Location Aware Fiction, it was first deployed as a theatrical performance. This section will describe how the researcher worked alongside the author to develop 'Shelley's Heart' into a Multiuser Location Aware Fiction and it will also describe how the researcher implemented 'Shelley's Heart'.

In order to view the theatrical version of 'Shelley's Heart', the researcher visited the theatre in question before commencing work on the adaptation discussed here. This version of 'Shelley's Heart' blended live performance with recordings made at Saint Peter's Church, and had users navigate through the story by voting on what they wanted to see next. Watching *this* version of 'Shelley's Heart' allowed the researcher to see the original narrative structure of the Fiction. The original structure of 'Shelley's Heart' was a Canyon of Concurrent Nodes [25, 24]. Figure 12 will serve to illustrate what is intended by this term. This figure shows three groups of Concurrent Nodes. The latter are nodes that can be visited in any order without locking one another. As users must move in a defined order between the linear connections between Concurrent Nodes, a Canyon is established.

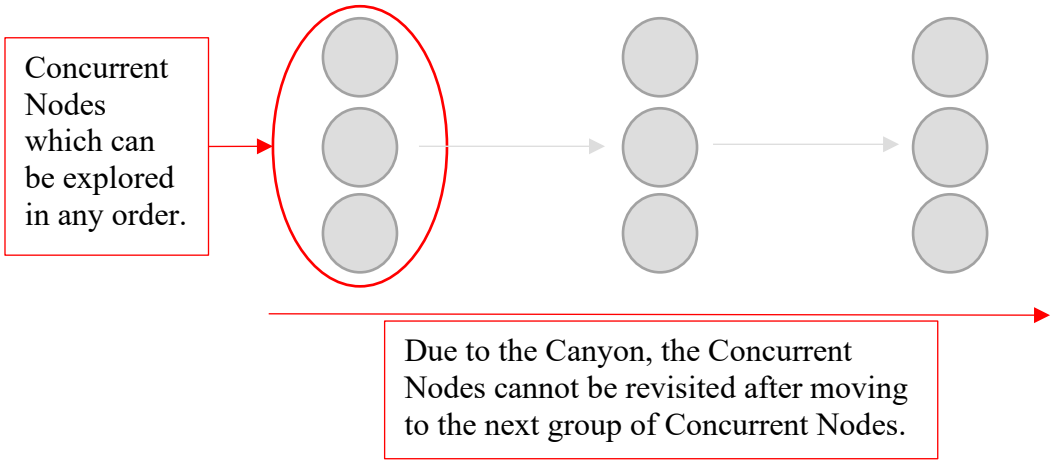

Figure 12: Several Concurrent Nodes form a Canyon

In order to substitute Deltas for the Concurrent Nodes contained in the theatrical version, the researcher and the writer worked together [25]. The purpose of the Deltas was to enable individual user choices that could 'branch' the narrative. By selecting certain moments or episodes in 'Shelley's Heart' that could be formulated as choices, it was possible to implement Deltas. For example, in the theatrical version of 'Shelley's Heart', Mary channels the ghosts of Percy and her son William. The script for the Location Aware version was modified and now Mary *chooses* between Percy or William. Figure 13 shows Mary's choice and how a Foldback pattern is used alongside the Delta to re-converge the narrative.

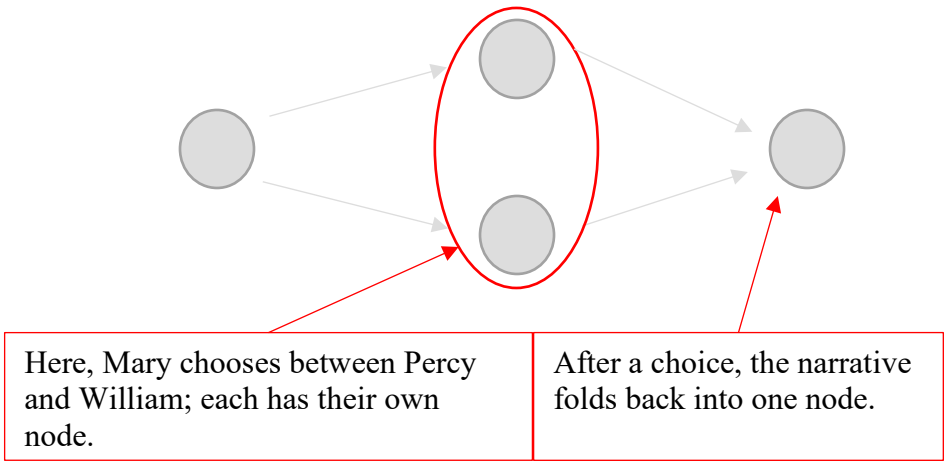

Figure 13: A Delta within a Foldback pattern

Once the researcher had implemented Mary's narrative, development began on the additional characters. In the theatrical version of 'Shelley's Heart' the characters of Byron,

John and Percy had been side characters, but now they were developed into protagonists. Their stories had already been partially defined in the theatrical version, due to their previous status as supporting characters, but their promotion to protagonists required new material. While developing the new content for 'Shelley's Heart', several things had to be considered. Specifically, the type of multiuser influence most appropriate to the Fiction, the practicability of generating new content and the compatibility of the original content with the new. As the new content was produced, all these factors were given due attention. As an example of the new content, Byron encounters the ghosts of *Lord* Byron and Lord Byron's partner, which allows his character to develop.

Table 2: Table of 'Shelley's Heart' Interactions

Interaction Initiator	Interaction Target	What Happens	Choice Nodes	Target Nodes
Percy	Mary	Percy chooses to either follow Mary, whom he has developed an interest in, or he pursues his heart.	P1A/P1B	M1A/M1B
John	Byron	John chooses which location he is going to frequent and his decision affects what will transpire for himself, Byron, and Mary in the following instant.	B2A/B2B/B2C	J2A/J2B/J2C
Byron	John	Byron decides whether John and he will embrace or fight after John attacks him in response to Byron jumping out from behind a bush.	J3A/J3B	B3A/B3B
Mary	Percy	Mary, who is lying upon Mary Shelley's Grave, either chooses to channel the presence of her baby William or the spectral presence of Percy to form a connection.	M3A/M3B	P3A/P3B

The writer and researcher considered where character interaction might most usefully occur, while simultaneously considering the addition of new content. There were four places within the narrative where characters interacted in a manner that was suitable for

player choice, and these were chosen as the places where multiuser interaction could occur. Figure 14 illustrates the four multiuser interactions, which are also described in Table 2. The experiences of participants reading Mary may be impacted by users reading Percy – as the table demonstrates. Likewise, users reading John can influence the experience of users reading Byron, while users reading Byron can influence the experience of users reading as John and users reading Mary can influence the experience of users reading Percy.

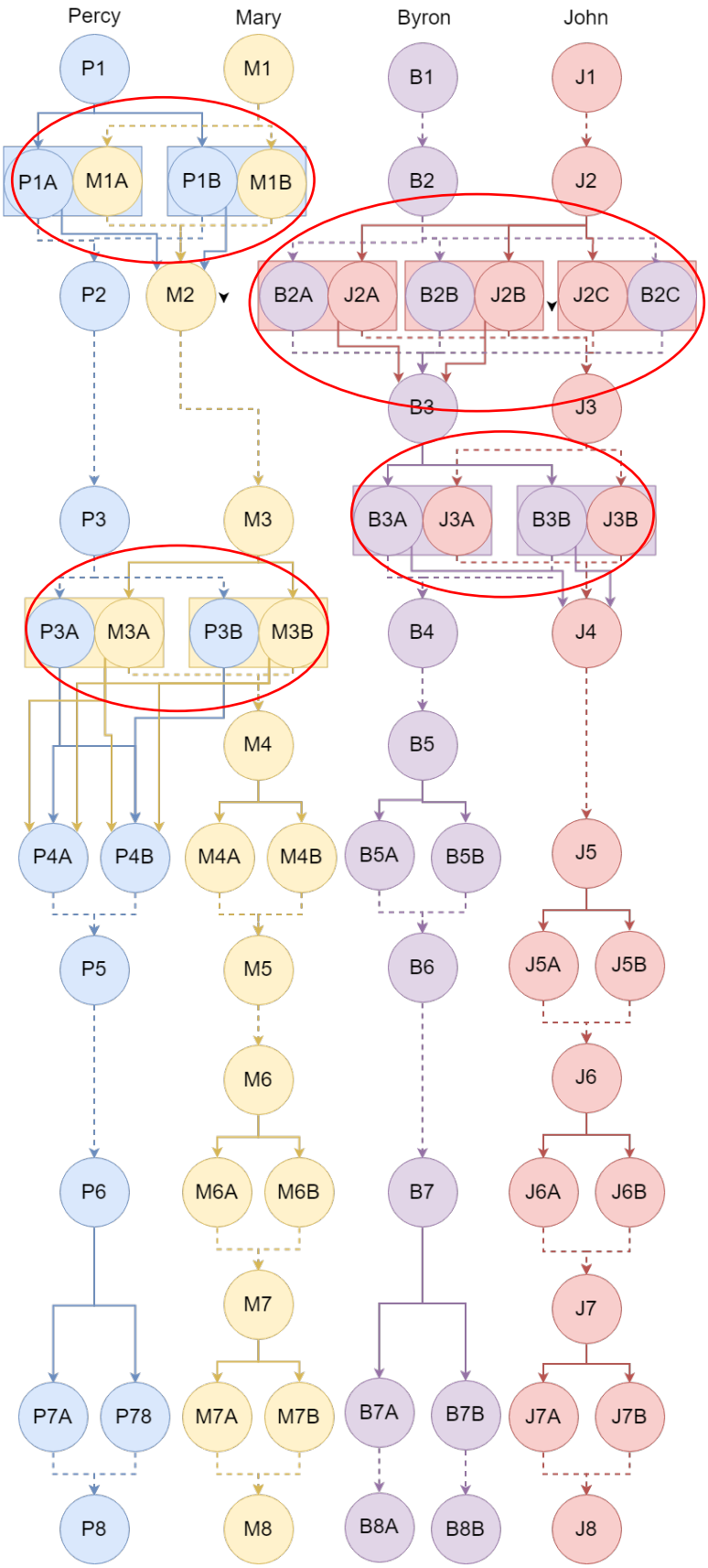

Figure 14: 'Shelley's Heart' Layout

All the interactions within ‘Shelley’s Heart’ exert Autocratic Instant Discourse Guiding Influence, as defined by the model of multiuser influence described in the previous chapter and the researcher’s previous work [23]. While this is only a single style of Multiuser Influence, it is applied across several instances of multiuser interaction. As Multiuser Location Aware Fiction is still at an immature stage of development, this data will make a significant contribution to determining the impact of multiuser influence within the field. Moreover, this type of multiuser influence fits the original vision of Gyori for ‘Shelley’s Heart’.

4.2 Selecting the Locations of ‘Shelley’s Heart’

The narrative of ‘Shelley’s Heart’ takes place in or near Saint Peter’s Church; hence when content is tied to locations, the latter all fall within the vicinity of the church itself.

To determine where to place these nodes, the writer’s toolkit [1] discussed within the literature review was considered. Specifically, we looked at deal breakers, pragmatics and aesthetics, as the toolkit advises.

Regarding deal breakers, the points of arrival and departure were placed so they were close to areas in which a reader would enter or exit Saint Peter’s grounds. How much effort it would take to move between nodes was considered, and so most nodes were placed an even distance apart, unless the narrative required a specific landmark that was closer or further away. In terms of reading time, the decision was made to separate the narrative into equally sized segments, which could be experienced either separately or together. A user might read all the characters’ stories for a longer experience, or a single character’s for a shorter one.

Regarding pragmatics, ‘Shelley’s Heart’ places each of its stories along potential routes around Saint Peter’s grounds to make full use of the terrain. High-cost locations created a significant issue due to Saint Peter’s Churchyard containing a steep hill which took up a large amount of space and caused accessibility issues. To allow for the difficulty of the terrain, it was decided that the steep section of hill would accommodate nodes from only Byron’s story. This was done because space was limited within the churchyard, which meant use of the hill could not be forgone entirely, but a warning was placed on the screen to select Byron, so users would know to avoid that story if they had mobility issues.

Regarding Aesthetics, each node of the story makes use of a different area of the churchyard, except for a few pages that are heavily dependent on each other. Each page is tied to a landmark that exists within the churchyard, although there are a few exceptions that are needed for the narrative. These exceptions relate to events that occur between two landmarks, and the nodes that describe them. For example, there are nodes between a sign outside the churchyard and a monument inside it: these nodes describe events that transpired while Mary was moving between the landmarks, but they themselves do not reference any landmarks. The church architecture itself mirrored the 'gothic' aspects of the narrative – a deliberate aesthetic decision.

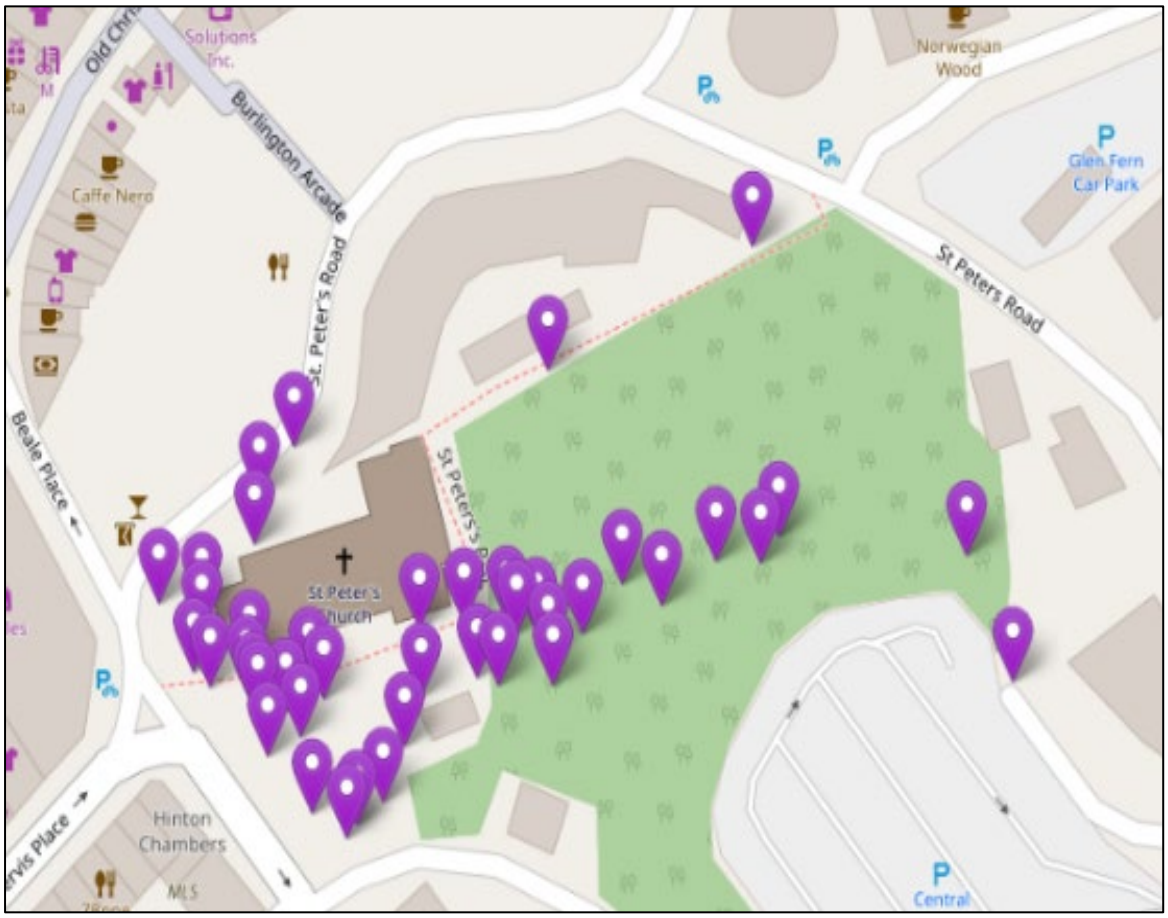

Figure 15: Nodes of 'Shelley's Heart'

There are 38 different locations within 'Shelley's Heart' where nodes may be placed, as reflected in Figure 15. Some of these are visited by several characters, while others exist to be used by only one character. In total there are 73 nodes within 'Shelley's Heart' that are tied to locations, and six essential nodes that are not. The exit node (which terminates the

experience), the starting node and the four community pages (which appear when any character's story ends) are the only nodes not associated with a particular story. The locations that are reused for multiple nodes are used again for the following two reasons: either they are a point at which multiple characters' stories intersect (hence the characters all use the same node), or they reflect a case in which a character makes a choice at a specific location.

