1. PROJECT LINKS

Game	https://circlejourney.net/spectralcarta
Game (desktop version)	https://circlejourney.net/spectralcarta?playtest
Trailer	https://youtu.be/I5DssH_1eRc
Walkthrough	https://youtu.be/Xrb9W5jfKYI
Game source files	https://mega.nz/folder/FINj3IYJ#bYy_IH0HkDqfkDksSfezYg

THE SPECTRAL CARTA: A LOCATIVE GHOST STORY FOR BRISBANE

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Exegesis submitted in partial fulfilment of the requirements for the degree of Master of Interactive Media, July 2020

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II. ABSTRACT

This research explores the use of locative mobile technology to develop emotional relationships with the urban spaces of Brisbane. Locative technology has the unique capability of attaching information to locations via GPS markers; this technology may be used to attach narratives about the histories of places to the corresponding locations. Through practice-led methods, this research engages with the creative practices of various locative authors and developers, as well as the researcher's own practice. It hones both technical and aesthetic toolkits for telling a new type of locative story: a locative visual novel, combining visual art, creative writing and interactive elements. A novel web-based engine is developed, allowing the developer a host of new creative tools with a greater focus on visual components. Using this engine, a story is authored with the aim of bringing the forgotten and buried histories of Brisbane to light.

III. STATEMENT OF ORIGINAL AUTHORSHIP

The work contained in this thesis has not been previously submitted for a degree or diploma in this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the work.

Signature: 

Date: 25 June 2020

IV. ACKNOWLEDGMENTS

I would like to thank the following people:

My supervisor, Dr. Jason Nelson, for his guidance and encouragement throughout this gruelling year of work, for his empathy for our struggles, and for his flexibility and understanding, which made the classes always enjoyable;

All faculty at the Queensland College of Art, Griffith University, for their tutelage, support and guidance throughout my Master's degree, whom helped draw out the best in me;

My parents for their generous support of my studies in Australia, psychological, emotional and monetary;

My classmates and fellow MIM candidates for their invaluable input, in the form of user-testing and creative feedback, who shaped the trajectory of my project and provided me a sounding board for my ideas;

And my psychologist Dr. Louise Blundell for her support, strategies and advice, the main reason I did not lose track of half my classes and assessments.

V. TABLE OF CONTENTS

1. RESEARCHER'S PERSPECTIVE

Arriving in Brisbane in 2018, I first familiarised myself with the city through *Pokemon Go*. Arguably the first locative game to attain mainstream popularity, *Pokemon Go* expands the universe of the *Pokemon* franchise to encompass the real world. Its gameplay revolves around territorial battles over in-game structures called gyms, and the collection of boons from sites called Pokestops. Every gym and Pokestop is located at a significant real-world location, be it Brisbane's City Hall or a mural painted on a traffic signal box.

Pokemon Go was not designed as a tool for familiarising oneself with a new city, but this is what it became to me. By 2018, the game was two years past its prime, but I continued to make detours during my daily commute to visit Pokestops and

began to remember locations by what Pokestops were nearby. It began to shape the patterns of my day-to-day journeying, and to form the template for my understanding of Brisbane's geography. Now entrenched in the pursuit of mapping out Brisbane in experiences and memories, I began to keep a "locative journal" using Google MyMaps. In this journal, I recorded every entry as a pin on a virtual map.

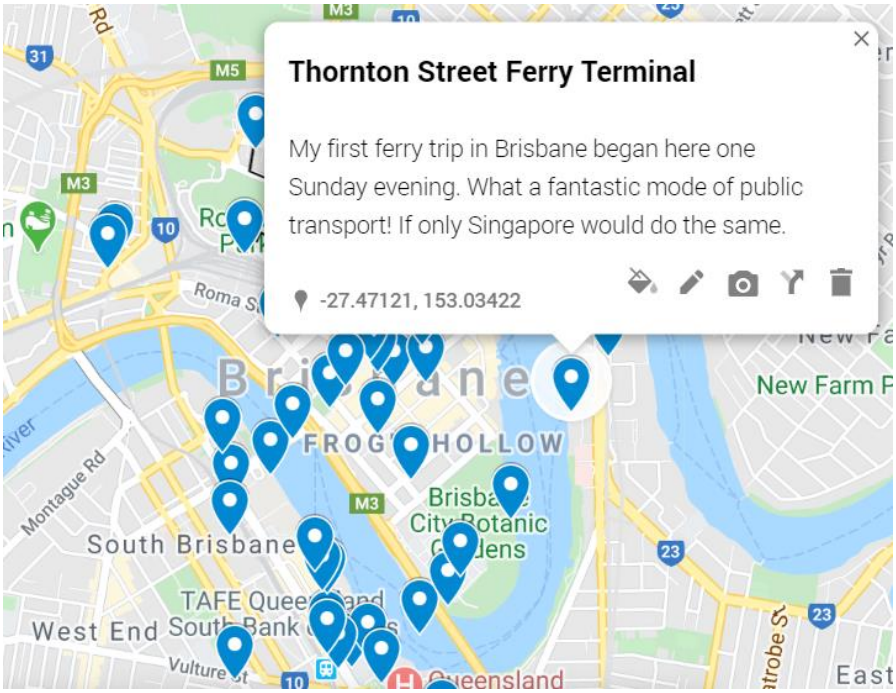

Figure 1. A sample of the author's Brisbane locative journal. Photograph by the author.

Through these experiences with locative media, I became aware of two things. First, when goals driving gameplay are left open-ended, as they are in *Pokemon Go,* players will find ways of playing not intended by the creators: in the words of Don Norman, the player may discover *affordances* that the designer did not anticipate.[1] Second, locative games do not have to be educational or goal-driven: they can simply be created for the purpose of facilitating meaningful explorations of and relationships with urban spaces.

[1] Donald Arthur Norman, "Affordances and Design," January 2004, https://www.researchgate.net/publication/265618710_Affordances_and_Design.

Inspired by my experiences with *Pokemon Go* and locative journaling, I developed an interest in authoring locative narratives. Following that, I developed a collection of three locative stories called *Ghosts Under Bridges,* whose plot events are accessed by walking to the locations where the events take place. *Ghosts Under Bridges* would later become the progenitor of this project, both technically and in terms of objectives. Both projects are about telling a story about the Brisbane that goes missed by most, even those who have lived here all their lives.

2. INTRODUCTION

2.1. Locative games: context and potentialities

Today, one is less likely to get lost than ever before. Smartphones have made it possible to determine one's exact location in seconds, through a combination of inbuilt global positioning system (GPS) sensors and mobile data connections.[2] Initially developed by the United States Department of Defense in 1973,[3] GPS has been made available to the public on a large scale, driving a boom in locative smartphone applications. These apps can deliver a host of location-specific content, such as local news, weather forecasts, and navigational information, by identifying the user's geographical location through GPS.[4]

While applications with such practical functions represent the bulk of locative apps, there has also been an explosion of locative mobile games. Notable instances from

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[2] Katsiaryna Naliuka, Tara Carrigy, Natasa Paterson and Mads Haahr, "A Narrative Architecture for Story-Driven Location-Based Mobile Games" (paper presented at *New Horizons in Web-Based Learning - ICWL 2010 Workshops, Shanghai, December 7-11, 2010*), https://doi.org/10.1007/978-3-642-20539-2_2.

[3] Ahmed El-Rabbany, "Introduction to GPS" in *Introduction to GPS: The Global Positioning System* (Norwood: Artech House, Inc., 2002), 1.

[4] Amy Schmitz Weiss, "Exploring News Apps and Location-Based Services on the Smartphone," *Journalism & Mass Communication Quarterly* 90, no. 3: 425-456, https://doi.org/10.1177/1077699013493788.

the past decade include *Ingress,* released in 2012,[5] and *Pokemon Go*, released in 2016 to massive international popularity.[6] With their unique ability to direct users through physical space and prompt interactions with the environment, locative games offer developers and storytellers a toolbox of new techniques for creating unique, immersive narrative experiences. Sensory details that cannot be delivered by even the best virtual reality technology, such as tactile experiences, scents, and atmospheric temperature, can be delivered through the user's physical environment. Thus far, locative games have overwhelmingly been educational in function; their ability to attach information to locations makes them the perfect tool for educating players on the histories of places.[7]

There is a growing need for education in that vein. Many cities across the world, including Brisbane, are caught in a cycle of urban renewal, and material histories are rapidly being lost to this process of demolition and rebuilding. Brisbane's Hillsong United campus, for instance, has been rebuilt and renamed several times: at different points since its establishment in 1909, it was known as the Lyceum Theatre, the George Cinema, and then the Tribal Theatre.[8] Few physical imprints of that history remain. Locative media, which till now has consisted largely of interactive tour guides and technological demonstrations,[9] could be the ideal tool for rejuvenating urban spaces and bringing these buried histories to light through

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[5] Shira Chess, "Augmented regionalism: Ingress as geomediated gaming narrative," *Information, Communication and Society* 17, no. 9: 1105-1117, https://doi.org/10.1080/1369118X.2014.881903.

[6] Masaru Tateno et al., "New game software (Pokémon Go) may help youth with severe social withdrawal, hikikomori," Psychiatry Research 246: 848-849, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5573581/.

[7] Jesper Kjeldskov and Jeni Paay, "Augmenting the City with fiction: fictional requirements for mobile guides" (paper presented at *Workshop on HCI in Mobile Guides, Mobile HCI 2007, Singapore, September 9, 2007*), https://www.medien.ifi.lmu.de/mirw2007/papers/MGuides2007_Kjeldskov.pdf.

[8] Cameron Atfield, "Brisbane venue manager on a mission to halt Hillsong theatre takeover," *Brisbane Times,* May 2, 2018, https://www.brisbanetimes.com.au/national/queensland/brisbane-venue-manager-on-a-mission-to-halt-hillsong-theatre-takeover-20170502-gvxjx4.html.

[9] Naliuka, Carrigy, Paterson and Haahr, "A Narrative Architecture."

storytelling.[10] Locative technology also has untapped potential as a medium for telling stories with a focus on emotional engagement, atmospheric scene-setting, and creating meaningful relationships between player and place. One of the main aims of this exegesis, thus, is to create a story-focused game that will be the first of its kind to centre around Brisbane's history.

2.3. Aims and Objectives

The chief objective of this research is to explore locative games as a vehicle for telling a story about the history of Brisbane. It seeks to demonstrate that locative games can motivate the player to wander through the city, enrich urban spaces by revealing their histories, and drive the thoughtful exploration of these spaces. It also seeks to prove the effectiveness of the "plains" structure of locative storytelling described by Millard et al. (outlined in Section 3.1. The history and theory of locative games).

Through the analysis of documents in the Queensland State Archives, news articles, and books, including *Building Brisbane's History,* ten to fifteen historical locations of interest will be selected, and a detailed cultural understanding of their roles in historical Brisbane gathered. Places that have interesting and overlooked stories will be prioritised, including the Old Windmill Tower on Wickham Terrace, with its history of playing host to convict executions,[11] and the Lyceum Theatre on George Street—the alleged site of a shooting in 1942.[12] Direct observation of these locations in the present day will reveal pedestrian routes and patterns of behaviour at these

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[10] Jeni Paay and Jesper Kjeldskov, "Location-based Storytelling in the Urban Environment" (paper presented at *20th Australasian Conference on Computer-Human Interaction: Designing for Habitus and Habitat, Cairns, December 8-12*), http://2012.agib.dk/docs/Location-based_storytelling_in_the_city.pdf.

[11] "Old Windmill Brisbane," *Must Do Brisbane,* accessed April 2, 2020, https://www.mustdobrisbane.com/visitor-info-arts-culture-history/old-windmill-brisbane.

[12] "Shooting in the Lyceum Theatre," *Australia At War*, accessed March 6, 2020, https://www.ozatwar.com/ozatwar/lyceum.htm.

sites, guiding the placement of in-game GPS markers. The story will then be written with reference to information gathered through document analysis. It will concern the past lives and discontents of ghosts residing across Brisbane, whom the player will interview to gather clues to locate key objects and lay them to rest.

As no existing locative authoring engine is designed with a strong visual focus, a JavaScript-based engine will be developed from the ground up, designed to allow the creation of branched and nonlinear locative stories with strong visual aesthetics. Using this engine, a browser-based locative game will then be created, one that is accessed through a mobile web browser and utilises the device's inbuilt geolocation services. This game unfolds as the user walks across Brisbane, overlaying a web of ghost stories over the relevant physical spaces. The story will be structured and written with the primary goal of complementing the urban spaces of Brisbane and fostering meaningful relationships between the player and these spaces.

When a working prototype is completed, user testing will be conducted with a group of up to ten test players. Qualitative feedback on their interactions with the interface, as well as their experience of playing the game while traversing Brisbane, will be gathered, both to ascertain that the game is user-friendly and has the desired impact, and to ensure that no major bugs go uncaught. Through this process, further iterations of the game will be created and refined.

2.4. Significance of the research

At the time of the publication of this exegesis, no existing tools allow for the creation of locative games with an extensive visual component, or integration with a dialogue system, following in the style of role-playing video games. Through this exegesis, a novel JavaScript-based engine will be developed that allows for such games to be created in it.

The game to be created will also be the first publicly available locative game about Brisbane. While other locative stories set in Brisbane do exist, none centre around

the unique nature and history of the city, as elaborated on in Section 3.3. A mobile ghost walk for Brisbane. Unlike existing instances of locative games, this game will explore the synergy between physical reality and onscreen content, by revealing latent knowledge and imaginings about locations, rather than imposing fantastical stories on reality. It will experiment with frameworks that have been developed by locative theorists, including the "canyons, deltas and plains" framework described by Millard et al. In line with the "plains" story structure described by Millard et al., the game will feature a plot that can be nonlinearly accessed from start to finish, with only a minimal amount of enforced sequencing, namely the progression of individual conversations. The stories will be written with that flexible structure in mind.

2.5. Scope and Limitations

This exegesis aims to explore the "plains" narrative structure for locative games, as described by Millard et al. This refers to a nonlinear structure where story events can be accessed in almost any order from start to finish. Additionally, the exegesis aims to explore the addition of a significant visual component to enhance the experience of the locative narrative. The exegesis seeks only to prove that these methods can be implemented efficiently, through the development of an engine. As the anticipated audience of this work will be small (fewer than a hundred players), the game cannot prove the format's popularity or appeal, as measured by audience reach, nor prove its marketability, since there will be no investigation into marketing.