4.3 The Technical Implementation of 'Shelley's Heart'

Having designed the narrative for Mary's section of 'Shelley's Heart', the researcher began implementing the Location Aware version of the Fiction. At this point, 'Shelley's Heart' contained the Deltas cited earlier, but it did not yet accommodate multiuser interactions.

The Storyplaces platform was utilised for the development of 'Shelley's Heart'. Storyplaces is a platform that allows authors to place nodes on a map, tie text or pictures to those nodes, and then define a relationship between those nodes. Figure 16 provides a simple example of how content may be added to Storyplaces, and indeed, this was undertaken for all nodes within Mary's narrative.

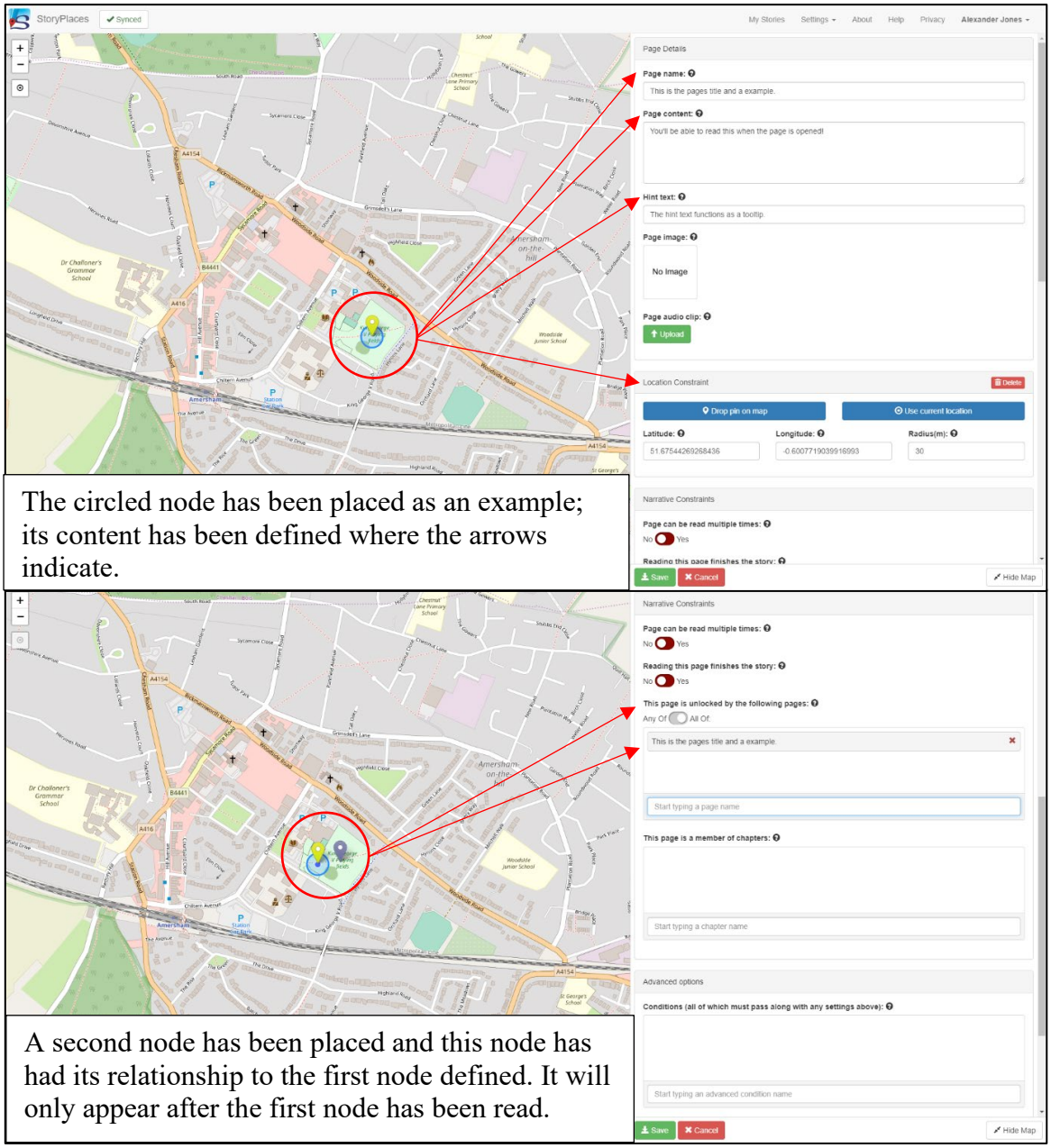

Figure 16: Creating a node with Storyplaces

The next stage of implementation commenced when all the characters had been designed within the narrative-development process. This stage of development implemented the narrative of all four characters, but this implementation of 'Shelley's Heart' still did not include multiuser interaction. It remained an experience for the single user. Four characters meant that the amount of content within 'Shelley's Heart' quadrupled, so each of the characters' narratives were organised into chapters. Storyplaces allows a writer to collect nodes in groups via cataloguing, before choosing to manipulate the time at which selected

chapters appear. For example, the researcher set the nodes within Mary's chapter to be the only ones that can appear after a user has visited a node labelled, 'select Mary'. The implementation can be seen within Figure 17.

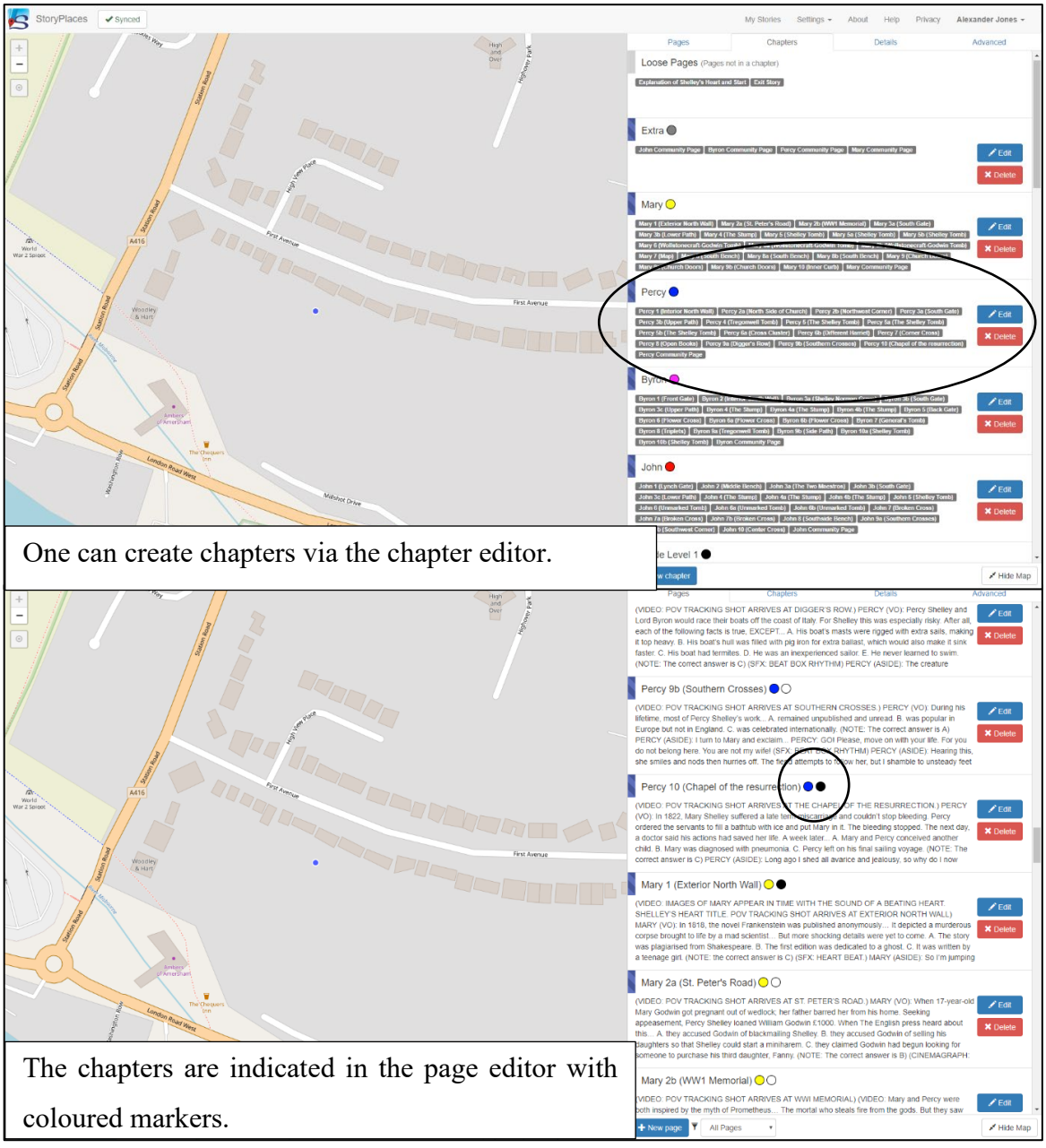

Figure 17: How chapters appear

After all character content had been implemented, the researcher began to implement the interactions between characters, but at this stage 'Shelley's Heart' still did not support multiuser interactions. Now, the objective was to develop the Fiction to the point at which users could 'experience' the impact that their decisions made on the narrative of one

character, while reading a *different* character. This was done by creating variables, conditions and methods within the advanced tools of Storyplaces; these would track the decisions made by a user and apply the correct effects. An example of the Storyplaces advanced tools can be seen in Figure 18.

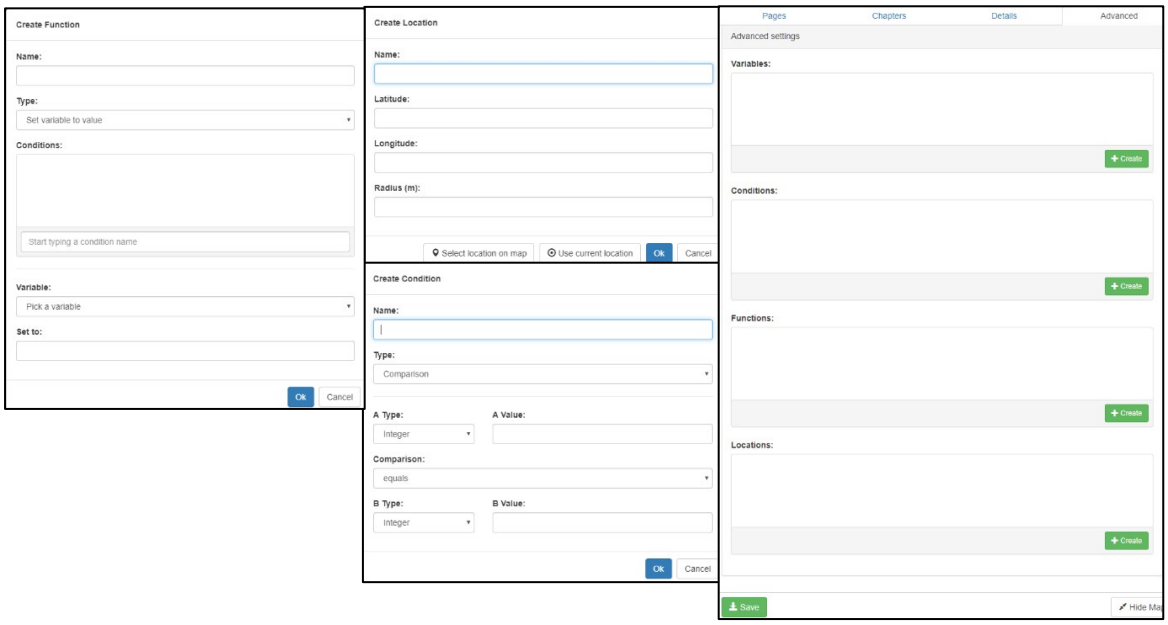

Figure 18: Storyplaces advanced tools

The researcher understood, while implementing conditions, variables and methods, that problems were arising from the basic tools deployed to define inter-nodal relationships. The issue was that the basic tools required an author to set a node as non-repeatable, if they wanted it to disappear as the next node appeared. Thus, although repetition of a character's story was a desired functionality, it was impossible for users to effect. To mitigate this problem, the researcher developed a plan to convert the entirety of 'Shelley's Heart' to the advanced tools. Now, the state of the narrative was updated via functions, while the appearance of nodes was determined by conditions and the *overall* narrative state was tracked by variables. The heavy use of the advanced tools can be seen in Figure 19.

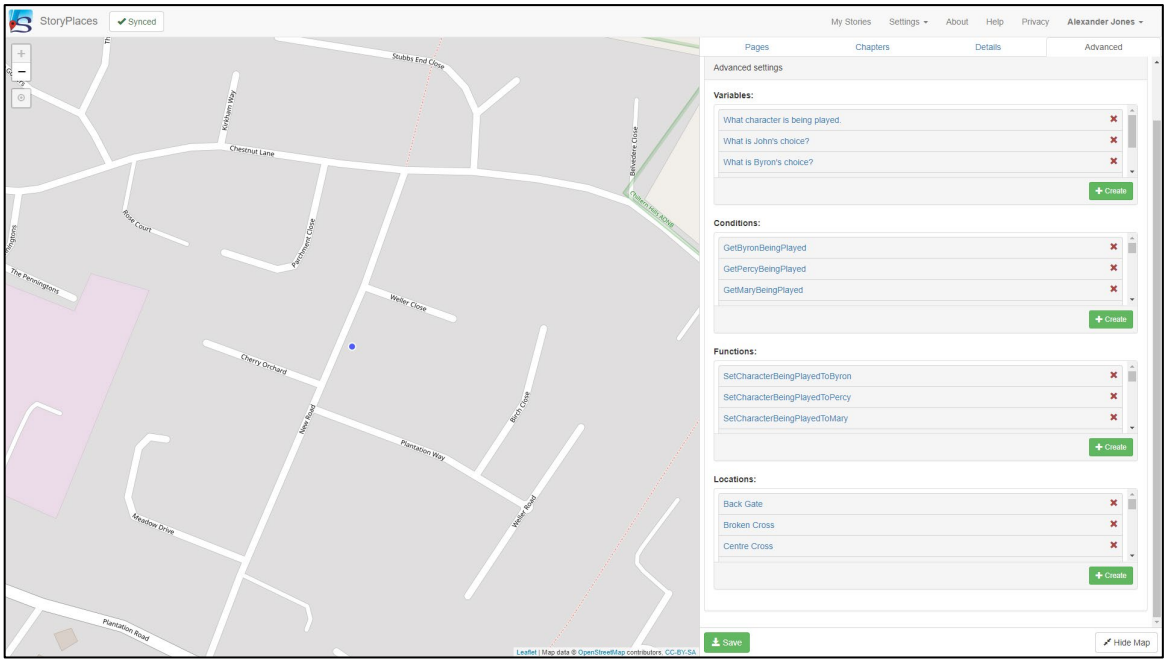

Figure 19: 'Shelley's Heart' advanced tool usage

As 'Shelley's Heart' was developed in the standard version of Storyplaces, the authoring tool could not be used to complete the development in its entirety. Instead, as described above, the general relationship between nodes was implemented, but then a Json file containing the contents was exported so that it could be edited for a custom version of Storyplaces. This was necessary, and a custom version of the platform was required, because the basic Storyplaces did not support multiuser interaction. The custom version of Storyplaces duly supported global variables that could be shared between users, and these global variables allowed for multiuser interaction as they could be used to relay the decisions of one user to another.

Nonetheless, no tool was available to globalise the decision-tracking variables, since no authorising tool was comprised within the customised Storyplaces. Without a tool, the researcher had to manually edit the Json into the custom version of Storyplaces. This was a lengthy process as any mistakes meant that the Json had to be edited again and reimported to the custom version of Storyplaces.

To permit the Json to be tested as it was converted to accommodate multiuser interaction, it was necessary to set up the customised Storyplaces on a server. To do this, a Bournemouth University server had to be set up using the Mongo DB and Node.js. Then,

whenever the researcher initiated changes, Postman was used to post new versions of the Json to the server.

4.4 Shelley's Heart as a Reader

This section will describe the Storyplaces interface and how it works with 'Shelley's Heart'. Figure 20 shows the basic interface of 'Shelley's Heart': the first part of the image shows the page selection screen while the second shows what is displayed after one selects a page. The node within this screenshot does not have a location attached to it and can be accessed from anywhere. This applies only to the exit node and explanation.

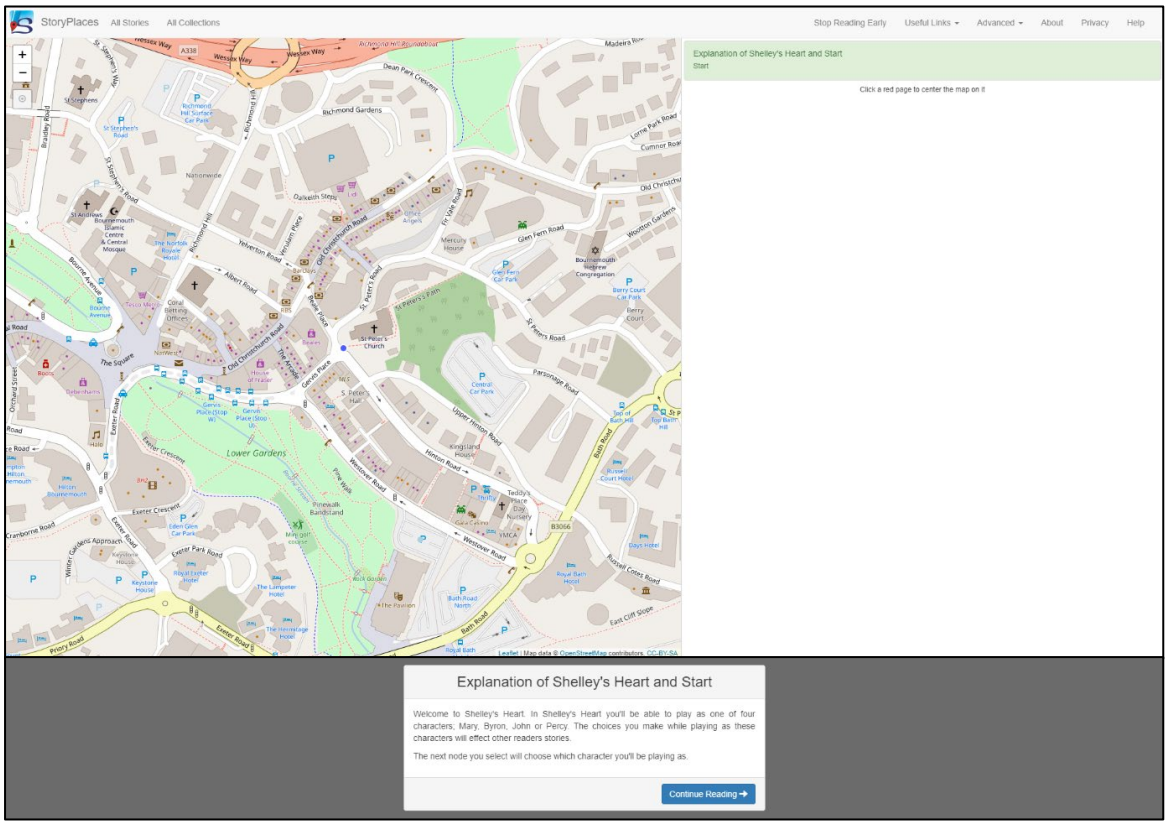

Figure 20: Storyplaces Interface

In 'Shelley's Heart' the choices, when they are presented, are divided between several nodes. Figure 21 shows the choice Mary makes regarding whether to channel William or Percy. The hints associated with the nodes indicate that the choice will impact the experiences of other uses, as it is one of four different multiuser interactions.

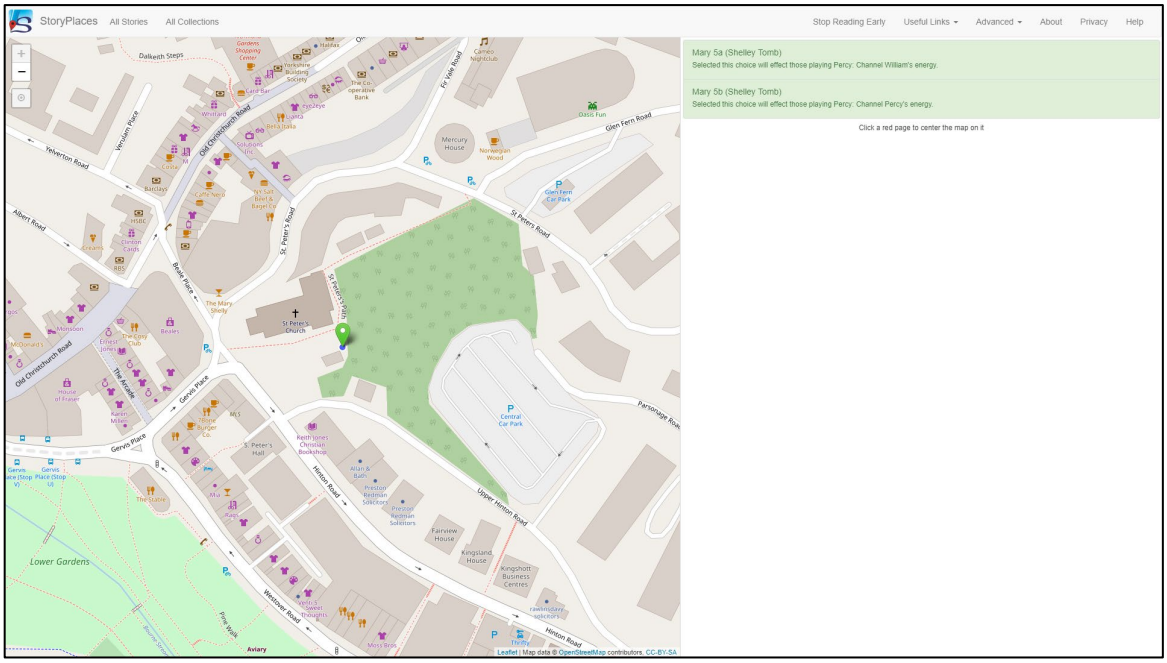

Figure 21: Making a choice in Storyplaces

In 'Shelley's Heart', when a user is presented with a node as a result of another user's decisions, the node will indicate that this is the case. An example of a node being proffered to one user because of another's selection is reflected in Figure 22.

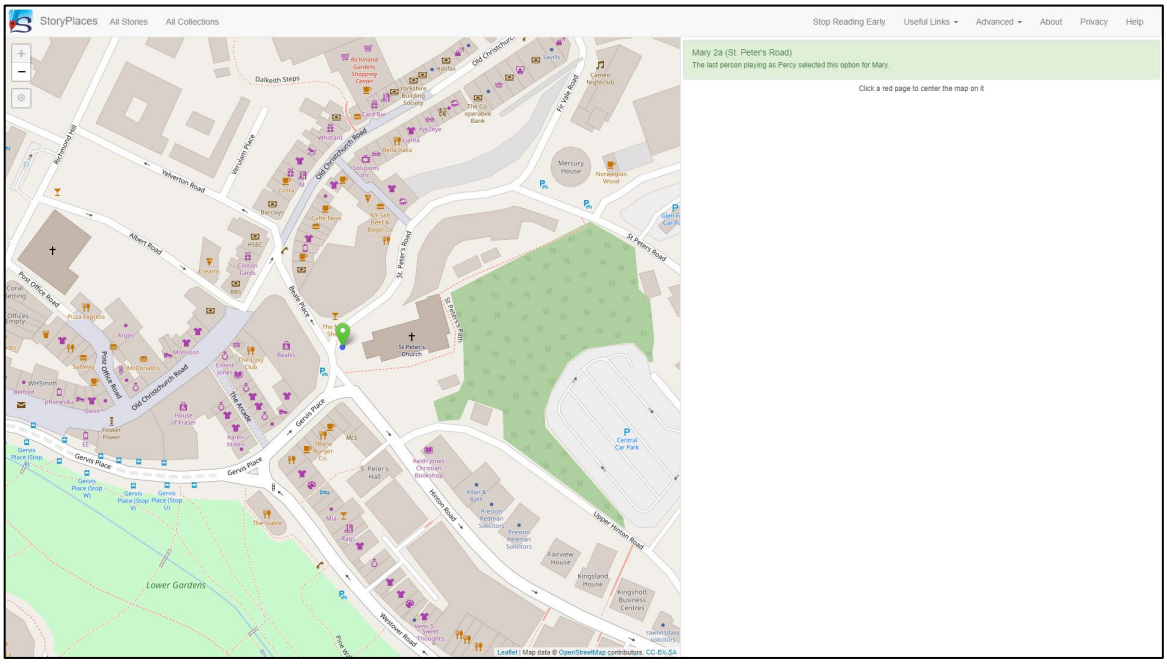

Figure 22: Being affected by a choice in Storyplaces

As previously noted, ‘Shelley’s Heart’ is an asynchronous experience. Therefore, users can interact with one another even when they read ‘Shelley’s Heart’ at different times. A user might see the impact on Percy of certain choices made by a user playing Mary, for instance, even if those choices had been made the previous day.

5 Methodology

To recap, the research questions for this thesis are as follows:

1. Do multiuser interactions impact Location Aware Fiction?
2. What is the nature of that impact?
3. What is the scale of that impact?

The chosen methodology was formulated with these questions specifically in mind.

5.1 Experiment Structure

This experiment used the multiuser version of 'Shelley's Heart'. This, as noted in the preceding section, facilitated multiuser interaction with the use of global variables, and indicated when such interaction took place within the UI.

The experiment consisted of 18 participants that were selected via opportunity sampling. The participants were students or staff of Bournemouth University, Dorset locals, or associates of these groups. As opportunity sampling fails to adjust for demographic variance and is not wholly random, it may produce bias. Nonetheless, for initial research into the field it supplies a sample that is reliable enough to make initial observations of Multiuser Location Aware Fiction.

The participants met with the researcher at St Peter's Church, Bournemouth. Participants were asked to sign consent forms to proceed with the experiment. The participants were informed of what would be taking place in the experiment through an information sheet supplied when they were originally contacted about the experiment, and to ensure perfect clarity, they were provided with an additional copy to refresh their memory before they were presented with their consent forms. When all the participants were duly gathered, the researcher ensured that they all had a working version of 'Shelley's Heart' open in a mobile browser. Subsequently, the participants were allotted 60 minutes to experience the fiction and were asked to meet at the churchyard entrance once they were finished. The interface of 'Shelley's Heart' was illustrated in the preceding section.

The participants were not organised into groups for the experiment and it was assumed that the participants would explore 'Shelley's Heart' individually, as 'Shelley's Heart' is asynchronous. Nonetheless, some participants elected to experience 'Shelley's Heart' as part of a group, as there was nothing to prevent them from doing so.

When the participants had finished ‘Shelley’s Heart’ and returned to the meeting area, they were given a Survey to complete. Upon completion of the Survey the participants had completed all on-site activities. Nonetheless, more information would later be gathered via follow-up interviews.

The interviews were conducted over the phone rather than in person as the two types of face-to-face interview, ‘one to one’ or ‘group’, both have issues pertaining to their use in this experiment. For instance, ‘one-to-one’ interviews place considerable burdens on the researcher’s time; moreover, results may be skewed if participants become agitated at being obliged to wait. ‘Group’ interviews have the problem that several more extrovert individuals could steer the group’s answers and hence render the data less reliable. Phone interviews do have issues as well, however. As time passes, participants contacted by phone are likely to have had their perception of events changed. To mitigate this risk, the researcher strove to contact participants as soon as possible, and indeed, all responsive participants were contacted within one week.

In addition to the data gathered from participants, a reflection upon the developmental experience of ‘Shelley’s Heart’ was conceived. Both the author’s and the researcher’s views are comprised in the reflection.

5.1.1 Survey Questions

The following are the questions that were asked in the survey, together with a justification for them.

Q: As part of this experiment there will be a follow-up telephone interview, and so we’ll need your telephone number to contact you. Your number will not be stored against your name but rather your Participation Number for this experiment, and once the telephone interview has been transcribed against your participant’s number we will delete your mobile number from our records. What is your telephone number?

The purpose of the question is to obtain a phone number as this will be needed for any subsequent interview. The question itself will include details regarding the handling of participants’ phone numbers; this will be done to reaffirm consent, even though issues of data security will also be carefully explained in the consent form.

Q1: To gather data on what choices you made in Storyplaces we need your Storyplaces User ID. If you're unsure of how to obtain your Storyplaces User ID, please ask one of the researchers for assistance. What is your Storyplaces User ID?

Obtaining users' Storyplaces User IDs will allow us to track exactly what nodes participants visit within the story as and when this will be useful, as comparing user logs between single-user and multiuser versions of 'Shelley's Heart' will allow us to see if the multiuser interaction had an impact on how users moved through the story.

Q2: What is your gender?

Q3: What is your age?

Both participants' gender and age are being gathered to control for any impact these may have on a user's perception of 'Shelley's Heart' and on their decisions during the experience. Given the lack of previous research on demographic variance, the presence of such an impact is merely speculative.

Q4: Do you live in Dorset?

Q5: Have you visited St Peter's Church or Mary Shelley's Pub regularly for any purpose?

Q6: Have you read Mary Shelley's *Frankenstein* before this?

Should the participant live in Dorset, have a pre-existing relationship with St Peter's Church, have a pre-existing relationship with the Mary Shelley pub, or have read Mary's Shelley's *Frankenstein* before, then their perspective of 'Shelley's Heart' could be altered. These questions will allow the research to control for the impact of a pre-existing relationship to the locale.

Q8: How would you rate your technical proficiency on a scale of 1-10, with 1 being poor and 10 being good?

A user's experience of 'Shelley's Heart' may be impacted if they are inherently apprehensive about using technology. Although this question asks about proficiency it will be a better reflection of a user's confidence with technology, and therefore provides a way to control for the technological shock participants may experience from 'Shelley's Heart'.

Q9: Had you used Storyplaces or read/played a Location Aware Fiction before 'Shelley's Heart'?

Q9a: If yes, what differences did you notice between what you'd previously experienced and 'Shelley's Heart'?

Someone who has experienced a Location Aware Fiction before may have different expectations compared with someone who has not, and this question will control for prior experience. In the event that multiuser interaction made an impression on the user during the experience, the follow-up (qualitative) question will also allow the participant to express as much.

Q10: How would you rate the experience of 'Shelley's heart' on a scale of 1-10, with 1 being poor and 10 being good?

Q10a: Why?

Q11: What was your favourite part of the experience?

Q12: What part of the experience stood out the most to you?

First, a quantitative evaluation of the user's experience is gathered. This data can be used to find a contrast between demographics and between categories established through social science coding. The latter provides useful data categories for analytical purposes. For example, one of the social science coding categories is a multiuser category – i.e. a category of participants that mentioned multiuser interaction. Any discrepancy between this category and others can be used to evaluate the impact derived from multiuser interactions.

Q: If you played several characters' stories, why did you do so?

Q: If you replayed a character's story, why did you do so?

The participants' choices in the game, whether they replayed characters or played multiple characters, can be tracked by their Storyplaces User ID, but *why* they exhibited these behaviours cannot be tracked in such a manner; hence, we ask these questions.

Q: What didn't you like about 'Shelley's Heart'?

If any aspects have detracted from the 'Shelley's Heart' experience, then they need to be controlled for and this can only be done should it be made clear exactly what has been an

issue for each participant. Nonetheless, this question alone was not sufficient for the purpose: some users mentioned all aspects of the experience that they found problematic, but others did not. This is known to be the case, as participants mentioned certain issues they had with the experience during the telephone interview, that they did *not* mention here.

5.1.2 Telephone Interview Questions

The purpose of a semi-structured interview is to give an opportunity for participants to mention aspects of the experience that have not been covered in the survey, to give them a chance to elaborate on things they mentioned in the survey and to give the researcher a chance to inquire into specific answers that require further exploration.

The following is a collection of the questions that will be asked in the telephone interview. Notably, however, each of these questions will be succeeded by a follow-up question, allowing a participant's original answer to be interrogated, and giving them the chance to expand on their answers if necessary.

Q: Can you walk me through the experience you had with 'Shelley's Heart'? What did you do throughout your experience with 'Shelley's Heart'?

This question will allow participants to explain their experience step by step, and in doing so they are more likely to talk about each instance in which an element of 'Shelley's Heart' stood out to them.

Q: Can you describe to me the features of 'Shelley's Heart'?

This question is the most direct and will, in principle, have the participants list each feature of the Fiction. If they have not yet referenced multiuser interactions, this is a clear opportunity for them to do so.