Furthermore, theorists have described several frameworks for writing locative narratives; this exegesis does not seek to prove the viability of all of them, or to implement all techniques described. Only a selected few, where they are relevant to this exegesis, will be explored, such as the technique described by Paay and Kjeldskov, of imbuing significance in in-game elements by connecting them to real-world objects (outlined in detail in Section 3.1. The history and theory of locative games).

Additionally, the primary focus of this research is on the development of a compelling creative outcome. History is an important aspect of the game, and while historical facts are researched thoroughly wherever possible, this game and the accompanying research are not to be considered as documents of historical research. Such research may be undertaken by the researcher at the doctoral level in the future.

2.6. The structure of the exegesis

In Section 3, the literature of the field will be explored, leading to the Research Question in Section 4. In Section 5, the Practice-Led Research methodology is examined as a guiding methodology for the exegesis, as well as the secondary methods to be used to complement practice-led research. In Section 6, three case studies are briefly examined as a component of the practice-led research outlined in the prior section. In Section 7, the process of creating *The Spectral Carta* from the ground up is outlined in detail, from conceptualisation, through the development of the programme, to user interface design. Finally, in Section 8, an analysis will be conducted into the creative outcome, in terms of successes, failures, significance and future potentialities for the research.

3. LITERATURE REVIEW

3.1. The history and theory of locative games

In 2004, an experiment with GPS accuracy tests by engineer David Ulmer led to the creation of Geocaching, the first game to make use of GPS.[13] In the game, a metal can's location was tracked via GPS receivers. Users around the United States could

[13] Barbara Elwood Schlatter and Amy R. Hurd, "Geocaching: 21st Century Hide-and-Seek," *Journal of Physical Education, Recreation & Dance* 76, no. 7: 28-32, http://doi.org/10.1080/07303084.2005.10609309.

locate the can using its coordinates, leaving items inside it for future players to find. Geocaching was the first well-known instance of a locative game:[14] a type of game that extends the "magic circle" of play from the digital realm to encompass the physical environment, using location-sensing technologies.[15]

Theorists have long sought to codify frameworks for writing stories for locative games. The earliest of these was outlined by Naliuka et al. in the 2010 paper, "A Narrative Architecture for Story-Driven Location-Based Mobile Games." In this seminal publication, the authors point out that smartphones with location-sensing technologies are a suitable platform for conveying a place's history by guiding the player through relevant locations and displaying information based on the player's position. The authors also note that location-based applications are particularly suited to the function of interactive guides. They highlight the fact that most locative games are either field guides framed as stories—such as *Viking Ghost Hunt*—or open-ended games such as *Can you see me now?* which lack a narrative.[16]

Naliuka et al. set out to pioneer a formal framework for writing locative stories. In their proposed narrative architecture, story events are triggered by both explicit user actions such as onscreen button presses, and passive user behaviour such as moving to a specified location. These stories can take the form of either embedded or emergent narratives, either pre-designed and delivered in linear fashion, or shifting based on the player's actions. Suggesting that an ideal locative narrative would be a balance of both kinds, Naliuka et al. developed a model in which stories

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[14] Jason Farman, "Locative Life: Geocaching, Mobile Gaming, and Embodiment" (paper presented at *UC Irvine: Digital Arts and Culture, Irvine, December 12-15, 2009*), https://escholarship.org/uc/item/507938rr.

[15] Markus Montola, "Exploring the Edge of the Magic Circle: Defining Pervasive Games," accessed August 25, 2019, https://www.markusmontola.fi/exploringtheedge.pdf.

[16] Naliuka, Carrigy, Paterson and Haahr, "A Narrative Architecture.".

branch into multiple parallel paths before converging back on key points, allowing for both a vast array of choices and some degree of structure.[17]

Paay and Kjeldskov take a different focus from Naliuka et al. in their 2010 paper "Location-based storytelling in the urban environment," instead exploring the aesthetic and poetic possibilities of locative storytelling. Through inbuilt location services, smartphones can convey a narrative "which uses people's physical surroundings as a backdrop for storytelling as they move around an urban environment."[18] In other words, sensory input from the player's physical surroundings—such as ambient noise, temperature and movement—combine with onscreen content to deliver the story. Paay and Kjeldskov conclude that location-based mobile games are a perfect vehicle for immersion and escapism, allowing the user to imagine a fictional world overlaid on the mundane urban environment. [19]

In their findings, Paay and Kjeldskov focus on games that convey historical information about a place. They describe the affective power of location-based mobile games as giving the player the sense that they are uncovering secrets hidden in corners of the city, through stories about ghosts and other invisible happenings. The sound cues from the game are designed to blend with existing environmental sounds, enhancing the aural experience rather than replacing it. Associating digital narrative events with existing objects—such as physical maps, symbols on buildings, and props—helps to ground the story as a retelling of history, blurring the boundary between fiction and reality to increase immersion. Characters in the game look like they belong in the locations where they are met, and locations are chosen that complement the atmosphere of the game.[20]

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[17] Naliuka, Carrigy, Paterson and Haahr, "A Narrative Architecture."

[18] Paay and Kjeldskov, "Location-based Storytelling."

[19] Paay and Kjeldskov, "Location-based Storytelling."

[20] Paay and Kjeldskov, "Location-based Storytelling."

Millard et al.'s 2013 paper builds on the work of Kjeldskov and Paay, asserting that locative narrative structure fundamentally differs from traditional narrative structure.[21] In a locative story, events are tied to physical locations, such that without methods of gating progress, the user may theoretically experience story events in any sequence. Consequently, the story's author must make an explicit decision about how to control that sequence.[22] Millard et al. describe a "sculptural" model for locative storytelling, in which three different classes of structures are possible: canyons, deltas, and plains. *Canyons* are games where the strict control of event transitions means they can only be experienced in a linear order; *deltas* are branching stories, with the availability of events depending on the player's current point in the narrative; *plains* are stories where all nodes are available at all times, and can be accessed in any order (fig. 2). Locative fiction can use each in isolation, or use all three formats in combination in different portions of the story.[23]

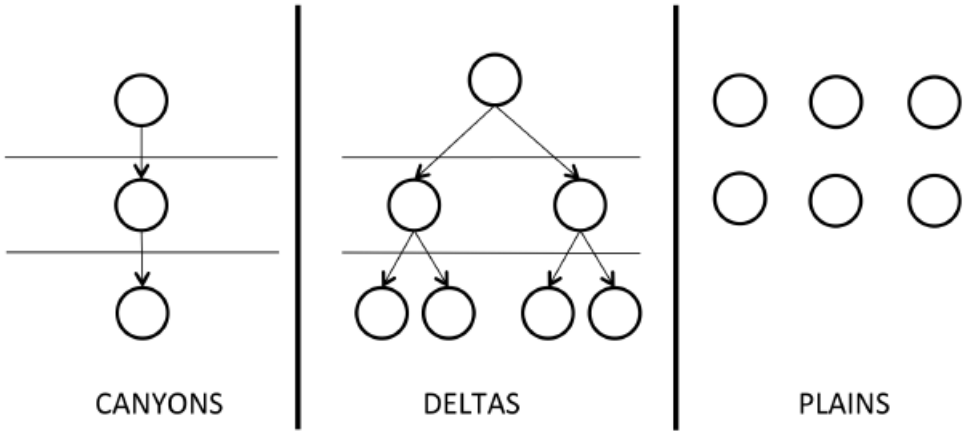

Figure 2. Millard and Hargood describe three structures for location-based fiction: canyons, deltas, and plains. Reproduced from David Millard, Charlie Hargood, Michael O. Jewell and Mark J. Weal, "Canyons, deltas and plains: towards a unified sculptural model of location-based hypertext," *ACM Hypertext 2013,* Paris, 1-2 May, 2013, 4.

[21] David Millard, Charlie Hargood, Michael O. Jewell and Mark J. Weal, "Canyons, deltas and plains: towards a unified sculptural model of location-based hypertext" (paper presented in *ACM Hypertext 2013, Paris, 1-2 May, 2013*), https://doi.org/10.1145/2481492.2481504.

[22] Millard, Hargood, Jewell and Weal, "Canyons, deltas and plains."

[23] Millard, Hargood, Jewell and Weal, "Canyons, deltas and plains."

In a later 2016 paper, "Location Location Location: Experiences of Authoring an Interactive Location-Based Narrative," Millard and Hargood outline methods for training writers in authoring locative narratives.[24] Before beginning to create a prototype for a narrative, they recommend that the author establish the poetic themes and structure of the story, underscoring the importance of research in creating a narrative experience that feels cohesive with the environment. In Millard and Hargood's case study project, *The Isle of Brine,* the story occurs in phases; within each phase, events can be accessed in any order, but a predetermined number of nodes must be visited before the player can move on to the next phase, allowing for nonlinearity within structure.

in the 2017 paper, "Developing a Writer's Toolkit for Interactive Locative Storytelling," Heather Packer et al. undertook a series of case studies, in which thirty-four participants read locative narratives written by Millard and Hargood and other locative authors and were interviewed afterwards. The authors sought to uncover "how [locative stories] function to produce an effect in the reader…to understand how authors can use the landscape to help tell their story." From this research, the authors developed a toolkit to guide future locative authors in utilising the medium while avoiding pitfalls. Many of their recommendations are useful to this exegesis: using the terrain to structure the story, for example placing decisions at road junctions, paying attention to accessibility for wheelchair users as well as reader safety, using environment to set the tone of the story, accounting for how a place might change over time, and writing in short, punchy segments to keep the story digestible. They conclude that the best stories are the ones that seamlessly

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[24] David Millard and Charlie Hargood, "Location Location Location: Experiences of Authoring an Interactive Location-Based Narrative" (paper presented at *9th International Conference on Interactive Digital Storytelling, Los Angeles, November 15-18, 2016*), http://dx.doi.org/10.1007/978-3-319-48279-8_40.

mask the duality of the reader's experience—of the real world and the story world—by creating a sense of connection between place and story. [25]

As can be seen from the existing literature, a wealth of frameworks has been offered for authoring locative narratives, of which five are highlighted here. Most of these theorists advocate a hybrid of linear and nonlinear techniques: a modular basis, where story beats can be reassembled in many configurations to give rise to a fluid sequence, combined with system for gating progress, allowing the author to enforce some overarching structure to the story. Many also note that while frameworks are foundational to the creation of a locative game, attention must be paid to research as well as poetic resonance between location and story. An understanding of technology and techniques alone is not enough to fulfil this aim: storytelling is what drives a locative game, and the subject of the story will determine its impact.

3.2. Drifting and ghosts: Subversive visions of urban spaces

3.2.1. Drifting

We never walk a straight line
We never trust a street sign
But it's in the detour that we truly find our way

— If/Then: A New Musical

The homogeneity of urban spaces in countries such as Australia and the United States has its roots in settler colonialism. Grid systems and the concept of the

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[25] Heather Packer et al., "Developing a Writer's Toolkit for Interactive Locative Storytelling" (paper presented at *10th International Conference on Interactive Digital Storytelling, ICIDS 2017, Madeira, November 14–17, 2017*), https://dx.doi.org/10.1007/978-3-319-71027-3_6.

"downtown" were dispersed across the world by European—particularly English—colonists during the British Empire's reign. Such a system of organisation is evident in Brisbane's layout, with the city organised on a grid and subdivided into downtown and suburbs as early as 1861 (fig. 3). These principles of land development were motivated by a desire to harness land for commercial purposes: the grid system expedites transit across the city, and renders it easily divided for commercial purposes, while the downtown allows commercial processes and technology to be concentrated in a small geographical area.[26] In Brisbane, these processes were complemented by the dredging of the river—in a literal exertion of control over the natural landscape—to facilitate the movement of ships along the waterway.[27]

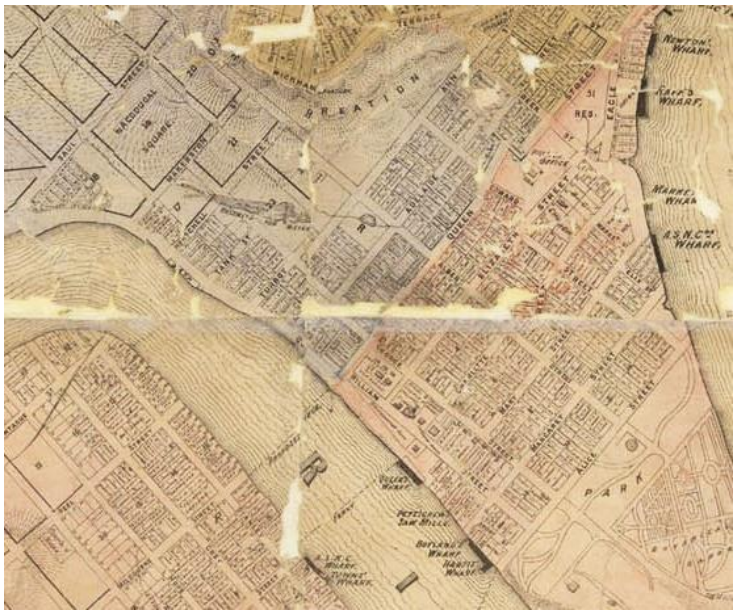

Figure 3. Colonial urban planning principles are evident in the layout of Brisbane as early as 1861. Map by James Warner, "Map of the City of Brisbane and Environs in sheets," c 1861, pen, from Queensland State Archives, accessed 23 June, 2020, http://www.archivessearch.qld.gov.au/Image/DigitalImageDetails.aspx?ImageId=5363.

[26] Maria E. Ignatieva and Glenn H. Stewart, "Homogeneity of urban biotopes and similarity of landscape design language in former colonial cities," in *Ecology of Cities and Towns: A Comparative Approach* ed. Mark J. McDonnell, Amy K. Hahs and Jürgen H. Breuste (Cambridge: Cambridge University Press, 2009), 399-421, https://doi.org/10.1017/CBO9780511609763.024.

[27] Jonathan Richards, "Historical changes of the lower Brisbane River," in *Moreton Bay Quandamooka & Catchment: Past, present, and future,* ed. I.R. Tibbetts, P.C. Rothlisberg, D.T. Neil, T.A. Homburg, D.T. Brewer and A.H. Arthington (Brisbane: The Moreton Bay Foundation, 2019), https://moretonbayfoundation.org/articles/historical-change-in-the-lower-brisbane-river/.