Should a participant mention multiuser interaction in any of the above questions, they will be asked what they liked about these interactions, what they felt they contributed, and if they would change anything about how the multiuser interactions were implemented.

5.1.3 Ethics and Data Protection Considerations

Any questions pertaining to Data Protection or Ethics were cleared after an ethics application was submitted via the internal approval system of Bournemouth University. The following sections will explore ethics and data protection in greater detail.

5.1.3.1 Ethics

The main consideration of this experiment regarding ethics is the safety of the participants. Notably, we need to consider the time of day when the experiment takes place, where the experiment takes place, and if there are any hazards we need to control for.

Regarding time, 'Shelley's Heart' is set at night. Nonetheless, the research must be carried out during the day, as having participants move about at night (while focusing on their mobile devices) would be an unacceptable risk.

Regarding location, 'Shelley's Heart' is set in St Peter's church, which is an open public area in which the participants should be safe. Nonetheless, for extra security while designing the node placement of 'Shelley's Heart', efforts were made to ensure no nodes were placed in areas of the church that would leave the participants isolated or vulnerable.

Regarding hazards, as stated earlier, 'Shelley's Heart' is set in St Peter's Church, which is relatively safe. Therefore, the only risk factors are perhaps the two nodes placed on the path outside the church, as they are next to a road. A researcher will be stationed on the path to ensure that participants are safe while consulting their mobile devices.

5.1.3.2 Data Protection

The following processes have been adopted for the protection of participant data obtained as part of this research project:

- All data collected during the research process will be securely lodged on University of Bournemouth hardware. Nothing, for example, will be stored on vulnerable personal devices.
- Identifying data, such as a participant's telephone number, will be stored against a Participant number in order to anonymise that data.
- Once identifying data, such as telephone numbers, have been used for the appropriate purposes, they will be destroyed.

5.2 Results

In this section, information about the sample will be provided first, in order to provide context to the results.

Next, the nature of the impact will be examined by exploring the observations of the author, researcher and those participants that mentioned multiuser interactions in their survey or

interview answers. This will provide a qualitative perspective on the nature of multiuser interaction impact on Location Aware Fictions.

Following on, social science coding will be employed to divide the participant population into groups and these groups will be analysed quantitatively to describe the scale of the impact that multiuser interactions have upon Location Aware Fictions

A synthesis of observations will be offered, following the analysis, to provide potential answers to the principal research questions.

5.2.1 Sample Information

At the end of the experiment, 18 participants had completed 'Shelley's Heart', and the demographics of the population were as follows:

- The sample consisted of six females and 12 males.
- The sample consisted of two participants aged between 45-54 and 16 participants between 18-24. No other age brackets were represented.
- Fifteen participants were not resident in Dorset at the time of the experiment, while three were.
- Three of the participants had previously visited the site while 15 had not. It should be noted these were the same participants who lived in Dorset.
- Three participants had read *Frankenstein* while 15 had not.
- None of the participants reported having used Location Aware Fiction before 'Shelley's Heart'.

5.2.2 Qualitative Analysis of Feedback

This section of the chapter will explore the qualitative data acquired by the survey and the telephone interview. Several responses mentioned the same topics and therefore analysis of this data will be organised with reference to those topics. Specifically, the topics comprised technical issues, videos, location tracking and multiuser interactions.

5.2.2.1 Multiuser Interaction

Analysis of participant feedback regarding multiuser interaction will be the focus of this section, with the aim of interrogating the specific nature of such interaction.

Six out of the 18 participants mentioned multiuser interaction. Five of these participants were aged between 18-24 and one of the participants was aged between 45-54. Of these six, none were Dorset residents at the time in question.

When participants mentioned multiuser interactions, they did so in specific ways: i.e. they described them in terms of their story being changed, in terms of changing other people's stories, or in terms of being social.

Of the participants who commented on multiuser interaction, three expressed pleasure at having their stories influenced by others. This was in response to the survey questions, *'*What was your favourite part of the experience*'*, and, *'*What part of the experience stood out the most to you*'*?

> *'How decisions of other players can change the story.'*
>
> *'The aspect of the changing story based on what paths other people chose.'*
>
> *'The effect of different choices made in others' games is interesting…'*

Two participants cited their enjoyment of the way in which their own choices impacted the narratives of other participants. This was in response to the same questions mentioned above.

> *'Interaction of my own choices with other people's experiences.'*
>
> *'It was cool that I was changing the story for other people…', and, 'Making decisions that affected other people.'*

And lastly, one of the participants who mentioned multiuser interaction described it in terms of it being social without referring to how their story was affected or how they affected others.

> *'The interactivity between people was fun for the social aspect.'*

Four of the participants who described multiuser interactions in the questionnaire also described multiuser interaction in the telephone interview. When they did so they described the multiuser interaction in the same manner as they had during the survey. For ease of reading, a term will be ascribed to each of the groups: those that talked about having their story changed will be referred to as Receivers from here on, while those that talked about

impacting other users' stories will be referred to as Broadcasters, and those that talked about multiuser interaction being social will be referred to as Communicators.

When asked, *'*Could you explain to me your experience with 'Shelley's Heart'?', and, *'*Could you describe the features of 'Shelley's Heart'?*'*, participants who had referenced multiuser interaction gave the following responses.

Those that were Receivers stated the following:

> *'The Split Narrative, the aspect that your story can change depending on what other people have chosen, the multiple-choice aspect going to different nodes around the church.'*
>
> *'I thought it was interesting how players' options were interacting, so for example, at some point I had to pick an option based on how someone else picked.'*

The Broadcasters stated the following:

> *'...got to pick options I think changed the story, one of these said it would affect someone else I think which is cool.'*
>
> *'...I made one choice that affected others in the middle but then went through the rest.'*

Unfortunately, no telephone interview could be conducted with the Communicator as he/she neglected to answer the call.

More specifically, Receivers gave the following responses in terms of how their experiences were influenced by multiuser features:

> *'It was interesting, it means you can do it multiple times and get different pieces of information each time you do it.'*
>
> *'I felt that was quite an interesting aspect, knowing that someone else had gone through a similar storyline and based off their options it was impacting what I could choose from. Yeah, I liked that aspect to be honest.'*

When asked how the multiuser implementation might be enhanced, Receivers commented as follows:

'No, I like the interaction between the various stories.'

'No, I think it only occurred once for me, I think, I wasn't sure from like the other situations. So, I think that was fine to be honest. I think there was 10-20 options overall so one instance of it was fine.'

When asked about the effect of multiuser interaction on their own narratives, Broadcasters made the following observations:

'Changing for me and others ain't something I've done before. Yeah I thought about choice more there.'

'…Well I think it added weight to choices I made, yeah it was more immersive as they mattered.'

And when asked what they would change about the multiuser implementation, Broadcasters stated:

'I wouldn't make a change.'

'I would make it so I could affect others more, there was only one time, one choice that allowed me to.'

Both Receivers and Broadcasters mentioned the frequency of multiuser interactions. A Receiver stated, *'*One instance was fine*'* while a Broadcaster stated, *'*I would make it so I could affect others more.*'* Hence, the frequency with which interactions occur would appear to be significant.

'It means you can get different pieces of information each time…*',* and, *'*I felt that it was an interesting aspect… it was impacting what I could choose from*'*, are comments from Receivers that suggest that Receivers appreciate that their narrative is being uniquely shaped by the prior choices of other participants.

*'*It added weight to choices I made*'* and, *'*I thought about choice more there*'* are statements from Broadcasters that suggest Broadcasters feel additional weight is added to their decisions when they impact another participant.

Despite a Receiver mentioning that multiuser interactions mean, *'*…you can do it multiple times and get different pieces of information each time you do it*',* only two participants

played through the story as a different character, and no participants replayed a character. Only two participants did, in fact, replay 'Shelley's Heart': neither mentioned multiuser interactions, and the latter were unrelated to the decision to replay.

> *'To see how the events of each story played out from different perspectives.'*
>
> *'To see what the different stories consisted of.'*

This contradicts the statements of Receivers that multiuser interaction would increase the chances of them replaying a Location Aware Fiction, and instead suggests that differing character perspectives within a narrative are the key to such a result, but two participants do not provide enough data to construct a definitive answer.

5.2.2.2 Location Tracking

This section will focus on the participants that mentioned location tracking, though it excludes comments that mentioned location tracking in relation to technical issues, as that issue will be covered in a later subsection.

In total, location tracking was mentioned by six participants: of these, four were male and two were female. Five of the participants were between the ages of 18-24, and two were living in Dorset at the time of the experiment.

The participants that mentioned location tracking did so in two ways. First, the pleasure derived from reaching nodes was cited; second, participants evinced enjoyment in visiting 'real' places associated with the Fiction.

The participants that described location tracking in terms of finding or tracking the nodes said the following when asked, *'*What was your favourite part of the experience?*'*:

> *'I enjoyed tracking the markers.'*
>
> *'Walking round and getting the clues… I liked the set up and the walking around to find the clues.'*

These participants seemed to have created a game around visiting the nodes and this is consistent with the findings of Blythe *et al.* [20], who found that some participants would set themselves objectives to gamify the experience.

In answer to the question, 'What was your favourite part of the experience?', participants that had referenced visits to real-time locations with regard to location tracking stated:

'Visiting the locations in the story.'

'The novelty of exploring real-time locations.'

'It was really fun. I really like the story and getting immersed in the actual place.'

'The story was great with good location points.'

It is striking that, while two of these individuals were resident in Dorset at the time, neither cited any personal relationships to the narrative locations [6, 18]. This may be because of the lower sample size or it could indicate that the local participants within this study had a weaker connection to the area than those within Nisi *et al.* [6, 18]. In the same vein, none of the participants reported knowledge sharing about the locations of 'Shelley's Heart' between those who lived in the area and those that did not.

5.2.2.3 Technical Issues

This section will focus on participants that mentioned technical issues.

Seven participants cited various forms of technical issue. Of these, five were male and two were female.

Participants mentioned technical issues in three different ways: a generic complaint, a specific complaint about the browser running slowly, and complaints about GPS accuracy. Of these individuals, all were aged between 18 and 24 at the time of the experiment and two resided in Dorset.

The generic complaints are as follow:

'Works well if the device allows it to.'

The browser complaint is as follows:

'Getting it to load on Safari was tough and the server ran slow.'

And the GPS complaints are as follows:

'The GPS tracker was slightly faulty.'

'...Issues with the location / GPS tracking.'

'Faulty GPS.'

'There are technical limitations of phone such as problems with location tracking. They meant you sometimes had to wander around until the phone connected.'

'The story was great with good location points but the GPS location kept moving around when still and was inaccurate.'

5.2.2.4 Videos

This section will address those participants who commented on the potential future addition of videos to the Fiction.

The subject of videos as a possible future component of 'Shelley's Heart' was cited by five participants. Two of these participants were female and three were male, while all participants were between the ages of 18-24 and none were living in Dorset at the time of the experiment.

The participants mentioned videos in the following ways:

'When the videos are added it will be very good...'

'...it would help having a video to feel more immersed in the story but was really fun to do as a group.'

'I feel this would be a really enjoyable experience and adventure when the videos have been filmed as opposed to reading a script. I look forward to the full version being released.'

'It is a very wordy game with a lot of information to take in at once about what's going on and who is where. I know this could be due to no audio or visuals currently.'

'I wasn't keen on the narrative that I had to read as I feel it can put people off or make it hard for them to read in the middle of the day. This will change once the video is implemented.'

As participants were *not* informed of the possible future inclusion of videos in the narrative, their references to this contingency are the more notable. It is possible, as 'Shelley's Heart' was written as a script, that some participants speculated that 'Shelley's Heart' would be filmed and they then developed an expectation that it would be. However the concept of videos may have originated, nonetheless, it is significant for its potential impact on results.

5.2.3 Quantitative Analysis of Feedback

There are two main quantitative metrics with which the scale of multiuser interactions' impact can be measured. The first concerns how participants rated the experience of 'Shelley's Heart', and the second concerns how they rated their technical confidence. As noted earlier in the section on methodology, participants were invited to grade their experience on a scale of 1 – 10. Technical confidence, as stated in the same section, is based on a question that asked participants to rate their 'technical proficiency' on a scale of 1-10. Although self-reporting of technical proficiency could provide unreliable data regarding a participant's actual technical skill, it does provide a way to measure a participant's confidence with technology. It is, therefore, as a measure of confidence that it is deployed here.

5.2.3.1 Demographic Analysis

The demographic variations within the sample will be addressed in this section of data analysis. If there is a difference between the demographics, e.g. those that have read *Frankenstein* versus those that have not, then such differences can be accounted for in the analysis of multiuser interactions.

The following demographics will be compared:

- Male and Female
- Those who are 18-24 years old and those who are 45-54 years old
- Those living outside Dorset versus those living inside the county.
- Those who have read *Frankenstein* versus those who have not.

'Those living in Dorset versus those resident outside' also comprises, 'those who had visited the site versus those who had not', as the same participants were contained in both categories. Hence only one category is explored in the subsequent sections.

As none of the participants had previously experienced a Location Aware Fiction, there is obviously no opportunity for an 'experienced versus non-experienced' category.

5.2.3.1.1 Comparison of Males and Females

The results show that female participants have a higher mean experience rating than male participants, as female participants have a mean rating of 8.17 while male participants have a mean rating of 7. Although the results imply there is a difference between the mean of Male and Female Experience Ratings, the difference was not found to be statistically significant with a One Tail T-Test. The One Tail T-Test returned a t-value of -1.33 and a p-value of 0.10. The mean Experience Ratings of Males and Females can be seen in Figure 23.

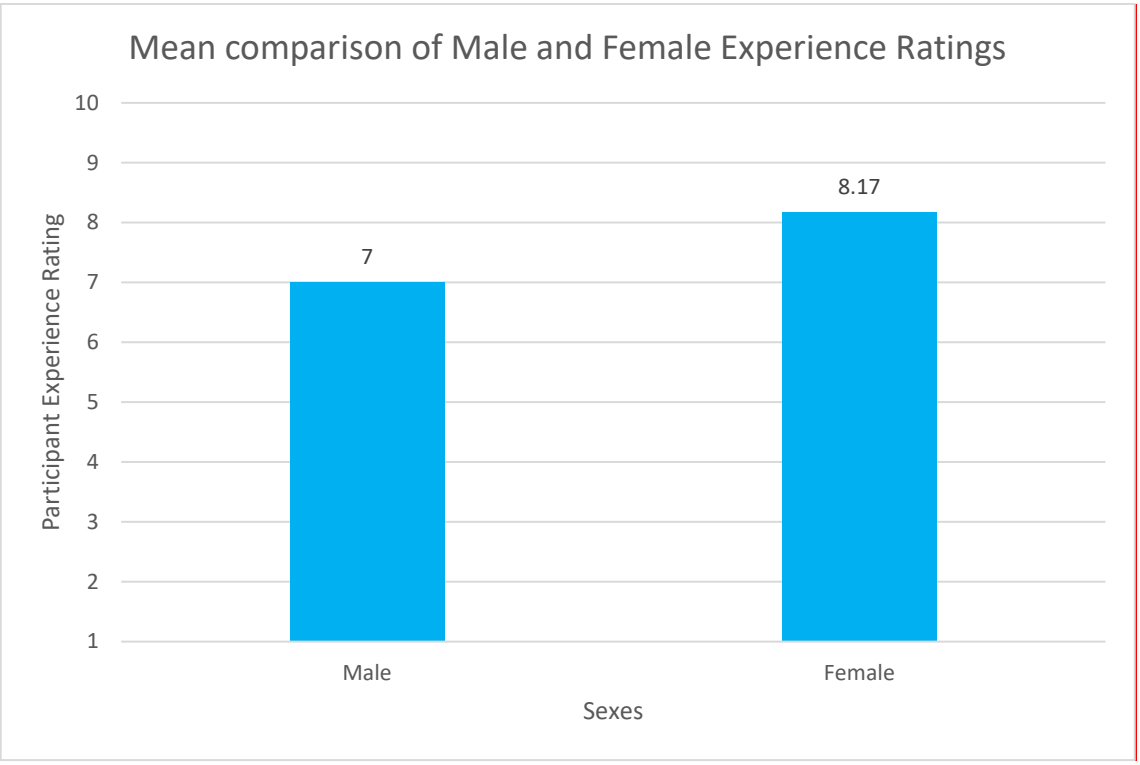

Figure 23: Mean comparison of Male and Female Experience Ratings

5.2.3.1.2 Comparison of 18 to 24-year olds and 45 to 54-year olds

Younger participants (mean rating 7.74) evinced a higher mean experience than older ones (mean rating 6). The results would imply there is a difference between the mean of younger and older participants' Experience Ratings, but the difference was not found to be statistically significant with a One Tail T-Test. The One Tail T-Test returned a t-value of

0.77 and a p-value of 0.23. Figure 24 illustrates the mean Experience Ratings for the two groups.

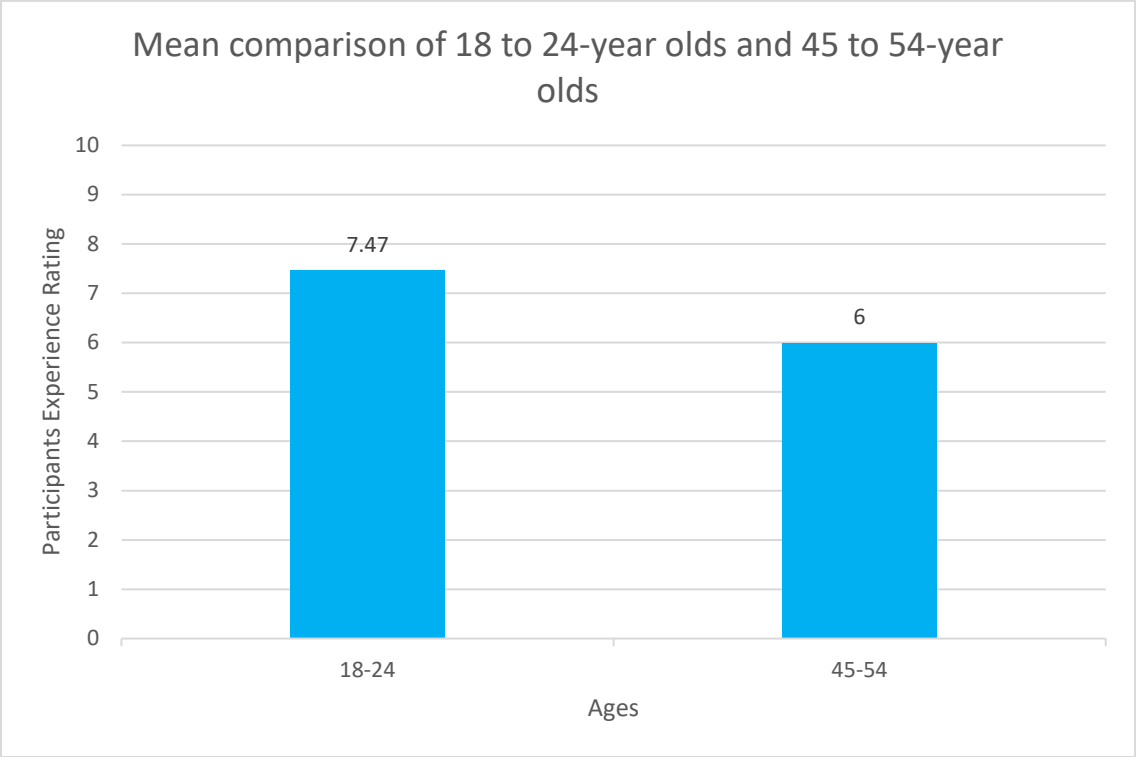

Figure 24: Mean comparison of 18 to 24-year olds and 45 to 54-year olds

5.2.3.1.3 Comparison of those living in Dorset and those living outside

Results evinced a higher mean Experience Rating for 'outside' residents as against Dorset residents. The latter had a mean rating of 7, as against a mean rating of 7.5 for the former. The results thus imply there is a difference between the mean Experience Rating of those from Dorset and those from outside Dorset. The difference was not found to be statistically significant with a One Tail T-Test. The One Tail T-Test returned a t-value of 0.43 and a p-value of 0.34. The mean Experience Ratings of those from Dorset and those from outside Dorset can be seen in Figure 25.

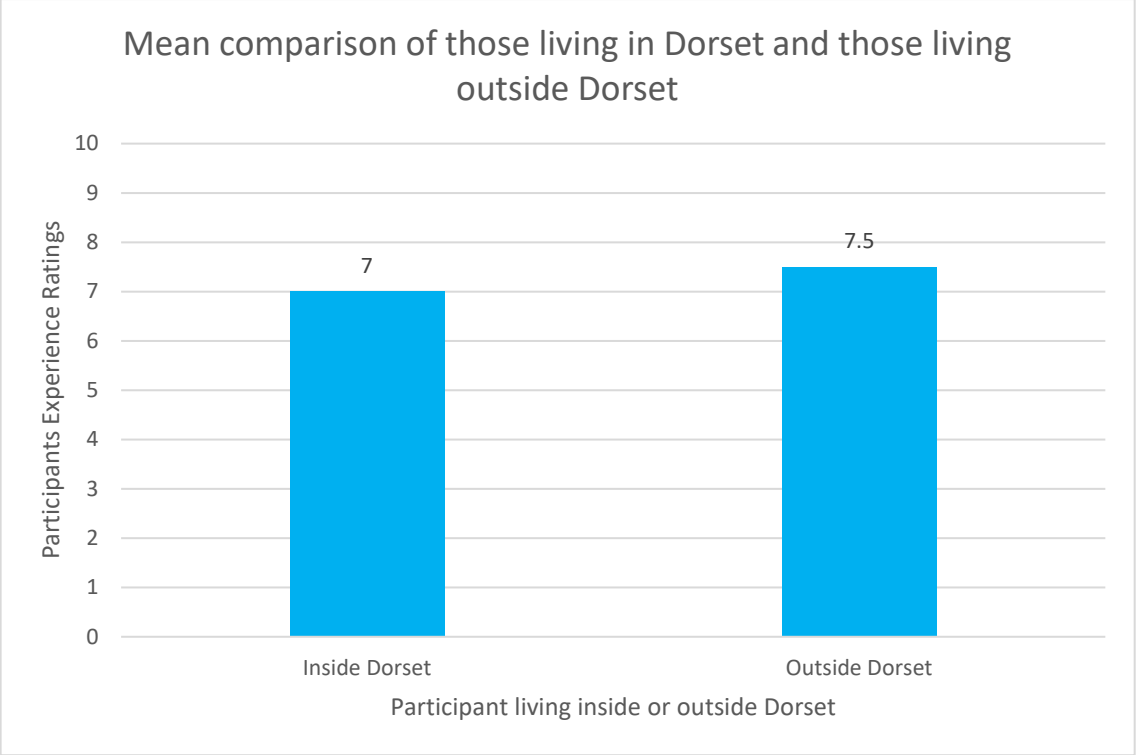

Figure 25: Mean comparison of those living in Dorset and those living outside Dorset

5.2.3.1.4 Comparison of those who have read *Frankenstein* and those that have not

Results demonstrated a higher mean experience rating for those who had not read *Frankenstein* versus those who had. The participants who had read the book had a mean rating of 7, while those who had not had a mean rating of 7.5. The results would imply there is a difference between the mean experience rating of readers and non-readers of the book. The difference was not found to be statistically significant with a One Tail T-Test. The One Tail T-Test returned a t-value of 0.43 and a p-value of 0.34. Figure 26 illustrates the mean experience ratings of those who had read the book versus those who had not.

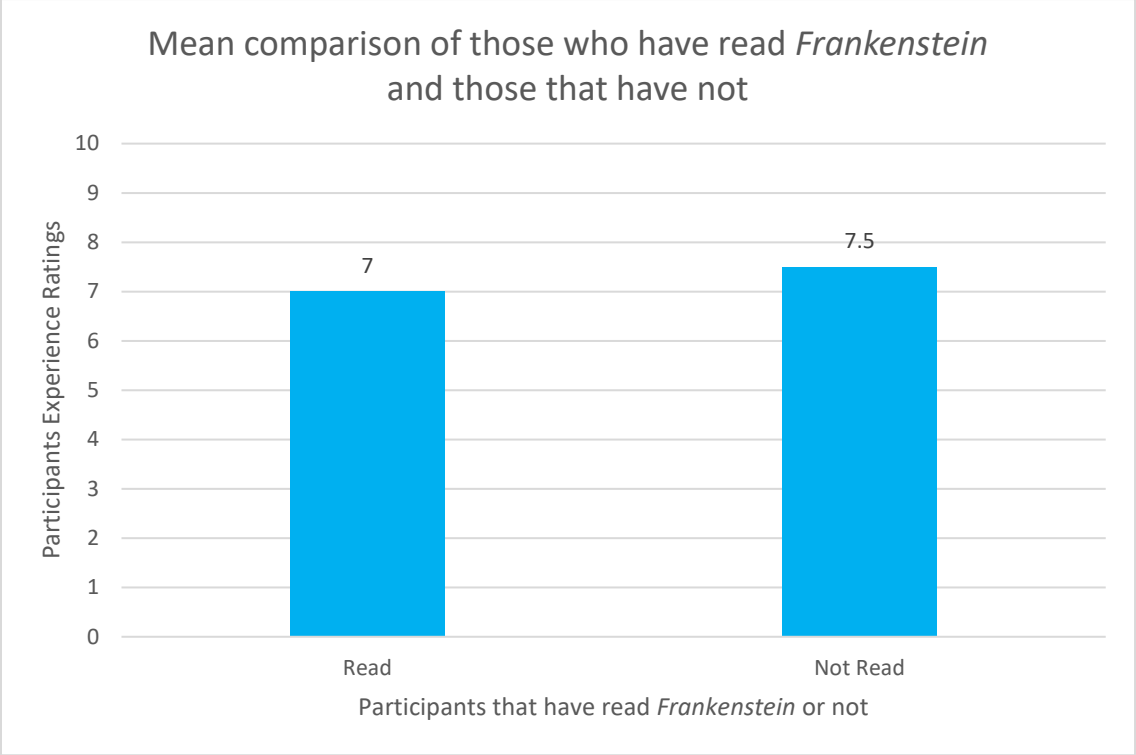

Figure 26: Mean comparison of those who have read social science coding groups

5.2.3.2 Social Coding Analysis

This section of data analysis will divide the sample into different populations using social science coding. The social science coding groups were drawn from the qualitative feedback covered in the previous section; why these categories were brought forward will be outlined later in this section. The social science coding groups can be seen, restated, in Table 3. It should be noted that the same participant may appear in several categories. For instance, given the requisite phone or survey data, one individual might be present within both the location-tracking and the multiuser interaction categories.

Table 3: Social Science Coding Groups

Category Name	Category Criteria	Example of comment that would count.
Technical Issues	Any reference to a technical failing; GPS failing, the user being unable to understand the interface, or the website being slow to load.	'Getting it to load on Safari was tough and the server ran slow.'
Videos	Any reference to the future implementation of videos or how the experience would benefit from videos.	'I feel this would be a really enjoyable experience and adventure when the videos have been filmed as opposed to reading a script.'
Location Tracking	Any reference to location.	In response to 'what was your favourite part of the experience', 'Visiting the locations in the story.'
Multiuser Interaction	The category would comprise any candidate who referred to multiuser interaction.	'The aspect of the changing story based on what paths other people chose'

The purpose of devising and evaluating these categories, rather than multiuser interaction alone, was to determine the impact that each phenomenon had on the participant's reading of 'Shelley's Heart'. With the impact of multiuser interaction and auxiliary phenomena quantified, the effect of multiuser interaction could be isolated and precisely determined. Therefore, each of the social science coding groups were devised to represent phenomena that may have had an impact upon the reading of 'Shelley's Heart'. Phenomena were categorised as having an impact when participants had mentioned them in a positive or negative manner, as shown in the previous section.

The category of videos is of particular note, as it was not the subject of this research and no questions were asked with regard to videos, yet it was mentioned by several participants. It is possible that this phenomenon arose because 'Shelley's Heart' presented its story in a script format – a consequence of presenting a theatre performance in written form. However, videos were present in two of the Location Aware Fictions explored during this research's literature review: 'Hopstory' [19] and 'Media Portrait of Liberties' [6, 18]. Videos being mentioned by participants without prompt and being present in other Location Aware Fictions suggested that they were relevant to Location Aware Fiction and warranted a category within the social science coding.

Analysis of the categories will be undertaken with reference to the main metrics noted earlier – experience rating and technical confidence – and the categories will be compared with one another. It should be noted that, due to the low sample size, it was highly unlikely that statistically significant results would be found in a quantitative analysis. Future research may, therefore, be undertaken to substantiate the results of the present study.

5.2.3.2.1 The Correlation between Experience Rating and Technical Confidence

One significant step in assessing the impact on Location Aware Fiction of multiuser interaction is to determine if there is correlation between a participant's self-rating of their own technical ability and their rating for Multiuser Location Aware Fiction *per se.* If there is a strong correlation between technical confidence and experience rating, this would imply that Multiuser Location Aware Fiction is better suited to technically confident users. This vector of analysis stemmed from the proposition that technical features would be better received by a technically proficient audience. This is relevant to the research question 'What is the nature of the impact?' as it attempts to define factors outside of multiuser interaction that influence the impact of multiuser interaction upon a user's readings of 'Shelley's Heart'.

In this section, the correlation between technical confidence and experience rating was measured for each of the social science coding categories. The correlation between experience rating and technical confidence for each group is represented in Figure 27. In Table 4, the correlation strength, Pearson's R, and the P value are presented for each of the categories. While Pearson's R suggests a correlation between technical confidence and experience rating for multiuser interaction, the findings are not statistically significant and

cannot be treated conclusively. Should these results be repeated with significance, it would have implications for which audiences would be most suitable for Multiuser Location Aware Fiction.

Table 4: Correlation of Experience Ratings and Technical Confidence

Category	Population	Pearson's R	P Value
Videos	5	0.82	0.89
Multiuser Interaction	6	0.65	0.16
Location Tracking	6	0.34	0.50
Technical Issues	7	0.32	0.48

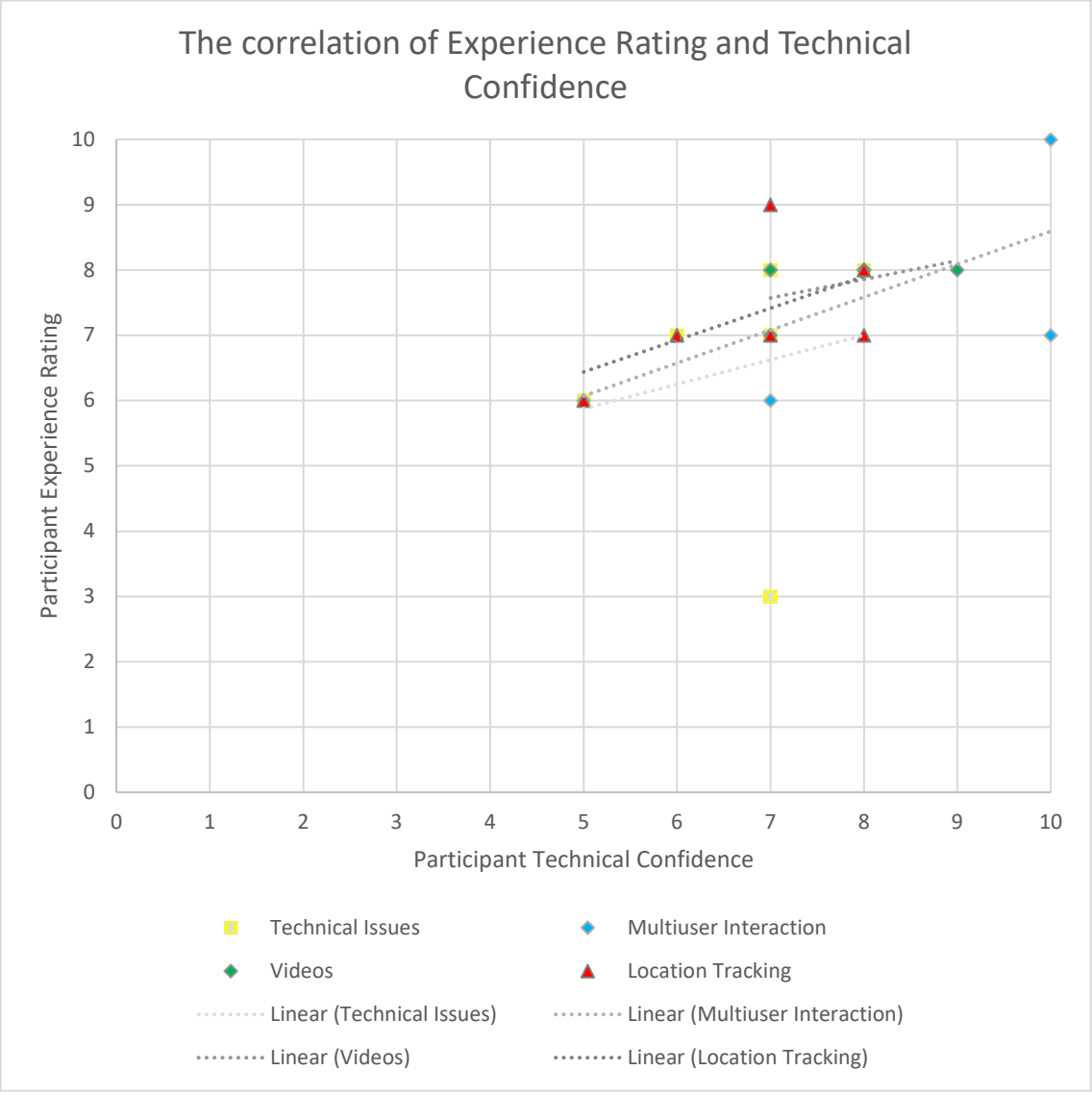

Figure 27: The correlation of Experience Rating and Technical Confidence

5.2.3.2.2 Mean Experience Ratings of Social Science Coding Categories

The impact of the social science coding categories on Location Aware Fiction, in terms of mean experience rating, was investigated through using One Tailed T-Tests. These tests compared each category's experience ratings against the experience ratings of all the participants outside of that category, to determine whether that category deviated from the experiment's overall population.