The ensuing centuries have seen many of these cities undergoing repeated urban renewal, in which large swathes of buildings are demolished and the land redeveloped. Via this process, city grids have become populated by skyscrapers and other monolithic structures—buildings that, in D. W. Meinig's words, came to symbolise the "urban spirit" as well as "utility, power, modernity, expansion, progress."[28] It was by these systems and methods that cities the world over, including Brisbane, came to sport the ubiquitous vista of skyscrapers on grids.[29]

The thinking of French philosopher Guy Debord, founder of the Situationist movement, bears relevance to this phenomenon. In a 1955 article, "Introduction to a Critique of Urban Geography," Debord suggests that the urban renewal of Paris has created a consumerist city "full of sound and fury, signifying nothing," concerned only with the efficient circulation of vehicles. As a result, Debord argues, people have lost track of the situational and experiential character of the city:

> *The sudden change of ambiance in a street within the space of a few meters; the evident division of a city into zones of distinct psychic atmospheres; the path of least resistance which is automatically followed in aimless strolls (and which has no relation to the physical contour of the ground); the appealing or repelling character of certain places — these phenomena all seem to be neglected.*[30]

Debord developed the concept of the *dérive* a year later, an idea that went on to be a founding principle for Situationism.[31] Translating literally to "drifting", the *dérive*

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[28] D.W. Meinig, "The Beholding Eye: Ten Versions of the Same Scene," in *The Interpretation of Ordinary Landscapes: Geographical Essays*, ed. D. W. Meinig and John Brinckerhoff Jackson (New York: Oxford University Press, 1979), https://www.uccs.edu/chuber/sites/chuber/files/inline-files/5-Meinig-BeholdingEye.pdf.

[29] Ignatieva and Stewart, "Homogeneity."

[30] Guy Debord, "Introduction to a Critique of Urban Geography," *Les Lèvres Nues*, September, 1955.

[31] Sadie Plant, *The Most Radical Gesture* (London: Routledge, 1992), 58, https://monoskop.org/images/2/24/Plant_Sadie_The_Most_Radical_Gesture_The_Situationist_International_in_a_Postmodern_Age.pdf.

refers to the act of wandering through the city without a goal or destination. Participants in a *dérive* discard "their work and leisure activities, and all their other usual motives for movement and action, and let themselves be drawn by the attractions of the terrain and the encounters they find there."[32] Debord prescribes the *dérive* as an antidote to the monotony of urban spaces. By disrupting routine and passing through rapidly changing environments, the act of walking departs from a predetermined script and ceases to be mindless, so that the walker can then rediscover their human character.[33]

In a similar vein, Debord's contemporary Michel De Certeau talks about the political and socioeconomic project of taming the city. In his essay *Walking in the City,* he describes how power structures have harnessed the city into a unitary whole, to be beheld from above, as a surveyor does a map—a mythicised utopia rather than a contradictory patchwork of human lives. This stands in contrast to the everyday city, mapped in the movements of individuals who, as they walk, cannot behold the greater whole of which they are a part—the "walkers, *Wandersmänner*, whose bodies follow the thicks and thins of an urban 'text' they write without being able to read it." To walk, De Certeau writes, is to "reappropriate" the city from the discipline enacted by power structures, to "compose a manifold story" without an author or overseer.[34]

Debord's and De Certeau's works correspond on the notion that walking in the city can be an act of rebellion, against a totalising order that seeks to flatten the city into a plane projection of its actuality. This concept bears resonances with this exegesis' foundational motivations: it seeks to inspire wandering without prescribed routes, as a means of fostering meaningful relationships with urban spaces.

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[32] Guy Debord, "Theory of the Dérive," *Les Lèvres Nues,* November, 1956.

[33] Debord, "Theory of the Dérive," 1956.

[34] Michel De Certeau, "Walking in the City," in *The Practice of Everyday Life,* trans. Steven Randall (Berkeley: University of California Press, 1984), 93.

3.2.2. Ghost stories

Ghost stories have existed for almost all of recorded history, with the earliest known instances dating back to the poetry of Homer and Vergil.[35] Their timeless popularity might be attributed not only to humankind's fascination with the afterlife and its manifestations,[36] but also to the way ghost stories are tethered to and encapsulate the essences of places.[37] As Emma McEvoy states in her essay *Ghost Walking*, ghost stories are "not only about history and heritage, but also class and economics, and the way a place may have changed over time."[38] More than fiction, the author suggests, ghost stories are the embodiments of the cultural beliefs and experiences of the communities that spawn them.

McEvoy focuses on the ghost stories of cities in Europe and North America, including New Orleans, Edinburgh and London. However, that latent symbolism is also applicable to ghosts beyond Western cultures. Drawing on examples from Chinese folklore, Keping Wu posits that ghost stories are often the manifestation of "spatial anxieties." Many Chinese ghosts, Wu states, emerge as urban development encroaches on rural dwellings; for example, Chinese water ghosts are "a reflection of [villagers'] reverence for the waterways…no longer important in [the] face of large-scale urbanization and industrialization." Wu suggests that these ghosts

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[35] D. Felton, *Haunted Greece and Rome: Ghost Stories from Classical Antiquity* (Austin: University of Texas Press, 2010), ix.

[36] Jeannie Banks Thomas, Diane E. Goldstein, and Sylvia Ann Grider, "The Usefulness of Ghost Stories," in *Haunting Experiences: Ghosts in Contemporary Folklore* (Logan: University Press of Colorado, 2007), 25-59.

[37] Paul Cowdell, "Ghosts and Their Relationship with the Age of a City," *Folklore* 125, no. 1 (2014): 80-91, www.jstor.org/stable/43297734.

[38] Emma McEvoy, "Ghost Walking," in *Gothic Tourism* (London: Palgrave Macmillan), 107-126.

mirror the anxieties of village residents forcibly relocated to apartment complexes.[39]

The abovementioned example encourages the interpretation that ghosts can often also act as vessels for *subversive* visions of urban spaces. After all, by their nature of being unverifiable as well as concerning tragic deaths, ghost stories are rarely told in any official capacity—being too gruesome and too disturbing—and their transmission is often relegated to the oral tradition. Verging on the taboo, ghost stories often reveal the unspoken histories that loom over urban spaces.[40] In Wu's example, Chinese water ghosts signify a cultural reaction to urban development among rural communities, who continue to revere waterways despite industrialisation rendering them an "inconvenience." This idea is upheld by the ghost stories of Brisbane, one chief example of which is tied to the Old Windmill, the oldest standing building in Brisbane.[41] As early as 1950, it was rumoured that converting the Old Windmill on Wickham Terrace into a tourist kiosk would stir ghosts from rest;[42] today, it is said that a ghost can sometimes be seen hanging inside the tower.[43] A building that was once the site of hangings, most famously the hangings of two Aboriginal convicts in 1841, [44] the story potentially reflects the anxieties of residents surrounding the acts committed there and, more broadly, the atrocities that underlie Australian history.

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[39] Keping Wu, "'Ghost city': Religion, urbanization and spatial anxieties in contemporary China," *Geoforum* 65 (2015): 243-245, https://dx.doi.org/10.1016/j.geoforum.2015.08.005

[40] Ho-Yin Fong, "A Ghost Tour In Rouge," *Journal of Modern Literature in Chinese* 12, no. 1 (2014): 98-107, https://www.researchgate.net/publication/278684035_A_Ghost_Tour_in_Rouge.

[41] Drew Creighton, "The dark history of Brisbane's oldest building," Brisbane Times, October 2, 2018, https://www.brisbanetimes.com.au/brisbane-news/the-dark-history-of-brisbane-s-oldest-building-20181001-p5072m.html.

[42] Clem Lack Jr., "Ghosts will stir in the old Windmill," The Courier Mail, January 10, 1950, 2, https://trove.nla.gov.au/newspaper/article/49709168.

[43] "Haunted Places and Ghost Stories of Brisbane Qld," Brisbanehistory.com, accessed May 20, 2020, https://www.brisbanehistory.com/ghosts_of_brisbane.html.

[44] Lack, "Ghosts."

On the other hand, ghost stories have also been leveraged for the purposes of generating revenue. The intrinsic connection between ghost stories and places makes them the ideal material to repackaged into guided tours. These tours are ften known as ghost tours or ghost walks. Cities such as Edinburgh and New Orleans are rife with ghost stories and boast multiple ghost walks.[45] In most ghost walks, the guide asserts the authenticity of their tales, sometimes taking on the persona of an otherworldly or historical figure and dressing in costume to that end. The guide then leads the tour group through haunting sites in the city, telling stories in ways that incorporate features of the environment.[46] With physical details of the surroundings embodying story events, ghost walks allow the participants to witness a multilayered vision of the city—past, present and future.[47] While the commercialisation of ghost stories into standardised, reproducible formats as such may perhaps be seen as diluting their power, they nevertheless prove the power of the ghost story as a vehicle for fostering relationships with place.

3.2.3. Drawing these threads together

The common ground between the two realms of urban story-making described in this section is best summed up by De Certeau in *Walking in the City*:

> *"There is no place that is not haunted by many different spirits hidden there in silence, spirits one can "invoke" or not. Haunted places are the only ones people can live in—and this inverts the schema of the Panopticon. But like the gothic sculptures of kings and queens that once adorned Notre-Dame and have been buried for two centuries in the basement of a building in the Rue de la Chaussée-d'Antin, these "spirits," themselves broken into pieces in like*

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[45] McEvoy, "Ghost Walking."

[46] Joy Fraser, "Never Give Up The Ghost: An Analysis of Three Edinburgh Ghost Tour Companies" (Master's diss., Memorial University of Newfoundland, 2005), 4-5.

[47] McEvoy, "Ghost Walking."

> *manner, do not speak any more than they see. This is a sort of knowledge that remains silent. Only hints of what is known but unrevealed are passed on "just between you and me."*[48]

De Certeau sees the multivalence of urban spaces (un-)preserved in the multiplicity of memories we hold of what is no longer there, memories which "haunt" the spaces that spawned them. With ghost stories, that haunting is made literal: ghosts are subjective beings shifting between states of existence, embodying self-contradicting visions of urban spaces, which stand in defiance of top-down efforts to harness the city into conformity.

Locative media is a useful medium for uniting these two threads in the context of Brisbane. The locative game to be made in conjunction with this exegesis seeks to draw out the contradictory, multilayered character of Brisbane, by honouring histories that have been lost to years of urban renewal, many of them erased from its official narrative. The game seeks to pare away the commercial, utilitarian layers of the urban landscape to reveal patchworks of lived experiences instead—both the experiences of the player, which are created as they play, and those of the people of the past, whose fictitious stories may serve as a shifting impression of Brisbane in bygone years.

Elements of gameplay will be designed to meet these aims. While clear objectives are generally considered essential in game design and for the most part cannot be avoided,[49] a game can be designed such that it does not demand that the player fulfill objectives immediately or with urgency. For example, by partially obscuring the locations of in-game markers—which can then only be discovered through guesswork and deduction—finding the most efficient route becomes impossible. It

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[48] De Certeau, "Walking in the City," 108.

[49] Katie Salen and Eric Zimmerman, "Unit 1: Core concepts" in *Rules of Play: Game Design Fundamentals* (Cambridge: MIT Press, 2004), 74.

would reward not speed but meandering exploration, by revealing narrative titbits where they may not be expected.

3.3. A mobile ghost walk for Brisbane

Ghost walks feature a prototypic form of the locative technique described by Paay and Kjeldskov, where locative stories may ground themselves in reality by mirroring interactions with real objects and environmental features.[50] Locative ghost stories may be said to be the spiritual successors of the ghost walk, with their shared goals of enriching urban spaces by overlaying the stories of resident ghosts on them.[51] It is perhaps no coincidence, then, that many locative applications, such as *Ghost Snap,*[52] *Viking Ghost Hunt*, and *Geist,*[53] are centred around ghosts. Superimposing virtual constructs on reality, these games lie in the overlap between tangible and intangible, between real and incorporeal—much like ghosts themselves.

Following in this legacy, the main objective of this exegesis is the creation a locative ghost story about Brisbane, written with respect to its local culture. While twenty-four locative stories set in Brisbane have been created for the *Story City* application, none of these stories truly engage with the nature of Brisbane or invite the player into a deeper understanding of its history. Instead, they explore culturally-unspecific tales about pirates, superheroes and zombies that could be transplanted elsewhere with few changes.[54] The lack of locative stories *about*

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[50] Paay and Kjeldskov, "Location-based Storytelling."

[51] Paay and Kjeldskov, "Location-based Storytelling."

[52] *Ghost Snap* (Bielefeld: WhiskyGuerra, 2016), mobile game, https://play.google.com/store/apps/details?id=de.whiskyguerra.GhostSnap.

[53] Naliuka, Carrigy, Paterson and Haahr, "A Narrative Architecture."

[54] "Brisbane," Story City, accessed April 4, 2020, https://www.storycity.com.au/stories/brisbane-street-reads/.

Brisbane is a missed opportunity that this exegesis aims to address, as although its 200-year history is shorter than that of Edinburgh, which has been settled since the first century CE,[55] or even 302-year-old New Orleans, this exegesis contends that the history of Brisbane is a worthwhile subject for an interactive tale.

4. RESEARCH QUESTION

How can locative narratives about buried histories aid in developing emotional relationships with the urban spaces of Brisbane?

5. METHODOLOGY

This project will employ multiple methods, including historical, creative and user-experience components in the realisation of the final creative outcome.

5.1. Practice-led research, a guiding methodology

Practice-led research is a method commonly employed in the fields of design and the fine arts. Researcher Martyn Jolly describes it as such:

> *"…a 'practice-led' thesis is based on the researcher's development of an appropriate experimental and analytical methodology, specific to the medium in which the practice takes place, and grounded in an understanding of the historical and theoretical disciplinary context in which it is located."*[56]

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[55] James Neil Graham Ritchie and Anna Ritchie, *Edinburgh and South-east Scotland* (Portsmouth: Heinemann Educational, 1972).

[56] Martyn Jolly, "Practice Led Research," ANU College of Arts & Social Sciences, accessed March 26, 2020, https://cass.anu.edu.au/practice-led-research.

In the absence of discrete statistical or qualitative data in the arts, an examination of creative practice, processes, and outputs becomes the main substrate for novel innovations in creative research. This methodology aims to situate the project in the context of the creative field, which includes the technical and phenomenological explorations of fellow researchers and creatives. In keeping with that aim, this project will be developed with respect to past and ongoing work in the field of locative research, be they frameworks developed by academics, or other locative applications and creative work.

5.2. Case studies

This exegesis will employ explanatory case studies to form a practice-led basis for the creative output. This method is particularly useful in elucidating how phenomena occur within specified human contexts,[57] such as how other locative games function under normal circumstances.

For this exegesis, two similar locative games will be examined: *The Isle of Brine* and *Death Works: Training Day.* The engine in which the former game was created, StoryPlaces, will also be autoethnographically investigated, through the creation of a short story in the application. These investigations will be undertaken with the central aim of extracting techniques and lessons from the works of other practitioners in the field. This will be particularly necessary because locative fiction has only been a defined genre for a relatively short period.

These games will be played as intended, including walking to GPS markers wherever applicable, with notes taken during the process. In cases where this is not possible, the games will be played through location-spoofing via Google Chrome's developer tools. Their interfaces and gameplay will be analysed through

[57] Robert K. Yin, Applications of case study research (Thousand Oaks: SAGE, 2012), 18.

some of the frameworks outlined in the literature review (Section 3.1. The history and theory of locative games), and lessons learned will guide the development of *The Spectral Carta*.

5.3. User testing

As a key feature of the research into the artist's practice, the creative product, *The Spectral Carta,* will undergo a process of iterative development and collaborative testing. After a working prototype of *The Spectral Carta* has been developed, it will be trialed by selected participants. Feedback on the gameplay will be gathered through informal interviews. Through the gathered feedback, a well-rounded understanding of the game's effectiveness will be gathered, with attention to aspects that are less successful or compelling. Further iterations of the game will be developed with reference to the responses. Through this back-and-forth between players and developer, as well as technical and aesthetic experimentation, the techniques of execution will be honed and refined.

6. CASE STUDIES

6.1. The selected case studies

The two games selected to be examined as case studies are *The Isle of Brine* by David Millard and Charlie Hargood and *Death Works: Training Day* by Trent Jamieson. The first of these is found on the *StoryPlaces* web application, and the second is found on the *Story City* mobile application. The *StoryPlaces* application, which *The Isle of Brine* was authored in, has been made available for public use; this was also examined for the case study. As these games and applications were investigated autoethnographically, all case study sections are written in first person, being descriptions of my experiences playing and reflections on their creative and technical execution. Essential discoveries and realisations will be discussed here primarily, although other observations may also be noted.

6.2. *The Isle of Brine*

The Isle of Brine is a locative story written in the StoryPlaces application. Both the story and the application were created by researchers David Millard and Charlie Hargood, as a part of ongoing investigations into locative stories.[58] Similar to *The Spectral Carta, The Isle of Brine* concerns the history of a place—here it is the Isle of Tiree in Scotland—and delivers its story through GPS markers that are triggered through physically visiting the corresponding sites. According to Millard and Hargood, *The Isle of Brine* was written as a means of fully exploring and demonstrating the technical capabilities of the *StoryPlaces* application, and of reflecting on the process of writing a locative story.[59] The researchers' gathered insights were published in their 2017 paper, "Tiree tales: a co-operative inquiry into the poetics of location-based narratives."[60] The story was investigated autoethnographically, through playing the game and the recording of experiences, thoughts and insights encountered in the process. Relevant insights are presented below. As this story was written for a location that could not be visit during the writing of the exegesis, *The Isle of Brine* was played through geolocation-spoofing with Google Chrome's developer tools, and supplemented with images of specific locations through Google Maps.

The interface elements of *The Isle of Brine* come together to make playing the game simple and intuitive. It is made up of two panels (fig. 4). The left panel displays a map with an indicator for the player's current location in blue, as well as pins indicating the physical locations of story markers. The right panel shows a list of

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[58] David Millard and Charlie Hargood, "Tiree Techwave - The Isle of Brine," StoryPlaces, accessed May 6, 2020, http://storyplaces.soton.ac.uk/tiree.php.

[59] David Millard and Charlie Hargood, "Tiree tales: a co-operative inquiry into the poetics of location-based narratives" (paper presented at *ACM Hypertext 2017, Czech Republic, July, 2017*), http://dx.doi.org/10.1145/3078714.3078716.

[60] Millard and Hargood, "Tiree Techwave."

these same markers, with titles and hints, corresponding to pins on the map. Pins that can be accessed are shown in green while pins out of range are shown in red.

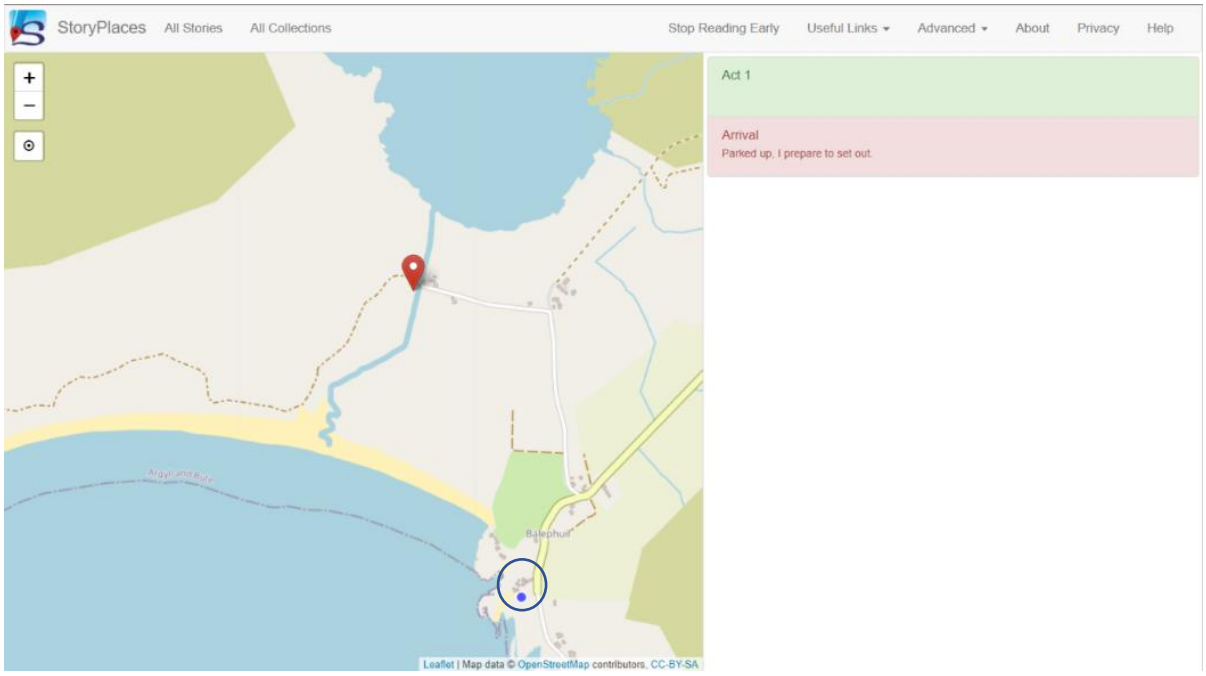

Figure 4. The interface of the StoryPlaces application, displaying the game *The Isle of Brine*. Screen capture by the author, from David Millard and Charlie Hargood, *The Isle of Brine* (Tiree: StoryPlaces, 2016), https://app.storyplaces.soton.ac.uk/#/story/595d05787e738f05ab768986.

The map shows the player's physical location in the real world, and in relation to the story markers. This directs the player's movement, presenting discrete destinations to walk towards and offering visual feedback as they move. On both panels, nodes within the player's geographical range are displayed in green while nodes that are out-of-range are displayed in red (fig. 4), so that the player is made aware of whether they are close enough to a pin to access its story. As new pins are unlocked, they also appear on the map and the node list, keeping the player apprised of the evolving set of options available. These features make gameplay straightforward to follow.

In the preface of each act of the story, the player is offered an explicit textual indication of what physical location to go to in order to access the first story node, as well as how long the act would take to complete. For example, "Balephuil Bay" is mentioned in the preface of Act 1, aiding the player in locating the start point. As I was initially unable to locate the first marker by browsing the map, these

instructions proved essential in directing me to the appropriate story locations. The clarity they offer is crucial to stimulating progression.

In each Act, nodes are spaced out over approximately 1.5 kilometres in total, a reasonably walkable distance, and are organised in roughly linear order along a road. While the direction of the path taken by the player does delineate a rough sequence to the nodes, the game allows the player to ignore some of them and proceed to further ones. As an experiment, I attempted to skip a few nodes along the route and access farther ones first. On reaching the farthest node, the previous ones vanished. This proved detrimental, as the missing context made some of the subsequent narrative events confusing.

The Isle of Brine excels where it uses space and distance to create poetic effects in the story. For instance, the pin shown in figure 5 lies a great distance away from a cluster of story nodes that the player just completed. The effect in the storytelling is to create a long pause, in which the player would presumably walk along a scenic seaside route, creating a period of silence in which the player may contemplate the previous piece of narrative. This pause follows a story node in which the narrator relates an anecdote about how he and a sailor friend left a struggling trawler and its crew to its own devices, inadvertently letting them die at sea. The long break is thematically appropriate, allowing the player to contemplate the sea and the moral quandary presented by the narrative.

Figure 5. A large distance between two markers creates a pause in the narrative. Screen capture by the author, from David Millard and Charlie Hargood, *The Isle of Brine* (Tiree: StoryPlaces, 2016), https://app.storyplaces.soton.ac.uk/#/story/595d05787e738f05ab768986.

One issue encountered is that the player's GPS location has to match the marker's very closely for the marker to become accessible. At a distance of ten metres away, markers were still inaccessible. This would present potential issues if the GPS signal in an area is weak.

Also, I found that on access, story markers disappeared and could not be revisited. There is no "trail" of completed storylines. As a result, the story seems to exist only fleetingly, disappearing as the player progresses. This may be the intent with the story, but one's inability to revisit what was previously read sometimes made it hard to follow the story, particularly if a detail mentioned briefly became important in a subsequent portion of the story.

6.3. Authoring in the StoryPlaces application

The StoryPlaces application is a platform for reading and authoring locative stories. *The Isle of Brine,* explored in Section 6.2., was authored on this platform, and as such the gameplay interface has already been explored. In addition to the reading application, the creators of the StoryPlaces application have also made the authoring tool available to the public. I investigated the capabilities of the tool by authoring a story with it—an adaptation of my earlier work *The Sky in Many Mirrors*.

The StoryPlaces tool has all the ingredients for a structurally-interesting locative story. It has a tool for graphically placing story markers at relevant locations, and on each marker, a dropdown menu allows the author to determined what variables unlock it, and whether it should set any variables on being accessed. This can be used to direct branching, looping, and other more complex formats. However, StoryPlaces is a heavily text-oriented system. The only creative visual elements found in StoryPlaces stories are individual photographs to be displayed above each marker's text, as seen in figure 6.

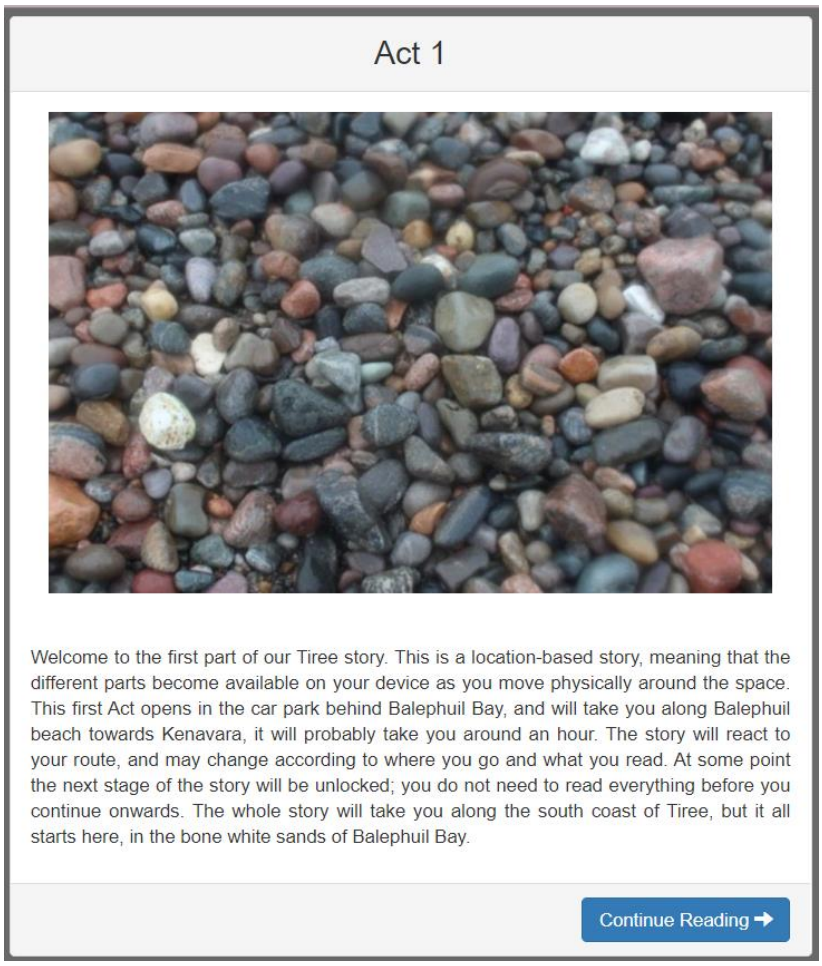

Figure 6. The panel displayed on opening the first marker in *The Isle of Brine*. Screen capture by the author, from David Millard and Charlie Hargood, "StoryPlaces Authoring Tool," https://app.storyplaces.soton.ac.uk/#/story/595d05787e738f05ab768986.

StoryPlaces is a powerful tool for locative prose, but due to the lack of visual utilities, it would not meet the needs of the exegesis' creative component. However, it offered an interesting model on which to design my own locative engine. I

ultimately drew inspiration from many of its features, such as the ability to save the created story as a JSON file.

6.4. *Death Works: Training Day*

The game *Death Works: Training Day* was authored by Trent Jamieson in the Story City application. Story City is downloaded and installed as a mobile application. The interface is largely made up of a single scrolling text area, with a map that can be toggled to be visible or invisible. On the map, an indicator shows where the player is located, giving the player immediate feedback as to their locations.

This story begins at Reddacliff Place. Starting from this node, and at every subsequent node in the game, two new map markers appear. Each one is described in the text, along with a serial number (as seen in figure 7) corresponding with one of the two markers displayed on the map. These markers represent choices to be made in the story, such as between two potential ghost-hunting missions. At every node in the story, one makes an explicit choice by walking towards the marker corresponding with one's preferred option, thereby enacting that decision on a physical level.