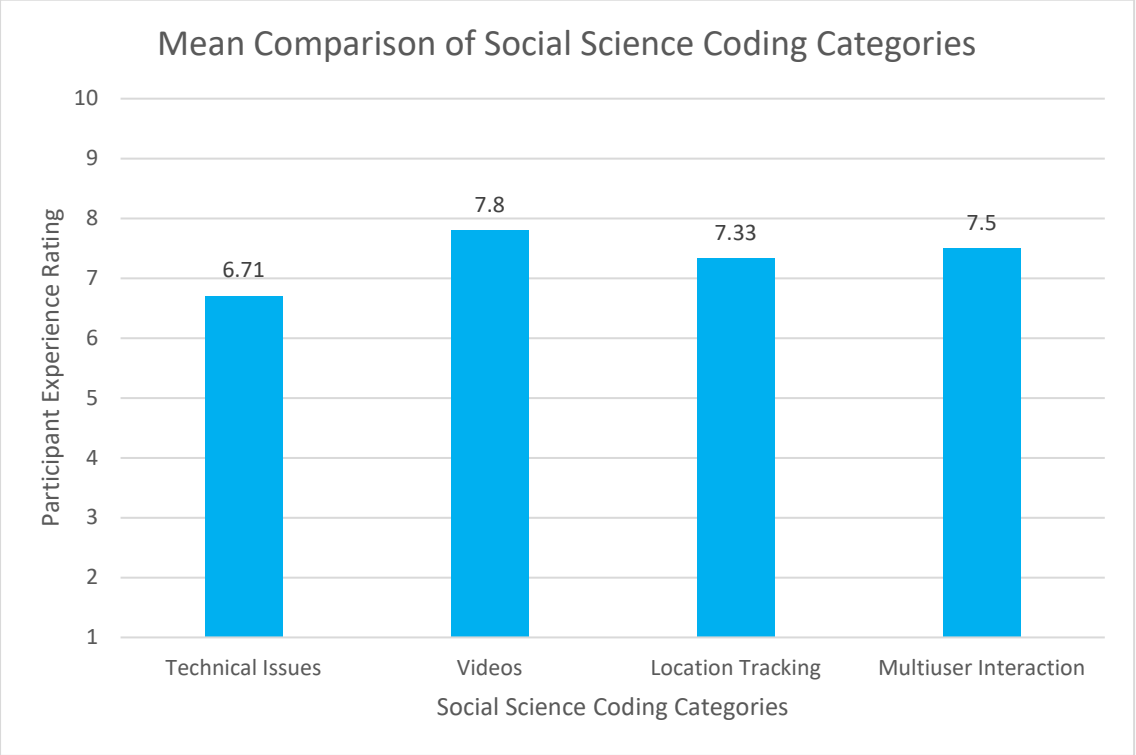

Figure 28: Mean comparison of Social Science Coding Categories

The mean experience rating of the social science coding categories can be seen in Figure 28, and the results of the One Tailed T-Tests for each of these categories can be seen in Table 5. The data suggests that technical issues negatively impacted the experience of users to a greater extent than other phenomena; however, the results are not statistically significant.

Table 5: Social Science Coding Categories One Tailed T-Test Results

Category	DF	T Value	P Value
Technical Issues	6	-1.65	0.60
Videos	4	0.15	0.44
Location Tracking	5	-.013	0.45
Multiuser Interaction	5	0.15	0.44

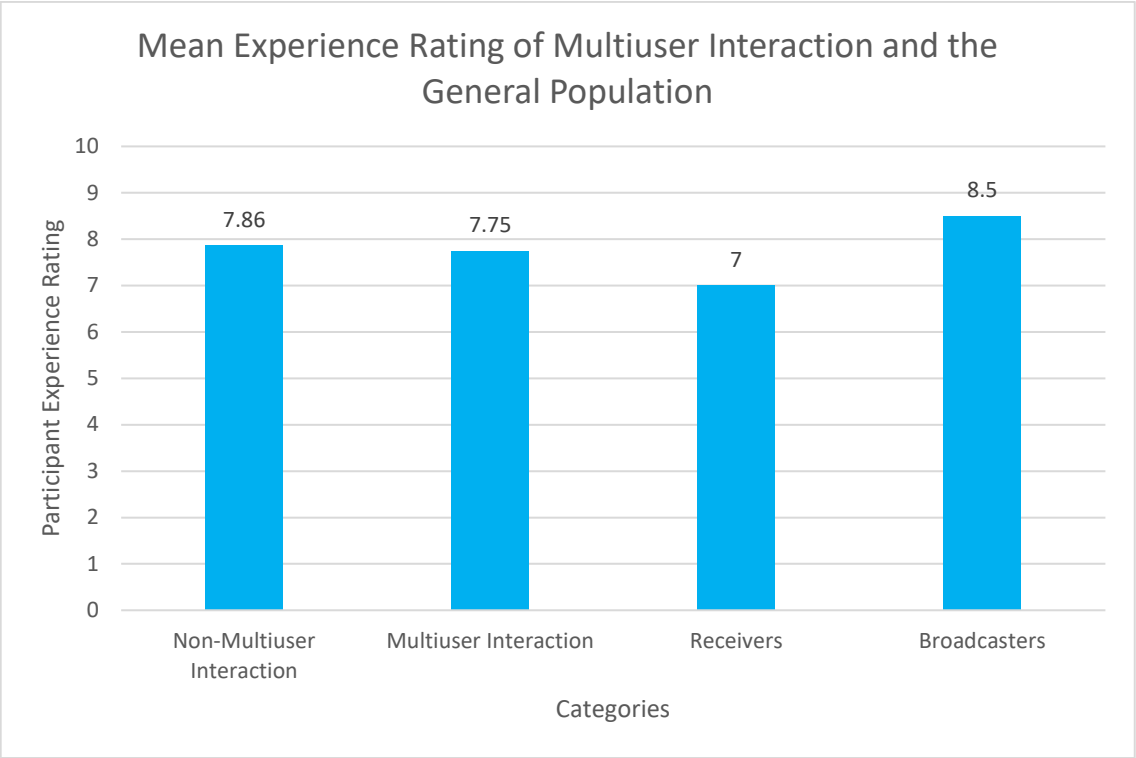

Figure 29: Mean experience rating of multiuser interaction and the general population

Figure 29 illustrates a mean comparison between the categories of multiuser interaction described in section 5.2.2.1 and the remaining population of the experiment. Participants who reported technical issues have been removed, as the prior analysis showed that they rated 'Shelley's Heart' more negatively than other participants. They were also represented differently in the general population and the multiuser interaction population. The population for the various categories is changed as a result of the elimination of those who cited technical issues; hence, Table 6 reflects the population for each group in Figure 29.

Figure 29 and Table 6 also include data from the Broadcasters and Receivers that were defined in a previous section.

Table 6: Population after technical issues are removed

Category	Original Population	Population Removed	Population in Table
Non-Multiuser Interaction	12	5	7
Multiuser Interaction	6	2	4
Receivers	3	1	2
Broadcasters	2	0	2

Table 7 shows the One Tailed T-Test results for Figure 29. The data in the table demonstrate the statistically insignificant nature of the results. Nonetheless, should these results be repeated with a larger sample size, one large enough for significance, it would imply that multiuser interaction has a positive impact on the 'impressions' of those users who preferred influencing other users.

Table 7: Multiuser Interaction and General Population One Tailed T-Test Results

Categories	T-Value	P-Value
Multiuser Interaction	0.10	0.46
Receivers	0.78	0.23
Broadcasters	-0.75	0.24

5.2.4 Reflections

As the introduction of multiuser functionality impacts development, as well as multiuser deployment *per se,* the views of both the researcher and the author will be considered here.

5.2.4.1 Author Reflection

For the author, one focus was the ability for users to see the different perspectives of the various characters in 'Shelley's Heart', which to a degree one could do in the theatrical version before multiuser interaction or location tracking. Nonetheless, introducing split paths for the various characters created an additional burden as the author had to expand the scope of each character.

> *'Giving Byron, John and Percy's Ghost their own story-paths meant transforming them from what E.M. Forster* (Aspects of the Novel) *called 'flat characters' into 'round characters,' that is, a character with internal complexities that plot developments exploit to create a compelling narrative. In all three cases, this meant introducing an additional character towards the beginning and end of their unique story-path.'*

Among other concerns, it was necessary to ensure that users would not miss information essential to the plot as a consequence of branching. This applied to both nodes – which would be affected by influence between characters – and branching, which was entirely determined by the users' personal choices. Please note that the following quote was based on an earlier version of 'Shelley's Heart': Nodes 2A and 2B are now P3A and P3B while nodes 2A and 2B are now P4A and P4B on Figure 14, which represents the current state of 'Shelley's Heart'.

> *'For instance, all of the story-paths have some nodes that are skippable and some that are crucial for comprehension of the plot. This determined how I laid out the player choices within each individual path ... at the end of Percy 2A and Percy 2B, the player chooses only between Percy 3A and 3B. This has to do with offering an earlier choice (between 2A and 2B) because either one of those (but NOT both) is skippable.'*

The author had potential options in mind regarding the deployment of Influence Selection within the narrative and afforded some insights into this challenge. Specifically, the author feels that the 'personal' aspects of Autocratic Influence render it especially suitable for 'Shelley's Heart', although different scenarios might otherwise correspond to differing forms of Influence Selection.

> *'... i.e. the branching choices have autocratic influence, but other elements such as character polls could have majority influence, etc. This seems less arbitrary and more intuitive in terms of a design strategy… though I suspect the one that would be most satisfying for players would be autocratic. Often friends will play simultaneously and enjoy influencing each other's experience. The other seem a bit more abstract and impersonal.'*

Here, one must bear in mind that research into optimal forms of Influence Selection for ‘Shelley’s Heart’ is incomplete; thus, any suggestions in this regard are merely speculative. The speculation, however, is based on the author’s experience working with narrative in the past.

5.2.4.2 Researcher Reflections

Several observations were made by the researcher regarding the development process of multiuser interaction – e.g. the added difficulty in crafting fabula, potential crowding, and difficulty in dealing with or creating awareness of multiuser interaction.

During implementation, the researcher perceived certain inherent contradictions concerning the fabula – specifically, between paths. For example, characters may appear in one scene which would be chronologically impossible due to another path having stated that they were in a different location. This issue may arise because, during conversion of ‘Shelley’s Heart’ to a Multiuser Location Aware Fiction, content was reused for different paths; therefore, an author working from scratch may not encounter this problem. In the case of ‘Shelley’s Heart’, it only occurs during the first nodes in the story. Research on Location Aware Fiction examined during the literature review discussed the difficulty of ensuring coherency, and this is consistent with the experience of the researcher.

Having four distinct paths in ‘Shelley’s Heart’ meant that numerous locations needed to be used, but this was mitigated slightly by some nodes sharing locations. Nonetheless, this could only occur at points in the narrative where it made sense, and therefore finding locations within St. Peter’s churchyard became a strain. Should another project be undertaken, the number of paths used should be tied directly to the available space for the narrative, unless there is very little divergence between these paths so that locations can be reused.

The user’s knowledge of multiuser interactions – or precisely, the manner in which this awareness should be managed and directed – was a major issue in the design of ‘Shelley’s Heart’. For ‘Shelley’s Heart’, it was decided that a tooltip would tell a user what action they were about to undertake and who it would affect but not *how* it would affect them, as seen in Figure 30.

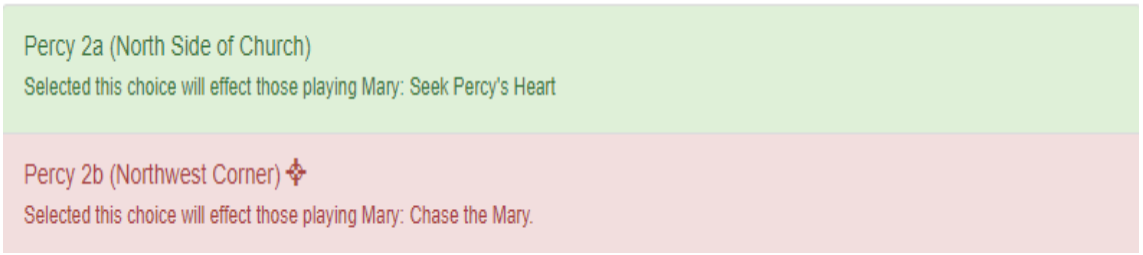

Figure 30: UI when Percy makes a choice

A tooltip is deployed to notify players when their narrative has been altered or impacted. This appears at the same moment as a tooltip notifying the player how an action will impact a different user. In effect, as little information as possible has been given, but the fact that participants' choices have an impact is presented in a similar manner to the Telltale[2] games' use of a 'They'll remember that' intervention as an indicator to players that their actions could have ramifications, as seen in Figure 31. To be clear, however, Telltale deploy this technique even when choices lack impact, in order to maintain player engagement.

[2] https://telltale.com/

Figure 31: 'Remember that' prompt of Telltale Games

Note: tooltips such as these were addressed in the section dealing with the reader's perspective on 'Shelley's Heart'. They are mentioned again here due to the lack of credible alternatives for 'notifying' users – or at least, no viable alternatives are currently apparent to the researcher.

5.3 Discussion

This section will comprise a discussion, with the objective of providing clear answers to the research questions of the present study. The data analysed above will provide the foundation for this discussion.

5.3.1 Do Multiuser Interactions Impact Location Aware Fiction?

The influence of multiuser interaction on Location Aware Fiction is reflected in a variety of ways. First, multiuser interactions have introduced certain unique design considerations into the development of Location Aware Fiction. Second, the fact that multiuser interaction

was cited in participants' feedback illustrates that it at least had sufficient impact to be worth mentioning. Thirdly, though further testing will be needed due to the small sample size, the results of this study indicated that multiuser interaction may have positively impacted the ratings of broadcaster users.

5.3.2 What Was the Nature of That Impact?

The impact of multiuser interactions upon 'Shelley's Heart' appeared to be at least partially related to the technical confidence of participants; those who were more confident with technology rated it higher. Nonetheless, the majority of user ratings could not be explained through reference to technical confidence, as the correlation was weak, as evinced by the quantitative analysis. This is important as it shows that the nature of multiuser interaction impact goes beyond appealing to the technical sensibilities of users, and that other elements are likely to be at play.

Part of the multiuser interaction impact is likely to be narratively focused: specifically, the nature of multiuser interactions' impact tends to alter the interpretation of narrative in a manner dependent on the user's sensibilities. So-called Broadcasters and Receivers were the two main types of sensibility identified in the study. Confirmation of these types will have implications for the development of Multiuser Location Aware Fiction, as they would need to be considered when designing interactions.

- **Broadcasters** feel that the impact of other users on their own stories has rendered their experience personal and unique.
- **Receivers** have their perspective on making choices altered when they know the choice will affect another participant. Consequently, they feel a greater sense of 'narrative immersion' and attach greater weight to their choices.