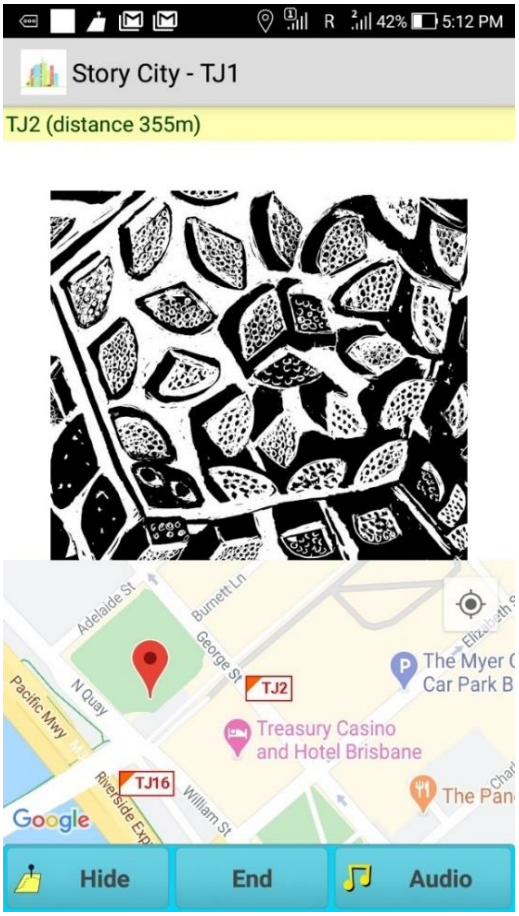

Figure 7. *Death Works: Training Day* in the Story City application. Screen capture by the author, from Trent Jamieson, *Death Works: Training Day* (Brisbane: Story City, 2014).

Death Works makes innovative use of connections between narrative and environment, the very technique described by Paay and Kjeldskov.[61] The story makes plot points out of the physical objects present in the area: the player finds a character hiding behind one of the spherical art installations on Reddacliff Place, and the character later describes a monogram found on the signal box by the traffic lights on George Street as a magical sigil. These details created an unprecedented sense of realism to the in-game events, as if they were taking place in my actual vicinity, albeit invisible to me.

Beyond references to individual objects, the story also makes reference to places in the surrounding area, such as Hungry Jack's. Under normal circumstances, these

[61] Paay and Kjeldskov, "Location-based Storytelling."

references would be interesting and add depth and realism to the narrative. However, since I undertook the case study in the middle of the COVID-19 lockdown in April 2020, many of the descriptions did not correspond to what I observed at all. The Hungry Jack's was not busy, and Queen Street was not crowded with pedestrians. As mentioned by Packer et al. in "Developing a Writer's Toolkit for Locative Interactive Narratives," accounting for how a place may change over time is important when authoring a locative narrative, and this discrepancy indicated a failure to do so. This was a good cautionary reminder that "current" references may not always remain current, as a place would undoubtedly change over time and cause landmarks to shift. If any references were made, they should be to things that would endure, such as histories and natural features, or remain general and thus generalisable. In relation to *The Spectral Carta* however, changes to physical spaces might rather make the game *more* interesting. The histories of these places would endure, and the latent symbolism of the ghosts, as pieces of lost history trying to find voice in the present, may in fact *gain* significance through these changes.

Finally, one chief learning experience came from my attempts to access the TJ16 marker in *Death Works.* The marker was positioned just off the road at the junction of William Street and the Victoria Bridge, as seen in figure 7. This made it physically impossible to access, as it was effectively located in mid-air. Attempting to go under the motorway near the base of the bridge to reach that location also did not work, as the GPS signal was almost completely blocked by the motorway. This reinforced the necessity of increasing the accessible radius of each GPS marker, as well as conducting tests at game locations to ensure that such difficulties were not encountered by players—strategies recommended by Packer et al., and Paay and Kjeldskov.

7. PROCESS AND OUTCOMES

7.1. Ideation

From the outset, this exegesis has been approached with two key goals: its completion would stretch my web development skills, and the creative output would

warrant continual use and development beyond the completion of the exegesis. During the ideation phase of the project, several concepts were brainstormed with guidance from the project supervisor, Dr. Jason Nelson, and with respect to the abovementioned goals (table 1).

Table 1. Initial game concept ideation

1. An augmented reality board or card game that overlays fantasy visuals on a physical board through a mobile application.
2. A moving game whose board has parts operated and transformed by Arduinos.
3. A web application that dynamically visualises survey responses on a world map as it is updated in real time.
4. A room that virtually recreates the feeling of a place somewhere else through visuals, sounds and smells.
5. An autobiographical game about mental illness, alienation, childhood bullying and the pressure-cooker school culture in Singapore.

All these ideas centred around technical implementations rather than specific poetic or aesthetic interests. Other than the last, none offered strong aesthetic threads or arguments. In order to find a project that would interest me on both aesthetic and technical grounds, I distilled this collection of ideas to the key themes present, noting that many of them are concerned with transforming physical spaces through human-computer interaction, the links between places and experiences, fantasy worldbuilding, and telling stories that lurk on the margins.

Dovetailing with my long-standing interest in maps and locative stories, the research began to explore the realm of locative narratives told through augmented reality. During a discussion with my project supervisor, a recent locative work I created was discussed: *Ghosts Under Bridges*, a collection of three locative stories about the experience of alienation in Brisbane, in which plot events are accessed by visiting and triggering GPS markers. *Ghosts Under Bridges* would come to provide the technical and aesthetic seeds for the subsequently generated ideas.

7.2. Technical feasibility considerations

While homing in on locative narratives as a format helped me settle on a mobile browser-based implementation, there was still a wealth of potential stories to be told through the medium. A few concepts were raised; the most prominent of these was an application that allowed strangers to collaboratively write stories overlaid on real physical spaces. This direction was discarded as it would involve setting up user accounts and creating a highly mutable structure that could adapt to any location in the world, a relatively large amount of work and time investment. Furthermore, it would be difficult to prove the concept's viability without a community of users. I opted instead to scale the concept, focusing on a story set in a single place I knew well: Brisbane. Taking this as the starting point for the next round of ideation, the eventual concept for the project—that of a treasure hunt—was arrived at.

After making the decision to focus on a treasure hunt in Brisbane, the ghost story element was revisited, adding the idea that the "fantasy world" would really be an alternate version of Brisbane where the landscape is a patchwork of bygone eras. The "treasures" to be found would be centrepieces of the ghosts' stories—objects intrinsically tied to their lingering regrets and discontents.

7.3 Outlining the game's structure

Before production of the game could commence, a rudimentary outline describing the story's structure and the narrative arc was established. At this point, many decisions had to be made on the scope of the story and the core gameplay mechanics. This outline also included notes on possible implementations and changes.

Table 2. First ideation of the game's structure

1. At the start of the game, the player is given a preamble (such as through a letter) setting the scene. The player is an exorcist, and their help has been enlisted to find 15 targets (they can be objects, architectural features etc.) and lay 15 ghosts to rest.

2. The main map interface comes up, along with buttons to access a diary/inventory of knowledge, and a button for switching between two maps.

3. Map A represents the real world: it's just a regular map with a sepia filter over it.

4. Map B is the "ghost world" map, which removes everything but historical buildings of interest, shown as GPS markers/shapes on a blank bg. On a higher difficulty level, this won't be accessible.

5. There is a marker icon in the middle of the map. Tutorial text/animation/context indicates that the icon represents you.

6. A fancy occult-looking compass points in the direction of the closest ghost and a meter indicates how far away it is. Ghosts are found at specific points on the map and move along defined routes.

7. When you walk within 20 metres of a ghost, it appears on the map as an icon, indicating that you can tap on it to interact.

8. When you tap on the ghost's icon, the screen transitions to a painted environment, and the ghost appears onscreen. The styling and animation will depend on the kind of environment, and who the ghost is.

9. A single dialogue line introduces the ghost. You are given a list of conversation options and you can select one to proceed. The ghost's responses to your choices appear as text on the screen.

10. At each dialogue branch, you are given a similar list of dialogue options, through which you can manipulate the direction of the conversation, find out more about the person, and try and negotiate clues out of them. There's no way of knowing the "right" thing to say, but there's no real way to mess up irreversibly, as conversation can be attempted as many times as you like—though it might change on subsequent attempts.

11. The clues that they give you will be woven into their dialogue (e.g. "I think I left my binoculars at the Lyceum" indicating you have to go to "the Lyceum", a building that has since been renamed, to find the target object). The player may flip to Map B to locate the building by its old name, or they may research it themselves.

12. Ghosts may verbally direct you towards multiple targets, and different ghosts may reference the same target. Some ghosts may be more cryptic in their phrasing, not mentioning a place directly by name. (One mechanic to consider: if one meets the ghost again, they may clarify their statement by specifying the name of the place they were referring to. Another mechanic to consider: a ghost you've met before always shows up on your screen even when you're farther than 20 metres away.)

13. Important things that ghosts say, especially lines referencing locations, will automatically be recorded in the diary, but in "diary voice" ("John mentioned that he left his binoculars at the Lyceum. Perhaps I should look around in the area?"), as if you were the one writing them. The diary can be accessed on the main map screen.

14. Each subsequent time the player "meets" the same ghost, they may react to one differently based on how conversations went.

15. Unlike ghosts, the targets are not pointed out by the compass—the player must simply go to the location given by the ghost. Once the player gets within 20 metres of a target, however, it will show up on the map as an icon as well. It will not show up unless you've had the requisite conversation to be aware that it's there (i.e. you can't discover them by accident).

16. The game has three phases. In each phase, you must meet five ghosts and find five targets (in any order). Only when you have completed all five do you move on to the next phase.

17. When you complete the third phase, you might be given a win screen and some links for sharing about the game and your victory?

18. Each phase represents a different time period or generation, probably in ascending year order. I am toying with the idea of each phase's ghosts being related to the ones from the previous phase's, relationships that you can unearth if you converse with them.

Organically, the game began to take on the shape of a "plain", as described by Millard et al.:[62] the story branches out more than it moves forward, and multiple nodes can be accessed at any given time, with progression gated by knowledge and the rate of physical exploration, rather than mechanical elements of the game.

---

[62] Millard, Hargood, Jewell and Weal, "Canyons, deltas and plains."

Within this structure, the intent became less to tell a linear story, and more to establish a snapshot of an interconnected web of relationships in Brisbane.

The intention behind the gameplay would not be to test the player's skill in remembering facts or solving puzzles, but rather, to encourage the player to explore Brisbane, by overlaying an extra layer of knowledge and intrigue on the player's surroundings. As such, it became clear that the game should not have a "game over" state, or permanently block progress due to missteps. Furthermore, as one of the aims of the game is to encourage wandering, the

7.4. Selecting historical sites

To select places of interest, document and archive analysis were employed to gain a holistic understanding of each location through the triangulation of data gathered from documents, news websites, books, and on-site direct observation.

7.4.1. Criteria for selecting sites of interest

Figure 8. A map with the approximate gameplay area marked with a circle. Reproduced from "Brisbane City Map," Queensland Australia, accessed 23 June, 2020, https://www.queensland-australia.com/brisbane-city-map.html.

Before initiating the search for locations, I established four criteria for shortlisting sites to include in the game:

1. The site falls within a set of defined boundaries (fig. 8), within which pedestrian travel is feasible for the player.
2. It has an interesting and notable history, but not one that is often spoken of. This precludes, for example, the Parliament House, whose history is well-known.
3. The present-day site is interesting and easy to visit or traverse.
4. The physical site has changed significantly over time since its establishment.

Several other secondary traits were informally considered, largely for the interest they would add to puzzle-solving, as well as the storytelling opportunities they would offer:

1. The site used to be known by a different name in the past.
2. The site is no longer operational, or no longer physically exists in its original form.
3. Only parts of the site in its original form are retained in the current building.
4. The site is connected to ghost stories and murders.

7.4.2. Shortlisting sites

With reference to the criteria outlined in Section 7.4.1., I began to compile a shortlist of locations to be included in the game. Invaluable to the search was Gregory and McLay's *Building Brisbane's History,* a book detailing the histories of buildings in Brisbane.[63] From this book, thirteen locations were shortlisted. One of these locations is the Story Bridge, an outlier because it lies outside the demarcated radius. However, it has been a site of personal interest since I authored the locative

[63] Helen Gregory and Dianne McLay, *Building Brisbane's History* (Warriewood: Woodslane Press, 2010).

short story collection *Ghosts Under Bridges*. The bridge's construction was initiated as a public works project in 1935, in a governmental effort to supply employment to Australians during the Great Depression. Four men died during its construction,[64] and from its completion in 1940, it became infamous as a suicide hotspot.[65] Its unembellished, foreboding appearance and its bloodstained history hold a strong psychological weight that I first explored in *Ghosts Under Bridges,* and which I was interested to continue exploring in *Ghosts of the River*.

To further extend the shortlist of locations, I conducted an internet search into rumours about hauntings around Brisbane. Naturally, the sources consulted were not required to be academically rigorous, as ghost stories are, by definition, not based in academic fact; the intent was for these rumours to spark a ghost story. A vast range of stories of hauntings in Brisbane were discovered online. Frequently mentioned in lists of hauntings were the Brisbane Arcade, where "it is said that [a woman's] ghost is still sometimes seen, dressed in a once-fashionable Victorian gown and pacing the balcony at night,"[66] and the Tower Mill on Wickham Terrace, once a convict-operated flour mill, where residents claim "they…see a figure inside the tower swinging to and fro."[67] These locations were added to the location shortlist.

The Plough Inn, an establishment that I had already placed on the location shortlist due to historical interest, is another site of a famous alleged haunting. The forum user Kanacki describes the ghost as such:

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[64] "The Storied Past of the Story Bridge," Story Bridge Adventure Climb, July 9, 2018, http://storybridgeadventureclimb.com.au/the-storied-past-of-the-story-bridge/.

[65] Andrew McMillen, "Brisbane's Story Bridge: a tale of tragedy for far too long," The Australian, September 5, 2015, https://www.theaustralian.com.au/weekend-australian-magazine/brisbanes-story-bridge-a-tale-of-tragedy-for-far-too-long/news-story/bbf77992212ae6378601469a71f788ea.

[66] "Haunted Places and Ghost Stories of Brisbane Qld," Brisbane History, accessed June 23, 2020, https://www.brisbanehistory.com/ghosts_of_brisbane.html.

[67] Laura Morley, "Brisbane's Most Haunted," The Good Guide, accessed June 23, 2020, https://thegoodguide.com.au/brisbane/blog/the-birds-word/item/brisbane-s-most-haunted.

> *"Legend has it that it is the ghost of a young girl strangled in the hotel in the 1920s when South Brisbane was still the haunt of sailors, prostitutes and spivs. No one has seen the ghost but many claim to have heard her. She…haunts…where Guest Room 7 used to be before the renovations, where the atmosphere is always cold and oppressive."*[68]

Outside of hauntings, I expanded the scope of the research to locations surrounded by an air of mystique that might be a suitable setting for a ghost story. Anecdotal first-hand accounts of ghost encounters in theatres directed me to conduct research into old theatres in Brisbane. This led me to the Lyceum, a defunct movie theatre that was purchased by Hillsong United in 2018.[69] Various news articles describe an attempted murder in the Lyceum: on August 18, 1942, an American soldier shot an usherette inside the theatre before committing suicide.[70] While the victim survived, the idea of a fictitious murder where the victim continued to haunt the theatre long after death captured my imagination.

The Boggo Road Gaol is also reportedly a hotspot for ghost activity, so much so that its official website mentions its reputation as the site of numerous hauntings.[71] In the interest of keeping the game within a walkable region, Boggo Road Goal was excluded from the shortlist.

Table 4. Preliminary location shortlist

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[68] KANACKI, "Phantom of the Plough Inn Brisbane QLD," Paranormal.com.au, accessed June 23, 2020, https://www.paranormal.com.au/public/index.php?topic=11383.0.

[69] Hillsong Brisbane, "Hillsong Church to renovate Brisbane's disused Tribal Theatre," Hillsong Brisbane, April 8, 2018, https://hillsong.com/brisbane/blog/2018/04/hillsong-church-to-restore-brisbanes-disused-tribal-theatre/#.XogUI4gzY2y.

[70] "Soldier Shoots Usherette Then Suicides," Barrier Miner, August 19, 1942, https://trove.nla.gov.au/newspaper/article/48380839.

[71] Boggo Road Gaol, "The Ghosts of Boggo Road Gaol – Boggo Episode 4," Boggo Road Gaol, October 22, 2018, https://boggoroadgaol.com/the-ghosts-of-boggo-road-gaol-boggo-episode-4/.

- City Hall
- Newstead House
- General Post Office
- The Plough Inn
- Botanic Gardens
- Chinatown
- Ekka Showgrounds
- Lefty's music hall
- Story Bridge
- Anzac Square
- Hillsong Church (previously the Lyceum)
- Wintergarden
- HMS Diamantina (Maritime Museum)
- Old Family Services Building (previously the Taxation Building)
- South Brisbane station
- Roma Street station
- South Bank Parklands/World Expo '88 site
- Victoria Bridge
- Albert Street Literary Walk
- Brisbane Arcade

7.4.3. Direct observation

An part of preparing to design the game was direct observation of locations to be included in the game. As the case study with *Death Works: Training Day* clearly indicated, and as recommended by Packer et al., it is important to visit the site where the in-game marker will be placed, to investigate any potential obstacles to

access, and to ensure that the game complements the physical environs rather than creating dissonance with it.

Direct observation of some of the in-game locations was carried out before the quarantine lockdown. These places include the Plough Inn, the Story Bridge, the HMAS Diamantina, ANZAC Square, the Botanic Gardens, Brisbane Arcade, the General Post Office, the Tower Mill on Wickham Terrace, and Roma Street Station. The game was also tested at locations such as the Botanic Gardens, Brisbane Arcade, the General Post Office and the Tower Mill on Wickham. Documentary photographs and notes were taken; these are included in Appendix A. Further direct observation was carried out alongside the process of producing the game; wherever these observations are relevant to the creative process, it is mentioned and the insights thereof described in detail.

Later, further direct observation was conducted when a working prototype of the game was complete. This second round of observation would ensure that the game functioned as intended.

7.4.4. Contingencies due to evolving situation

During the COVID-19 outbreak of 2020, further direct observation of game locations was not possible due to the lockdown. In lieu of this, the researcher sought out online information about in-game locations. On-site testing was replaced with virtual walks in Google Maps, and inferences based on the appearances of locations. This was not a perfect solution, and the game would have benefited from more extensive on-site testing, as established in the case studies.

7.5. Programming, from engine to stories

Programming of the game engine occurred concurrently with the writing of the game. As there were multiple layers to the technical implementation of the game, it would be a sizeable, multi-part process.

First, an engine would be programmed from scratch, implementing the following libraries: jQuery, Geolocation API, Leaflet and Number to Words. The map, created and manipulated with Leaflet, retrieves its map data from the open-source map provider, Mapbox.

Then, each character's story would be coded in my established syntax, taking the form of a JSON file.

7.5.1. The proof-of-concept

While engines for authoring locative stories such as StoryPlaces and Story City do exist, it was found through the above case study that these did not meet the needs of the research. There was a need, rather, to create a full browser-based engine that would allow for the flexibility desired for the research. This involved the browser's inbuilt geolocation API, Leaflet.js and the map provider Mapbox—all of which I had previously played with in a simple project called *Brisbane In Colour*, which maps GPS coordinates in *Ghosts Under Bridges.*

As a proof of concept, I created a simple HTML page containing a map. It tracked the user's current location with the browser's Geolocation API, displayed as a red pin. allowing the user to place a blue pin at their current location with customised information attached. Leaflet.js and map provider Mapbox were used to display the map and uploaded pins. AJAX requests dynamically updated a JSON file with the coordinates of new pins. All this was coded from scratch with consultation of Leaflet.js and Geolocation API documentation.

The function of placing pins on the map in real time would have been used for the "collaborative locative journalling" or "collaborative worldbuilding on real spaces" concepts described earlier, but it was ultimately not used.

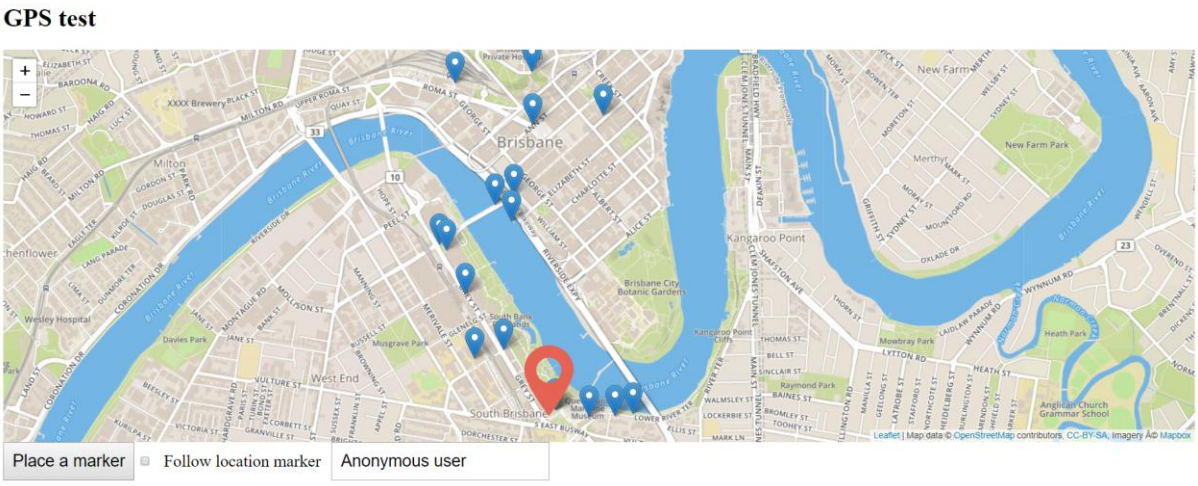


Figure 9. The proof-of-concept map application. Screen capture by author.

The original JSON file generated by this programme, `coords.json`, was an array of objects (fig. 10). Each object contained the pin's name, as well as a pair of coordinates showing the pin's location on the map. Popups containing the pin's names would appear when they were clicked (fig. 11). A different pin, shown in red in the image, marks the player's location using GPS data returned by the geolocation API's `watchPosition()` method.


```
[{"name":"Anonymous user","coords":"-27.9609344,153.3804544"},{"name":"Anonymous
    user","coords":"-27.482014,153.0248894"},{"name":"Anonymous user","coords":"
    -27.4820146,153.0248881"},{"name":"Anonymous user","coords":"-27.4823656,153
    .0267139"},{"name":"Anonymous user","coords":"-27.4823139,153.0281259"}
    ,{"name":"Anonymous user","coords":"-27.4821919,153.0291231"},{"name"
    :"Anonymous user","coords":"-27.4609413,153.0194489"},{"name":"Anonymous
    user","coords":"-27.9237858,153.3536927"},{"name":"Anonymous user","coords"
    :"-27.9237858,153.3536927"},{"name":"Anonymous user","coords":"-27.4739976
    ,153.0185056"},{"name":"Amari","coords":"-27.4742937,153.0189225"},{"name"
    :"Amari","coords":"-27.4763997,153.0199582"},{"name":"Amari","coords":"-27
    .4791164,153.0220507"},{"name":"Anonymous user","coords":"-27.479518,153
    .0204606"},{"name":"Anonymous user","coords":"-27.4720685,153.0215792"}
    ,{"name":"Amari","coords":"-27.4716288,153.0226168"},{"name":"Amari"
    ,"coords":"-27.4681927,153.0236387"},{"name":"Amari","coords":"-27.4661832
    ,153.0193652"},{"name":"Amari","coords":"-27.4640964,153.0176656"},{"name"
    :"Amari","coords":"-27.45911,153.0148735"},{"name":"Anonymous user","coords"
    :"-27.465625985630087,153.02359351086105"},{"name":"Anonymous user","coords"
    :"-27.4728771,153.0224762"},{"name":"Anonymous user","coords":"-27.4677328
    ,153.0274811"},{"name":"Anonymous user","coords":"-27.4818997,153.0289931"}
    ,{"name":"Anonymous user","coords":"-27.4644979,153.0269359"},{"name"
    :"Anonymous user","coords":"-27.4644548,153.026887"},{"name":"Anonymous
    user","coords":"-27.4642876,153.0252844"},{"name":"Anonymous user","coords"
    :"-27.474057499999997,153.026543"},{"name":"Anonymous user","coords":"-27
    .4648862,153.0251646"},{"name":"Anonymous user","coords":"-27.4627966,153
    .0240627"},{"name":"Anonymous user","coords":"-27.4621541,153.0214432"}
    ,{"name":"Anonymous user","coords":"-27.5123547,153.0409546"},{"name"
    :"Amari","coords":"-27.5078699,153.0389107"},{"name":"Amari","coords":"-27
    .5018885,153.040095"},{"name":"Amari","coords":"-27.4968562,153.039111"}
    ,{"name":"Amari","coords":"-27.4928361,153.0355669"},{"name":"Amari"
    ,"coords":"-27.4879627,153.0329989"},{"name":"Amari","coords":"-27.4842168
```


Figure 10. The original coords.json file. Screen capture by the author.

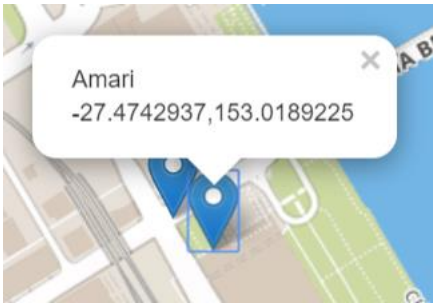


Figure 11. A pin with its associated popup opened, showing the associated name and the pin's coordinates. Screen capture by the author.

While not all parts of the proof of concept were used, it demonstrates all the basic ingredients of the eventual game: a JSON file containing a list of coordinates and associated data, an AJAX request that retrieves the JSON file, and functions that extract information from the JSON file and place pins on the map accordingly.

7.5.2. The basic framework

The game uses the jQuery library as a time-saver and to simplify the code. Outside of jQuery, Leaflet, and Number To Words libraries, all functionality within the game is programmed from scratch.

The original version of the proof-of-concept was built on the assumption that the list of markers would be updated in real time as users added new entries to it. As such—and due to inexperience—it was programmed such that every twenty seconds, the markers would be cleared from the map, the list retrieved again from the JSON file via and AJAX request, and the map repopulated with markers. This would cause obvious problems, such as increasing mobile data usage and changes applied to the markers being reset when it is repopulated.

As the project evolved, it became clear that regularly updating the marker list would not be a concern. As such, the function that retrieves and updates markers was split into two: `retrieveMarkers()`retrieves the list of markers once, at the start of the game, while `paintMarkers()` redraws the markers on the map whenever a visual change occurs.

The “list of marker objects” system from the proof-of-concept was adapted to contain information about each character, such as coordinates, name and character sprite URL. These are once again stored in the `coords.json` file. Each character would be associated with a sequence of conversations or “scenes”, all stored under the character’s name in the `stories.json` file. Within each scene is a single `dialogue` array containing all individual lines of dialogue of that scene (fig. 12). The structure of this JSON file is detailed in the comment in figure 13.

```
"dialogue": [
    {
        "text": "My key! My key! Oh dear me, where is my key?"
    },

    {
        "text": "I think I left it at the junction of Ernest Street
            and Stanley Street.",
        "oncomplete": {
            "metMaryBrown": true
        },
        "journal": "Mary Brown says she left her key at the junction
            of Ernest Street and Stanley Street."
    }
]
```

Figure 12. An array of dialogue lines in the stories object.

```
"Mary Brown" : [
    {
        "_comment": "Each property in the root object is associated with a
            particular character, with the key being their name. Stored
            under each key is an array of objects, each object representing
            a dialogue node attached to the character (with array order
            being the rough chronological sequence of nodes). Each object
            contains a list of boolean conditionals ('required') to be met
            in order for this story node to be triggered, the dialogue
            sequence to be displayed ('dialogue'), and what switches to set
            once the dialogue is completed ('oncomplete'). The programme
            runs through the node list in sequence, so if an earlier node
            'catches' a certain condition, there is no need to list it again
            in a subsequent node's list of conditions.",
        "required": {
            "metMaryBrown": false,
            "foundMarysKey": false
        },
        "dialogue": [
            "My key! My key! Oh dear me, where is my key?",
            "I think I left it at the junction of Ernest Street and Stanley
                Street."
        ],
        "oncomplete": {
            "metMaryBrown": true
        }
    },
```

Figure 13. The original stories.json file, with a comment detailing the structure of the stories object.