Multiuser interaction impact in the design and development process necessitated a change of approach. This is highlighted by the author in his reflection: he states that multiuser interaction required adding additional layers to side characters, and also needed a more careful approach when designing narrative paths as it became possible for important information to be skipped without the consent of the affected player.

5.3.3 What Is the Scale of the Impact?

Since Broadcasters and Receivers rated the experience differently, the scale of the multiuser impact appeared to vary. Receivers rated the experience below the general population while Broadcasters rated it above the general population. As the author implied during his reflection, this may suggest that Autocratic Influence heightens a user's enjoyment when influencing another participant, as Broadcasters rated the experience highly. This does not appear to hold true for Receivers, however. A fruitful topic for further investigation, then, would be the different ways in which users' enjoyment is affected by various types of Influence.

Though it seems that 'being Autocratic' may have influenced the results of Broadcasters, there are no references in this research that would indicate a preference for Delayed or Instant Influence, Fabula or Discourse Influence, or Generative or Guiding Influence. Since the scale of the impact seems to be related to the implementation of Multiuser Influence, future work should include a variety of influence types.

5.3.4 Methodology Evaluation

The quantitative analysis within this research led to statistically insignificant results while the qualitative analysis provided preliminary insights into the nature of multiuser interactions. This situation raises the question of whether or not the methodology utilised requires modification.

The purpose of each type of analysis should be revisited in order to determine if the methodology should be altered. The purpose of the qualitative analysis was to identify the nature of multiuser interaction's impact upon Location Aware Fiction. The purpose of the quantitative analysis was two-fold: to measure the scale of multiuser interaction's impact upon Location Aware Fiction, and to determine if the said impact's nature is related to the technical proficiency of users.

The qualitative analysis did provide some insight into the nature of multiuser interaction in the form of Broadcasters and Receivers. However, these findings could be supplemented with additional information should the methodology be altered.

First, the interviews with participants could be improved with additional questions regarding multiuser interactions. These questions should focus on determining how

participants perceive their experience was altered by multiuser interaction and what their favoured aspect of multiuser interaction is. Examples of questions that may yield the desired results are:

> *'How did the interactions between users in 'Shelley's Heart' work? Interactions being moments within 'Shelley's Heart' where one user's choices affected the narrative of another user.'*
>
> *'What was your favourite aspect of the multiuser interactions within 'Shelley's Heart'? Interactions being moments within Shelley's Heart where one user's choices affected the narrative of another user.'*

Secondly, observing participants while they are experiencing 'Shelley's Heart' could also serve to improve the qualitative analysis. Such observation would focus on two aspects of a user's experience: how users interact with other participants when they encounter them while reading, and how users react when reading the nodes that provide opportunities for multiuser interaction.

Both of these modifications attempt to build upon the methodologies' ability to determine the nature of multiuser interaction's impact upon Location Aware Fiction.

The failing of the quantitative analysis was an inability to provide statistically significant results. Therefore, modifications to the quantitative analysis should focus on achieving statistically significant results so that the scale of multiuser interaction's impact can be measured. There are modifications that can be made to this end.

First, increasing the overall population size: the current population meant that the subpopulation derived from social science coding was too small for meaningful statistical analysis.

Secondly, having two populations – one population that experiences a multiuser version of 'Shelley's Heart' and another population that experiences a single-user version of 'Shelley's Heart'. This is because the primary purpose of this research was to determine the effect of multiuser interaction but the reporting of the phenomenon was too low to form a subpopulation large enough for meaningful results.

Both of these suggestions should serve to provide statistically significant results; however, it should be noted that research into Location Aware Fiction requires participants to physically travel to a location, making large populations harder to achieve. If larger populations cannot be achieved, the methodology should refocus entirely on qualitative analysis, as quantitative analysis will be unable to produce significant results. Since research of this kind is heavily focused around user experience, qualitative analysis should be sufficient.

6 Conclusions

This research revealed a trend for Location Aware *Games* to be multiuser experiences and Location Aware *Fictions* to be oriented to single users. Hence, this research sought to integrate multiuser interaction within a Location Aware Fiction in order to examine the (relatively underexplored) impact.

The research explored a variety of Location Aware Fictions, finding that not only were they predominantly single-user experiences, but also that research into Location Aware Fiction focused predominantly on qualitative rather than quantitative studies, and that there was a persistent reported problem of participants disassociating the narrative from the physical environment. Nonetheless, the Writers' Toolkits Aesthetics addressed this issue, and it was found that over time, Location Aware Fiction moved from simple patterns to more complex compositions.

The research explored a variety of Location Aware Games: not only were they found to be predominantly multiuser experiences but also, over time, Location Aware Games became asynchronous and reduced the total number of interactions that could occur within them. Games comprising user-generated content received negative feedback if content originators could not be identified.

The multiuser research covered in this study proposed a framework of interactions based around General Characteristics, Initiator Characteristics and Recipient Characteristics. Examination of this model concluded that it was a strong base for future models of multiuser interaction. Nonetheless, the focus was essentially on the interactions *per se* and not on the narrative impact of those interactions.

Based on the above-mentioned research, this project then proposed a model of multiuser influence that would draw upon the framework of multiuser interactions to explore how interactions could influence narrative. This model of multiuser influence was composed of Influence Selection, Timing, Target, and Method, and has previously been published in an NHT workshop [23].

Using the theories of Location Aware Fiction, a framework of multiuser interaction, and the model of multiuser influence, a Multiuser Location Aware Fiction named 'Shelley's Heart' was produced to run on a custom version of the Storyplaces platform.

Subsequently, an experiment was undertaken whereby participants in the Fiction would provide data via a survey and, later, via a telephone interview. The data was then analysed so that it could be applied to answering the research questions for this study.

6.1 Outcomes and Contributions

The main contribution of this study was an attempt to answer the following research questions:

1. Do multiuser interactions impact Location Aware Fiction?
2. What is the nature of that impact?
3. What is the scale of that impact?

Multiuser interactions had an impact upon several participants, as demonstrated by several participants mentioning multiuser interaction unprompted in the questionnaire and telephone interviews. Therefore, multiuser interaction was found to have an impact upon Location Aware Fiction but the impact may be limited to a subsection of those who experience the narrative.

Observations of this impact's nature can be drawn from the qualitative analysis, which suggests that the impact is related to how it changes a user's perspective of various narrative elements. The type of user in question determines the nature of the alteration in perspective. The types of users are Receivers and Broadcasters. The nature of multiuser interaction impact on a Receiver is that it imparts a sense of uniqueness to the narrative, as the user perceives their narrative to have been uniquely shaped by others. The nature of multiuser interaction impact on a Broadcaster comprises an added sense of weight afforded to decisions when a user believes that their choices will affect other users.

The quantitative analysis suggested that the nature of multiuser interaction's impact can partially be related to its being a technically impressive feature, which is most likely why users' experience ratings of 'Shelley's Heart' correlated with their technical confidence. This accounted for 65% of the user experience rating, as evinced by regression, and is thus a strong correlation.

The scale of multiuser interaction impact varied between types of users, with Receivers and Broadcasters reporting different experience ratings on average. Although further research is needed to investigate this matter, it may result from the design of 'Shelley's Heart': specifically, Broadcasters may have a preference for Autocratic Influence.

The above-mentioned findings are not based upon statistically significant results, as the sample was too small. However, these results do serve to provide possible explanations that warrant future exploration, and over the course of this research several additional contributions were achieved:

- An implementation of a Multiuser Location Aware Fiction in the form of 'Shelley's Heart' – see section 4.
- A model of multiuser influence that can be used in conjunction with the framework of multiuser interaction to generate a comprehensive approach to the design/analysis of multiuser interactions – see section 3.
- A qualitative analysis of the participants' experiences in 'Shelley's Heart', which has led to the proposal of several sub-categories of multiuser interaction that future work may incorporate into the model of multiuser influence – see section 5.2.2.

The first contribution is important as it provides an example for future work to build upon and demonstrates the feasibility of integrating multiuser interaction into Location Aware Fiction. Moreover, the process of developing a Multiuser Location Aware Fiction provided the opportunity to learn and share vital lessons in the development of Location Aware Fiction.

The second contribution is important as it provides a vocabulary to describe the phenomena of multiuser interactions. Such vocabulary is needed to facilitate discussion about varying types of multiuser interaction within Location Aware Fiction and the effects that they have upon the experience of users.

The third contribution is important as it begins to define variation between users of multiuser interaction. This is key to the development of Location Aware Fiction, as it allows researchers to explore how multiuser interaction can best be deployed to facilitate the enjoyment of specific user types.

6.2 Future Work

Future work will include an exploration of how the identified types of users interact with different forms of multiuser interaction and multiuser influence. This will be essential in establishing how the nature and scale of multiuser interactions' impact changes, depending on their implementation. This could be achieved with a narrative that is more complex in terms of the types of interactions and influence it employs. For instance, each participant might represent a soldier in a particular cohort of the Roman army, and the user's decision to fight or run would determine whether an army is defeated within the narrative.

Future work will need to include a more extensive list of metrics to establish the scale of multiuser interaction impact. These factors should comprise an element representing some form of 'literary confidence', as narrative implementation clearly has a major influence on the impact of multiuser interactions. It would also be prudent to divide the experience rating into separate categories as follows: how would you rate the narrative; how would you rate the technology; and how would you rate the experience? This will afford data on the overall impact of multiuser interaction on the user's experience while providing a clearer account of the *nature* of that impact.

6.3 Concluding Remarks

Overall, it appears that multiuser interaction is a promising addition to Location Aware Fiction and that this work provides an insight into the impact it may have upon the user's experience. Nonetheless, regarding the interactions of particular user 'types' with specific forms of multiuser interaction implementation, the present study has raised various new questions.

Although this work is focused on Location Aware Fiction, there is potential for its findings regarding multiuser interaction to be applied more broadly to technology-driven narratives if designers of the latter wish to include multiuser interactions.

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8 Appendices

Bournemouth University

Participant Information Sheet

The title of the research project

Developing models of Co-Presence and evaluating its impact on Locative Narrative.

Invitation to take part

You are being invited to take part in a research project. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

What is the purpose of the project?

Locative Experiences have become more common as mobile devices have grown in popularity. These experiences first started as GPS driven tour guides, however over time development began on Locative Games and Locative Narratives. While the Locative Games that emerged typically had an element of Co-Presence, normally in the form of multiplayer, Locatives Narratives have remained single user experiences.

The Aim of this research is to incorporate Co-Presence into a Locative Narrative to examine what effects it has on the experience, and should there be an effect, how big the effect is. It is important for such an evaluation to be completed as it provides more information on how authors can best use tools in the emerging medium of Locative Content.

Why have I been chosen?

The aim of this study is to have 30 participants that are randomly selected, there is no inclusionary or exclusionary requirements for this research.

Do I have to take part?

It is up to you to decide whether to take part. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a participant agreement form. You can withdraw during the Locative Experience at any time and without giving a reason and we will remove any data collected about you from the study. Once the Locative Experience has finished you can still withdraw your data up to the point where the data has been analysed and has become anonymous, so your identity cannot be determined.

What would taking part involve?

During this research you'll be asked to experience a Locative Narrative called Shelley's Heart, based in St Peter's Church. You can finish the experience early or complete it, however once you've finished with the experience you'll be asked to complete a short survey and you'll be contacted for a follow up telephone interview.

What are the advantages and possible disadvantages or risks of taking part?

Whilst there are no immediate benefits for those people participating in the project, it is hoped that this work will allow an understanding of how Co-Presence effects the experience of Locative Narrative.

What type of information will be sought from me and why is the collection of this information relevant for achieving the research project's objectives?

The information that will sought from you is information that'll describe your experience with Shelley's Heart, specifically, information that'll identify your experience with Locative Narrative in general will be sought along with information that describes your experience with Shelley's Heart.

Will I be recorded, and how will the recorded media be used?

The audio of the telephone interview undertaken during this research will be used only for transcription of the recording. No other use will be made of them without your written permission, and no one outside the project will be allowed access to the original recordings.

How will my information be kept?

All the information we collect about you during the research will be kept strictly in accordance with current Data Protection Regulations. You will not be able to be identified in any reports or publications without your specific consent. Research results will be published in the resulting Thesis of this work.

All personal data relating to this study will be held for 5 years from the date of publication of the research. BU will hold the information we collect about you in hard copy in a secure location and on a BU password protected secure network where held electronically.

Except where it has been anonymised, we will restrict access to your personal data to those individuals who have a legitimate reason to access it for the purpose or purposes for which it is held by us. As well as BU staff and the Mres student working on the research project.

The information collected about you may be used in an anonymous form to support other research projects in the future and access to it in this form will not be restricted. It will not be possible for you to be identified from this data.

Contact for further information

If you have any questions or would like further information, please contact Alexander Jones at ajone3@bournemouth.ac.uk

In case of complaints

Any concerns about the study should be directed to Alexander Jones, email ajones3@bournemouth.ac.uk. If your concerns have not been answered by Alexander ones, you

should contact Professor Michael Silk, Bournemouth University by email to researchgovernance@bournemouth.ac.uk.

Finally

If you decide to take part, you will be given a copy of the information sheet and a signed participant agreement form to keep.

Thank you for considering taking part in this research project.

Participant Agreement Form

Full title of project: Developing models of Co-Presence and evaluating its impact on Locative Narrative.

Name, position and contact details of researcher: Alexander Jones, Mres Student, ajones3@bournemouth.ac.uk

Name, position and contact details of supervisor: Charlie Hargood, Senior Lecturer, chargood@bournemouth.ac.uk

Please tick the appropriate boxes	***Yes***	***No***
Taking Part:		
I have read and understood the Project Participant Information Sheet.	☐	☐
I confirm that I have had the opportunity to ask questions.	☐	☐
I understand that my participation is voluntary.	☐	☐
I understand that I am free to withdraw up to the point where the data are processed and become anonymous, so my identity cannot be determined.	☐	☐
Should I not wish to answer any question(s) or complete the locative experience, I am free to decline to do so.	☐	☐
I understand taking part in the research will include being recorded (audio) but that these recordings will be deleted once transcribed.	☐	☐
I agree to take part in the project.	☐	☐
Use of the information I provide for this project only:		
I understand my personal details such as name and phone number will not be revealed to people outside this project.	☐	☐
I understand that my words may be quoted in publications, reports, web pages and other research outputs. Please choose one of the following two options: I would like my real name used in the above. I would **not** like my real name to be used in the above.	☐ ☐ ☐	☐
Use of the information I provide beyond this project:		
I agree for the anonymised data I provide to be archived at BU's Online Research Data Repository[1] .	☐	☐
I understand that the anonymised data I provide may be used by the research team to support other research projects in the future, including future publications, reports or presentations	☐	☐

_____ _____ _____

Name of Participant Date Signature

_____ _____ _____

Name of Researcher Date Signature

This form should be signed and dated by all parties after the participant receives a copy of the participant information sheet and any other written information provided to the participants. A copy of the signed and dated participant agreement form should be kept with the project's main documents which must be kept in a secure location.

[1] Other Archives can be listed (if applicable). More detail can be provided here so that decisions can be made separately about audio, video and transcripts

Shelley's Heart: Experiences in Designing a Multi-Reader Locative Narrative

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ABSTRACT

Locative Narratives tie elements of the narrative to physical locations that users must visit in order to experience. While single reader locative stories and multiplayer locative games are increasingly common, the intersection of these, multi-reader locative narratives, are much less common. This work will analyse prior works of Locatives Narrative and Multi-User Locative Games in order to develop a model to describe Multi-Reader Locative Narrative and present the design for *Shelley's Heart* (an in-development multi-reader locative narrative) in the terms of this model.

CCS CONCEPTS

• **Human-centered computing** → **Hypertext/hypermedia**;

KEYWORDS

Interactive Narrative, Games Design, Locative Narrative

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NHT'18, Baltimore, USA

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1 INTRODUCTION

Locative Narratives are a storytelling medium that makes use of location-based technologies such as the Global Positioning System (GPS) to tie sections of its narrative to locations in the real world so that users must physically visit the relevant coordinates to experience sections of the narrative. This works in a manner similar to the Locative Mobile Game "Pokemon Go"[1] which ties Pokemon to real life locations and challenges users to visit said locations in order to catch the prior mentioned Pokemon.

This paper focuses on Co-Presence within Locative Narratives; Co-Presence refers to a situation in which two or more users are connected to the same system and can in some way influence one another's experiences within that system. To provide an example of Co-Presence and to remain consistent, within the Locative Game "Pokemon Go" users can place their captured Pokemon within Gyms and these Pokemon will then appear within that Gym for other users to fight.