The most important feature of this new structure was the introduction of Boolean control switches. These switches offer a simple way to track the player's progress based on which ones have been toggled, making it possible to determine what dialogue options should be available to the player at any given time. At initialisation, the `switches` object is created, where each of the aforementioned control switches is stored as a property, along with its value: `true` or `false`. Each time the player taps a ghost or item, the programme loops through all the dialogue options in its conversation list, displaying the first option whose control switch conditions (as tagged in the `required` property seen in figure 14) are met. Once that dialogue sequence is complete, the `switches` object is updated: the control switches defined in `oncomplete` are changed, usually from `false` to `true`. Then the character's list of conversations is looped through again, and the next dialogue option whose conditions are met is displayed, and so on and so forth.

To demonstrate this structure, I used Mary Brown, an example character whom I used for my initial tests. The entirety of Mary Brown's "story", with all dialogue lines, is contained within the `stories` object shown in figure 14. Each time the player interacts with Mary's ghost pin, the script loops through the entire array of Mary Brown's conversations. For each, conversation, the switches states listed under the `required` property—in this case that both `metMaryBrown` and `foundMarysKey` are false—would be checked against the keys in the `switches` object. If all the required switches match, the interface displays the conversation. Once the "hello" conversation is complete, the `metMaryBrown` switch is changed from `false` to `true`, essentially marking that conversation as read and preventing it from being read again (since `metMaryBrown` has to be `false` for this conversation to be accessed). As all these conversations are stored within an array, each one also has a unique index among that ghost's conversations, which would be useful for organising associated information, as described in more detail in Section 7.5.5: A Journal, inventory and letter system.

The triggers for these control switches were later moved to individual lines of dialogue, rather than at the very start of each conversation (fig. 14). Line-based tags allowed for finer control of conversation flow. For instance, if the player decides to

close the dialogue in the middle of a conversation, the old system would have marked that conversation as read; however, if it is necessary for the reader to read the second-to-last message to get the gist of what is happening, placing the tag on the second-to-last line would ensure that the conversation is only marked as read once that line in the conversation is passed.

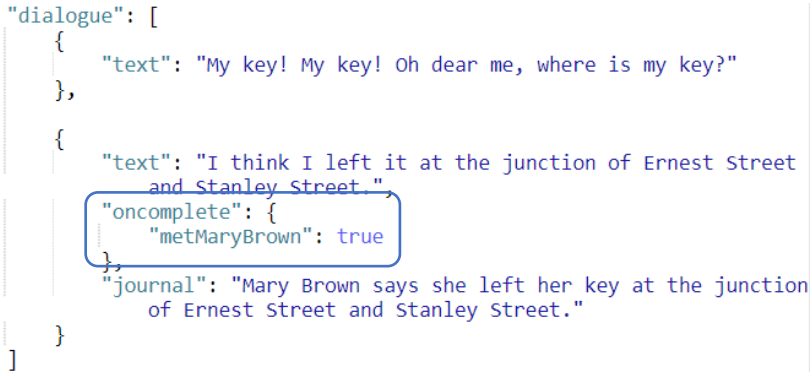


Figure 14. The switch triggers (found in the oncomplete property, circled in blue) have been moved to the dialogue lines.

As can be seen in figures 13 and 14, the `required` and `oncomplete` properties previously contained objects with key-value pairs, representing each of the control switches to be checked, and its target state, `true` or `false`. As a quality-of-life improvement, the function that loops through and compares the switch conditions was updated such that instead of objects with key-value pairs, it was possible to simply format them as arrays of strings in the format `conditionName` or `!conditionName` (with the exclamation mark prefix indicating that the control switch had to be marked as `false`). This new format is seen in figure 15.

```
{
    "required": [
        "Mary Brown:!met"
    ],
    "requiredItemState": [
        "!Mary's key"
    ],
    "optionLabel": "What's the matter?",
    "dialogue": [
        {
            "text": "My key! My key! Oh dear me, where is my key?"
        },

        {
            "text": "I think I left it at the junction of Ernest Street
                and Stanley Street.",
            "oncomplete": [
                "met"
            ],
            "journal": "Mary Brown says she left her key at the junction
                of Ernest Street and Stanley Street."
        }
    ]
},
```


Figure 15. The new format for required and oncomplete switch lists, employing strings instead of key-value pairs, marked in blue.

The items, such as Mary's key in this example, used a similar but far more simplified system, where instead of opening the dialogue panel, text is simply displayed as popups, and only one line is found in every "conversation".

As the game was developed, the `stories.json` file became unwieldy to work with, as it contained every single conversation in the game. It was then split into multiple JSON files, with one per character or item (fig. 16).

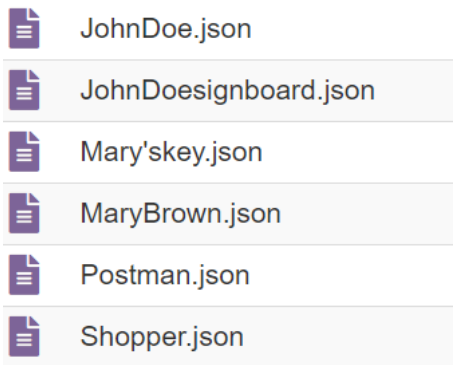


Figure 16. The stories.json file is separated into individual character JSON files.

The list of player characters is now managed inside `characterlist.json` (fig. 17). A function automatically retrieves each associated JSON file.

```
[
    "Mary Brown",
    "John Doe",
    "Shopper",
    "Postman",
    "Mary's key",
    "John Doe signboard"
]
```

Figure 17. The list of characters in characterlist.json.

7.5.3. Triggering distance and mechanisms

The game was coded such that ghosts would fade into view as they were approached, using the parameter of the player's distance from the ghost. At twice the "trigger distance", approximately sixty metres, the fading-in would start, and at the trigger distance of about thirty metres, the ghost would be at full opacity. Once the ghost is tapped while within trigger distance, a function opens the dialogue overlay and activates the conversation system described in Section 7.5.2. The opacity changes, as with most visual changes, would be executed every time the player moves and their distance from each ghost change.

The wide trigger radius was set because the inherent inaccuracy of GPS sensors might make it difficult for the player to be on the exact location of a ghost. Figure 18 shows the typical distance at which a ghost might be triggered. Additionally, it would make it more likely that the player might find ghosts without actively seeking them and encourage wandering as opposed to goal-driven walking. For items, the trigger distance is smaller—about twenty metres—as the objects are meant to add an element of puzzle-solving, and should be harder to find by accident. Adjustments were later made such that the ghosts start fading in from much farther away—ninety metres—to further enhance the possibility of finding ghosts without actively seeking them.

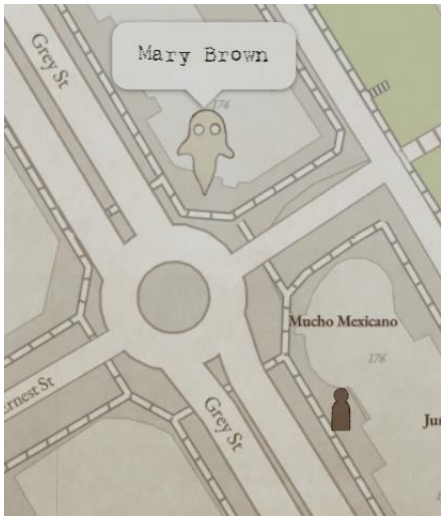


Figure 18. The typical trigger distance for a ghost marker: approximately one block's width.

7.5.4. Points of interest

Points of interest are a new type of pin that was added after I considered the possibility of player interactions with places, rather than ghosts or objects. For instance, on receiving an object, the player might—rather than giving it to someone—throw it into the river, such as is the case with the Lookout Point marker (fig. 19). Points of interest are essentially reskinned ghosts; they have an icon made up of four arrowheads, but function in essentially the same way as ghosts, with the same dialogue interface but without the character sprite (fig. 20).

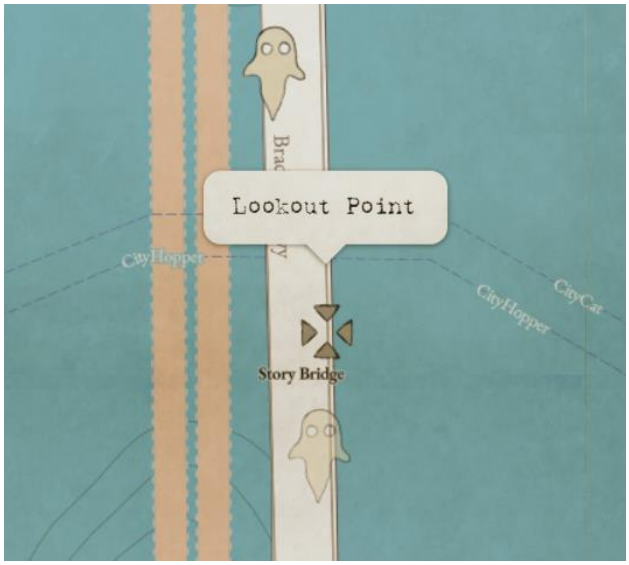


Figure 19. The Story Bridge lookout point: a point of interest marker.

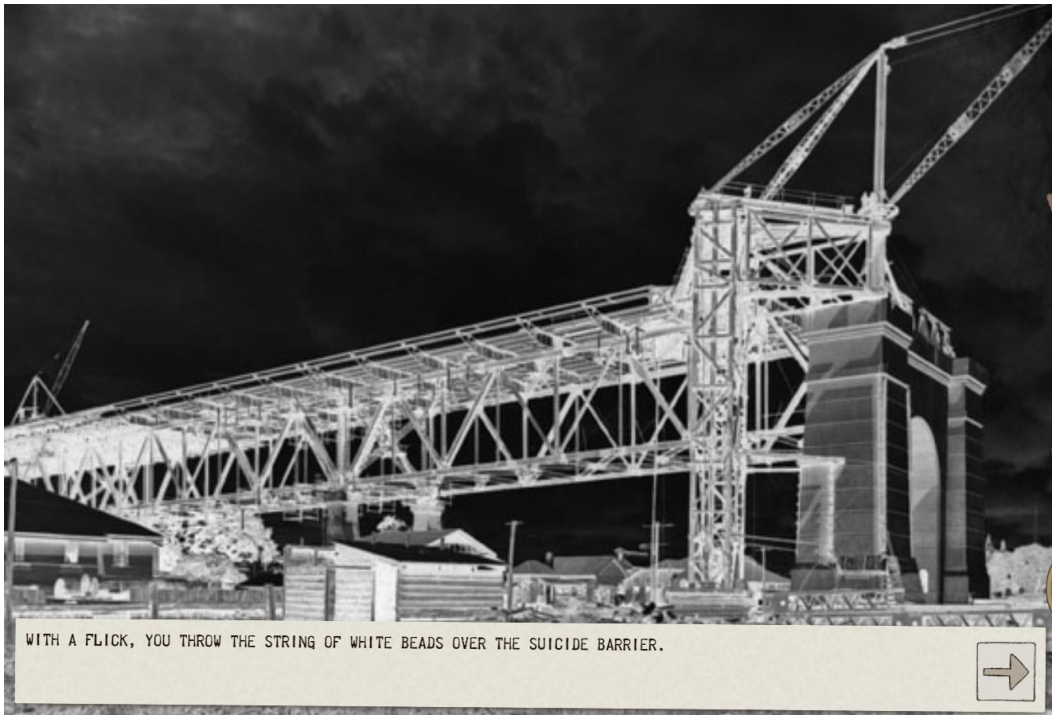


Figure 20. An example of dialogue displayed at a point of interest marker.

Reusing the ghost dialogue system for points of interest helped prevent redundant work; since one could easily narrate the process of interacting with places through text, adapting the dialogue system to points of interest was simple.

7.5.5. Journal, inventory and letter system

A basic structure had been established, where it was determined that all important events would be triggered via explicit player actions, such as tapping on ghosts or items on the map, and tapping through individual lines of dialogue. Physically moving on the map would not trigger any events by itself. With this structure in place, it was possible to add functionality to the game that was triggered by these explicit player actions.

As the player progresses through the game, various “collections” are updated to reflect the player’s findings and interactions: the inventory, the journal, and the letter folder. The inventory—a staple of many roleplaying games—tracks the items that the player has found. The journal system, added slightly later, maintains a record of important information shared by ghosts, as well as important events such

as the discovery of items. Since clues about the locations of ghosts and items are disclosed primarily through dialogue, it would be essential for the player to remember what has been said. Leaving this entirely to memory would foreseeably cause more frustration than enjoyment; as such, the journal records all essential information and events as they are encountered (fig. 21). The letter folder is largely the same as the journal; however, letters "sent" to the player are not necessarily related to the events that trigger them. Rather, they act as hints directing the player to undiscovered ghosts.

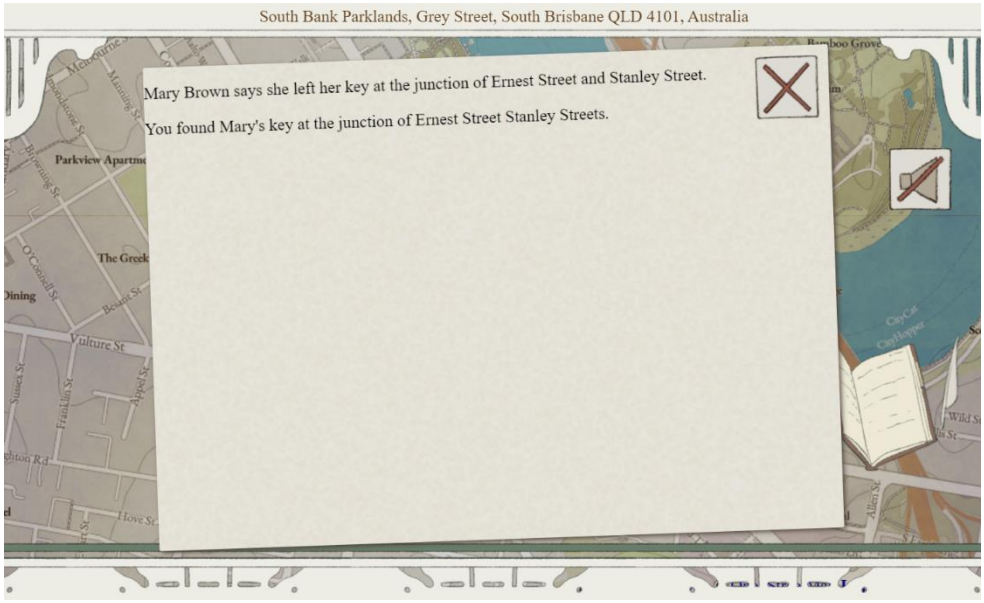


Figure 21. A demonstration of the functioning journal.