To explore Co-Presence within Locative Narratives an original linear locative narrative - Shelley's Heart - is being adapted into a Multi-Reader Branching Locative Narrative. The narrative is set in St. Peter's Church which is the final resting place of Mary Shelley and her husband's heart, it follows modern reincarnations of herself and her friends as they confront their monsters.

To effectively develop Shelley's Heart into a locative narrative that demonstrates co-presence this paper will propose a model to describe the influences users can exert on one another's experience of the narrative, this model will be used to describe the current design of the Co-Present Locative Narrative version of Shelley's Heart, and lastly an account of the authoring process will be provided so that it can be contrasted to the development of Single-Reader Locative Narratives.

[1] Pokemon GO, Niantic, 2016

2 BACKGROUND

Several Locative Narratives have been developed over the years; "Hopstory"[16], "RIOT!"[5], "Media Portrait of the Liberties"[15], "Viking Ghost Hunt"[14], "Snow White is Missing"[9], and "Tiree Tales"[12]. These projects described the authoring process for Locative Narratives, provided data demonstrating these narratives' positive reception and showed that Locative Systems can function as an effective medium for narrative.

While the prior mentioned Locative Narratives are all single-user experiences the majority of Locative Games are multi-user experiences; "Pirates!"[4], "ArQuake"[19], "Can You See Me Now?"[2], "Uncle Roy All around you"[3], "Bill"[6], Tycoon[6], "Feeding Yoshi"[1], "Capture the Flag"[7], "Hitchers"[8], and "Barabarossa"[11] are all examples of multi-user Locative Games. These Multi-User Locative Games, like the Single-User Locative Narratives, were received positively which shows that Locative Systems can also function as an effective medium for Multi-User experiences.

Despite the prior mentioned success of Single-User Locative Narratives and Multi-User Locative Games there hasn't been thorough exploration of Multi-User Locative Narratives, one that is built on the foundations of what has been learnt from the prior mentioned fields.

Millard proposed a model of structures that occur within Locative Narrative[13], specifically, the model proposed three primary structures; Canyon's, Deltas, and Plains. Hargood proposed an extensions to this model that consisted of several patterns that can exist within the structures of Locative Narrative[10]; Parallel Threads, Gating, Concurrent Nodes, Alternative Nodes, Foldback, Phasing, and Unlocking. The patterns relevant to this work are Parallel Threads, Alternative Nodes, and Foldback.

Packer[17] proposes a writers toolkit for the development of Locative Narrative which consists of several types of considerations; Dealbreakers, Pragmatics, and Aesthetics. Dealbreakers describe a set of requirements that if not adhered to mean a user would not read a locative narrative or they would not finish it, Pragmatics described how you could best utilize the environment of a location to direct a user through a narrative, and Aesthetics described how you could form a connection between the locations you've tied the narrative to and the themes of your narrative.

This selection of research provides a foundation for developing a Locative Narrative and thereof it has been used to inform the development of Shelley's Heart's Locative Narrative Design. However this work doesn't provide a foundation for Co-Present element of the Narrative which is what separates Shelley's Heart from other Locative Narratives, in order to address this research relating to Co-Presence will be used to supplement.

Spawforth has examined Co-Presence in Video Games in order to develop a taxonomy intended to describe the interactions between users and he has proposed several concepts for Co-Present Locative Narratives [18]. Spawforth's taxonomy however focuses on how interactions are perceived by the participating users, it doesn't currently describe how these interactions are effecting the narrative and so it'll need to be expanded in order to accommodate this.

3 EXTENDING MODELS OF CO-PRESENCE

As previously mentioned Spawforth[18] provides a taxonomy that can describe interactions between users but this extensions to Spawforth's taxonomy explores Co-Presence through the lens of "influence", specifically, how one user's actions are translated to other users within the system. Influence is composed of several elements; Influence Selection, Influence Timing, Influence Target, and Influence Method.

Influence Selection refers to the method used by the narrative system to determine which user or users will be given the ability to influence another user's experiences. There are two types of Influence Selection in the form of Autocratic Influence and Democratic Influence; Autocratic Influence is when a single user's interactions influence other user's experiences while a Democratic Influence is when several user's combined interactions influence other user's experiences. Autocratic influence is typically assigned via a milestone; Being the first or last to do something. Democratic Influence is typically assigned by the number of people that have done something; The majority or minority choice.

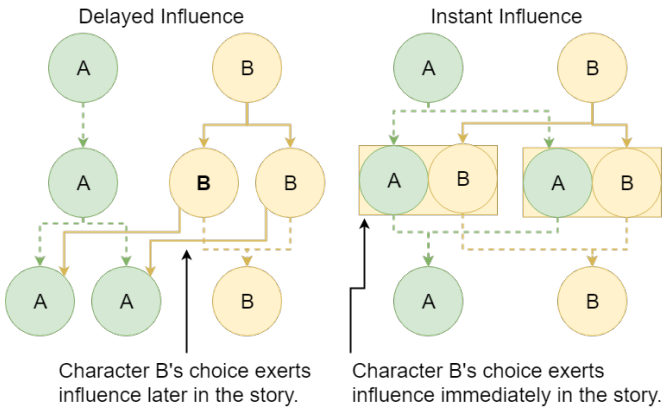

Figure 1: Delayed Influence vs. Instant Influence

Influence Timing refers to the amount of time that passes between an interaction occurring and its influence being experienced, specifically, it refers either to a Instant Influence or a Delayed Influence. Instant Influence describes when the Influence exerted immediately effects the experience while Delayed Influence describes when time passes between

the interaction and the influence being experienced. This is demonstrated diagrammatically in figure 1.

Influence Target refers to the element of the narrative that is being influenced, specifically, it describes if the influence being exerted by a user will alter the Fabula or the Discourse of the narrative. Fabula refers to the events of the narrative and the chronological order they occur in while discourse represents how these will be presented to the user. This is demonstrated diagrammatically in figure 2.

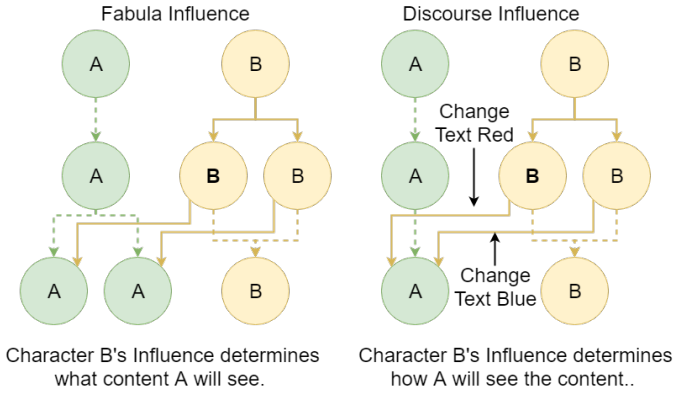

Figure 2: Fabula Influence Versus Discourse Influence

Influence Method refers to how an interaction is implemented within the narrative; this can be as a Guiding Influence or as a Generative Influence. A Guiding Influence is one that restricts which options other users can select and therefor guides them through a narrative while a Generative Influence instead adds entirely new content to the story.

4 SHELLEY'S HEART

The story of Shelley's Heart follows four protagonists; Mary, Byron, John, and Percy. The prior three are modern reincarnations of Mary Shelley, Lord Byron, and John Keats respectively while the later is the ghostly manifestation of Percy Shelley who has been bound to this earth until he reclaims his heart. The story is spurred to begin due to a chance encounter between the spectral Percy and Mary which provides the motivation for Mary to gather Byron and John in order to seek Percy out within St. Peter's Church. Each of the four protagonists have separate journeys within the church's yard; At points the cast will intersect, they'll be faced by ghosts of the past, and ultimately they'll have to face Mary Shelley's monster. During their journeys the readers of each protagonist will be able to make decisions that alter the story for themselves but they'll also be able to make decisions that'll affect future readers of the other protagonists.

Shelley's Heart is being implemented within Storyplaces [10] which is a hypertext based Locative Narrative tool, and for the purpose of creating a Co-Present Locative Narrative additional functionality is being developed for the platform.

Authorial Process

Collaboration between the technologists/games designers and the author of the original Shelley's Heart narrative underwent a similar process of many interdisciplinary research projects in that reaching a shared vocabulary and learning from each others' expertise dominated much of the early process. The original story was already a locative narratives with shifts in perspectives between characters, making it a natural fit for experimentation with co-presence. The author notes as follows:

> "The original design of Shelley's Heart included many opportunities to shift between narrative perspectives. As with the classic film Rashomon (Akira Kurosawa, 1950) this allowed participants to discover how different characters view the same dramatic moment in very different ways."

The concept of understanding different characters perspectives and actions aligning with the reader understanding the experience and action of other readers. However, we were keen to experiment not just with the experience of other readers but their agency, and the ability of a reader to become aware of others' interaction with the plot. This necessitated changes which led to challenges similar to many interactive narratives such as the problem of coherence and agency, and maintaining manageable narrative structure in the face of branches. These issues were solved with a combination of careful rewriting, and use of common patterns such as foldbacks and alternative nodes. Whether content was essential for the plot or might be altered to reflect a choice often impacted where these choices came, often with core content covered in a later choice if missed in an earlier one:

> "For instance, all of the story-paths have some nodes that are skippable and some that are crucial for comprehension of the plot. This determined how I laid out the player choices within each individual path ... at the end of Percy 2A and Percy 2B, the player chooses only between Percy 3A and 3B. This has to do with offering an earlier choice (between 2A and 2B) because either one of those (but NOT both) is skippable."

The author also notes that the introduction of parallel threads to the story has increased the demand on writing not just from the perspective of content but also character design. Where as the original linear story had a single clear protagonist now there are four, and "less dimensional" characters

have had to become more "rounded". Finally the exploration of co-presence as a use within the narrative remains experimental in that both author and researcher remain unsure of its likely impact on the narrative. This has meant its initial implementation (and consequently affect) is modest, but hopefully substantial enough to explore its impact.

Structural Design

The over all structure of Shelley's Heart can be seen in figure 3. Shelley's Heart, in terms of the CDP model, makes use of a series of parallel Canyon structures with a light implementation of a Delta structure in order to enable a degree of user agency. In the conversion of Shelley's Heart into a Co-Present Locative Narrative a Parallel Threads pattern was employed with each character having paths that run along one another, the narrative like before includes fold-back patterns and Alternative Nodes but now some of these have been re-purposed into providing moments of Co-Presence.

During the development of Shelley's Heart into a Co-Present Locative Narrative several things had to be considered; The feasibility of producing new content, the compatibility of new content with the existing narrative, and what suited the Co-Presence the best. All of these considerations were made when designing the following Co-Present interactions;

Character	Selection	Time	Target	Method
Percy 1	Auto First	Instant	Fabula	Guidance
Percy 2	Auto First	Delayed	Discourse	Guidance
John 1	Auto Last	Instant	Fabula	Guidance
John 2	Auto Last	Delayed	Discourse	Guidance
Byron 1	Demo Maj	Instant	Fabula	Guidance
Byron 2	Demo Maj	Delayed	Discourse	Guidance
Mary 1	Demo Min	Instant	Fabula	Guidance
Mary 2	Demo Min	Delayed	Discourse	Guidance

Influence Methods for each of these interactions were selected so that there effect on how a user experiences Co-Presence could be observed, specifically, this is why each of the interaction uses a different form of Influence Method. Currently these aren't assigned with suitability in mind as research on how these influence methods effect the narrative is needed in order to make such a calculation, instead the Influence methods were assigned randomly.

Due to the previous design of Shelley's Heart all of the Influence Timings for Fabula altering interactions had to be Instant, this is because implementing Delayed Fabula influence would have required the restructuring of the entire narrative while only using Instant Fabula Influence fit into the current structure of Shelley's Heart. To compensate for this, and to ensure the effects of Delayed Influence were

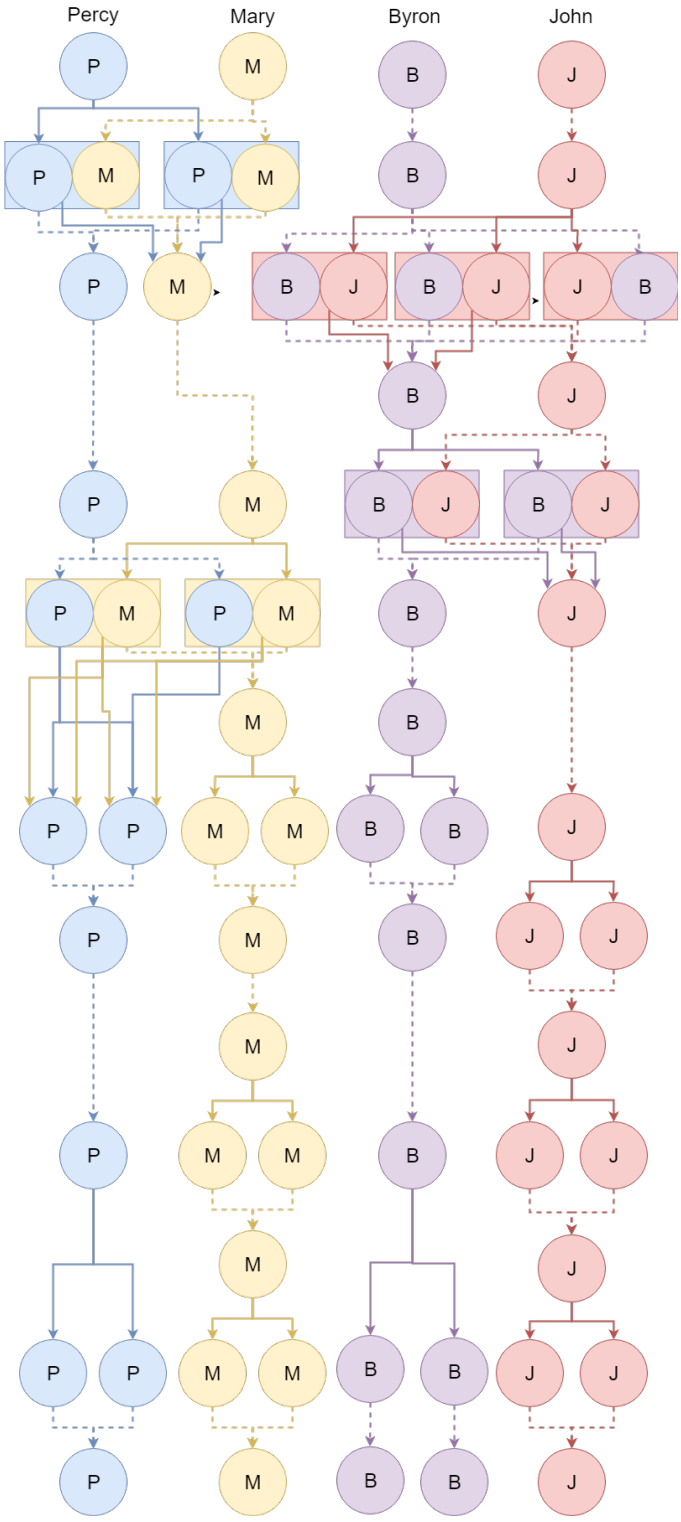

Figure 3: Structural Design of Shelley's Heart

explored to an extent, it was decided that interactions that affected Discourse would be designed to exert Delayed Influence.

5 CONCLUSIONS AND FUTURE WORK

The aim of this work is to develop a model for describing the influence between users in multi-user narrative with a specific emphasis on locative narrative as they tend to be set in public spaces, it is to apply such model of influences to a Co-Present Narrative in the form of Shelley's Heart, and it is to use that model to contextualize the data gathered from people experiencing Shelley's Heart. This being done to firstly provide a taxonomy for discussing this type of narrative, specifically, it is looking to develop a conversation about how to best utilize the influences between players in order to better understand co-presence in locative narrative going forward.

In future work we intend to evaluate our approach to co-presence in Shelley's Heart through a user study with participants trying different paths. Through observational study of the readers and subsequent interviews we hope to understand whether readers were aware of the agency of other readers in the story, and whether there was any resulting effect on the reader's experience.

Currently all the interactions within Shelley's Heart are Asynchronous therefore future work could include a synchronous Co-Present Locative Narrative that encourages users to play separate perspectives simultaneously, and it could be used to explore how Co-Influence effects are different in a synchronous or asynchronous system. Similarly while only guiding influence is used in Shelley's Heart future work could include the exploration of how generative influence effects a narrative and how you'd design a narrative while accounting for the variation that could occur in a generative narrative if at all.

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