For each of these three collections, a single function handles the addition of items to them: `appendToJournal()` for the journal, `addToInventory()` for the inventory, and `sendLetter()` for the letter folder. Each of these would take at least the name of the item as a parameter, and add a new item to the `journal`, `inventory` and `letters` objects respectively. Additionally, because it would be possible to remove items from the player's inventory, a second object, `returnedInventory`, was created to track objects that had been "taken back" from the player. Also, all three collections would be graphically displayed in separate panels in the interface, and functions were defined to both refresh the contents of the panels as well as toggle their visibility: `refreshJournal()` and

`toggleJournal()`, `refreshInventory()` and `toggleInventory()`, and `refreshLetters()` and `toggleLetters()`.

Like the control switches described in Section 7.5.2. The basic framework, journal and inventory updates were then attached to dialogue lines in the `stories.json` file (fig. 22). On accessing a certain line of dialogue, a function checks if the `journal` property is defined, and if so, adds the entry to the journal using the `appendToJournal()` function. At any given point, the function accessing the dialogue lines would have access to the name of the ghost being spoken to, and as such, it was also possible to group journal entries under the respective ghosts' names in the `journal` object for organisational purposes.

```
"dialogue": [
    {
        "text": "My key! My key! Oh dear me, where is my key?"
    },

    {
        "text": "I think I left it at the junction of Ernest Street
            and Stanley Street.",
        "oncomplete": {
            "metMaryBrown": true
        },
        "journal": "Mary Brown says she left her key at the junction
            of Ernest Street and Stanley Street."
    }
]
```

Figure 22. The journal property (circled in blue) defines the text to be added to the journal.

As seen in figure 23, a bug was encountered where text would reappear in the journal every time the player repeated the part of a conversation that triggered that journal entry. While this situation was rare, a failsafe was added where each journal entry was instead assigned a unique identifying number based on the index of the conversation it was found on, and on access, it was added to an array with indices addressed nonlinearly. This would result in many empty items, as not every conversation branch would have a journal entry attached (fig. 24); null items would, as such, have to be explicitly ignored.

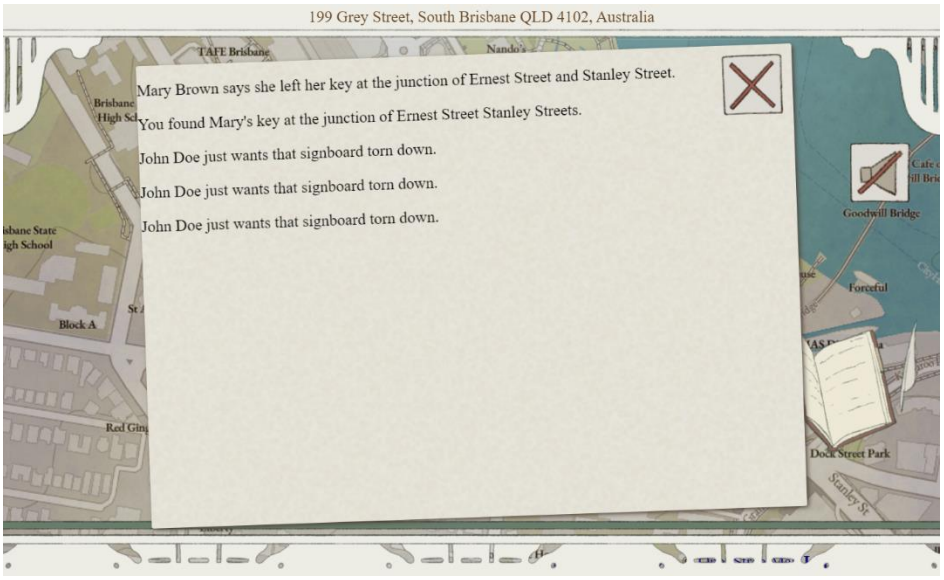


Figure 23. A bug in which text is repeatedly added to the journal.

```
▼Pedestrian: Array(12)
    0: null
    1: null
    2: null
    3: null
    4: null
    5: "Martin says the key may be at t…
    6: "The ghost at the junction is na…
    7: null
    8: "I can reach Her Majesty's Theat…
    9: null
    10: null
    11: "Martin wants me to find his fa…
    length: 12
```

Figure 24. Numerous null values are seen due to the manner in which entries are added to the journal.

The inventory and letter systems were similar, but simpler, in functionality. For the inventory, instead of text, an object containing all an item's associated information, such as its name and a link to its sprite image (fig. 25), would be passed and stored in the `inventory` object. These items are then displayed in the inventory panel through `refreshInventory()` and `toggleInventory()` (fig. 26).

```
▼Martin's key:
    index: 4
    name: "Martin's key"
    src: "assets/keypin.png"
    unread: false
```

Figure 25. An object representing an inventory item, with image source and other associated information stored as properties.

Figure 26. The initial visual appearance of the inventory.

7.5.6. Dialogue system

The dialogue system, a major feature of the gameplay, is inspired by the dialogue systems of Japanese visual novels such as the *Ace Attorney* series published by Capcom (fig. 27). In the basic version of the engine described in Section 7.5.2., the dialogue box would automatically display the ghost's dialogue "scenes" one after another until all possibilities were exhausted, in a linear order, and with no input from the player. At this point, it was necessary to create a way to display all possible dialogue options and allow the reader to select from them. Each branch would in turn trigger different sets of switches, thereby unlocking different dialogue paths. This concept, derived from the visual novel genre, would be the structural basis for *The Spectral Carta*'s conversation system. To that end, a dialogue option menu was added to the

Figure 27. A dialogue panel in Ace Attorney. Courtesy of Wikimedia Commons, https://en.wikipedia.org/wiki/Phoenix_Wright:_Ace_Attorney#/media/File:Phoenix_Wright_Ace_Attorney_cross-examination.png

interface. The `stories` object was also updated with the addition of an `optionLabel` property, a text label associated with each dialogue scene. The text would be formatted as a conversational prompt, such as “What's the matter?”, and the dialogue scene would follow naturally as a response to it (fig. 28 and 29).

```
{
    "required": [
        "Mary Brown:!met"
    ],
    "requiredItemState": [
        "!Mary's key"
    ],
    "optionLabel": "What's the matter?",
    "dialogue": [
        {
            "text": "My key! My key! Oh dear me, where is my key?"
        },

        {
            "text": "I think I left it at the junction of Ernest Street
                and Stanley Street.",
            "oncomplete": [
                "met"
            ],
            "journal": "Mary Brown says she left her key at the junction
                of Ernest Street and Stanley Street."
        }
    ]
},
```

Figure 28. The optionLabel property (circled in blue) sets the text content of the label that will be displayed in the list of dialogue options.

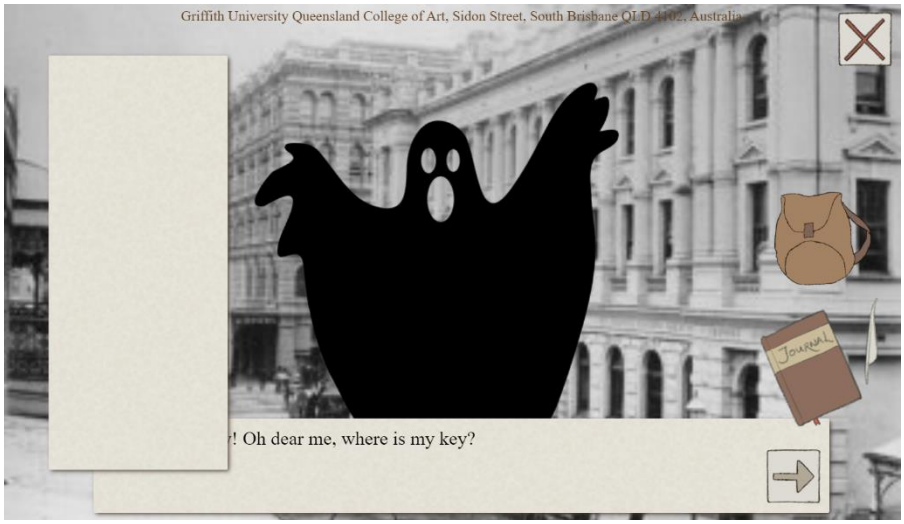


Figure 29. The ghost's response to the player's prompts.

These option labels would be the text populating the option panel, which appears every time the reader reaches a branch in the conversation (fig. 30). Each label corresponds with a dialogue scene; by clicking one of them, the player can select that conversation prompt, causing the corresponding dialogue scene to be

triggered. Together, this back and forth of selections and responses simulates two-way conversation.

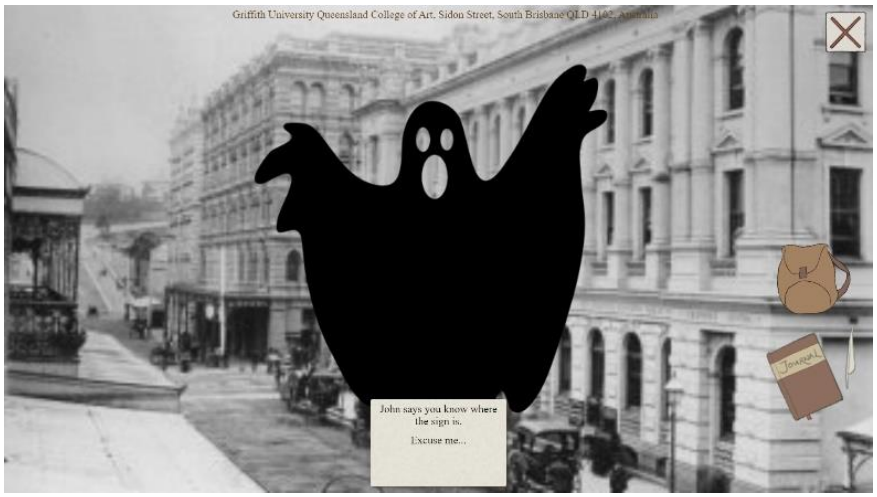


Figure 30. The dialogue option panel, where the player can select replies to the ghost, is shown at the bottom of the interface.

Later, a new type of dialogue tag that I refer to as *overrides* was added. Previously, all dialogue options whose conditions are met would appear in the option list each time it was the "player's turn" in a conversation. However, when the `override` property of a given dialogue scene is set, such as with `haveYouFoundKey` in figure 31, these options do not appear by default. Once the associated override tag is triggered by a dialogue line (in figure 31, the trigger is the line "Have you found my key yet?"), *only* options with the appropriate tag will appear. This is useful for situations where only one reply, or a limited set of replies, makes sense, such as when the ghost asks the player a question, and displaying the full list of possible options could interrupt the flow of the conversation.

Figure 31. Setting the override property on a specific dialogue line (marked in blue) will trigger an override. When that override is triggered, only conversations marked with the same override label (marked in red) will be shown.

7.5.7. Interactions between dialogue and collections

Outside of switches and conversation flow, what items the player has in their inventory can also influence the availability of dialogue options. For example, if the player is holding Mary Brown's key, the dialogue option where the player mentions the key to her becomes available. Additionally, the journal, inventory and letter collections could be manipulated on individual dialogue lines. For these, the `journal`, `removeOnComplete` or `sendLetterOnComplete` properties were added. Each time a dialogue line with one of these properties set is accessed by the player, the corresponding collection is updated. For instance, to tag a dialogue line with the journal entry "You returned Mary's key to her" as seen in figure 32, the `journal` property would be set to contain that text, and then the function that triggers dialogue lines would call `appendToJournal()` on the given string, adding the text to the journal. Likewise, the `removeOnComplete` property defines which items should be taken from the player's inventory once accessing that line in the dialogue (fig. 32), and `sendLetterOnComplete` defines a letter to be sent to the letter folder.

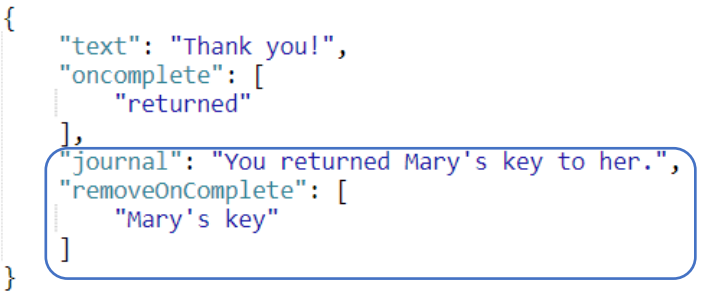


Figure 32. The journal and removeOnComplete property (circled in blue) indicate what journal entries should be added and what items should be removed from the inventory respectively, when the line of dialogue is accessed.

7.5.8. Dialogue labels

On writing the script for the second character, the shopkeeper, it became clear that dialogue alone could not convey the entire story, and some actions would have to be narrated in second person. For that reason, speaker labels (such as "Shopkeeper:") for individual dialogue lines were added, as a means of indicating that a line was spoken, as opposed to narrated, wherein the line would have no speaker label. A few different formats for dialogue labels were tested, as described in table 4.

Table 4. Possible formats for dialogue labels.

• **Apparition:** (refer to the ghost as a ghost) • **Old lady:** (refer to ghost by visual descriptors) • **?:** (question mark until you find out the ghost's name)

Eventually it was decided that an altered form of the second format—where the label describes the ghost through their occupation or role—would flow best with the rest of the game's writing, which already has ghosts refer to each other based on these descriptors.

The toggling of dialogue labels would be controlled by the `noLabel` setting (fig. 33), with `true` indicating that it would not have a label, and `false` or `undefined` (that is, not defining it at all) indicating that it would have a label, the default behaviour.

This setting would be checked every time a dialogue line is accessed, before it is rendered onscreen. Dialogue lines with and without labels are seen in figure 34.

```
"dialogue": [
    {
        "noLabel": true,
        "text": "She seems perplexed by your question."
    }
]
```

Figure 33. The noLabel setting indicates if a dialogue line will have a dialogue label.

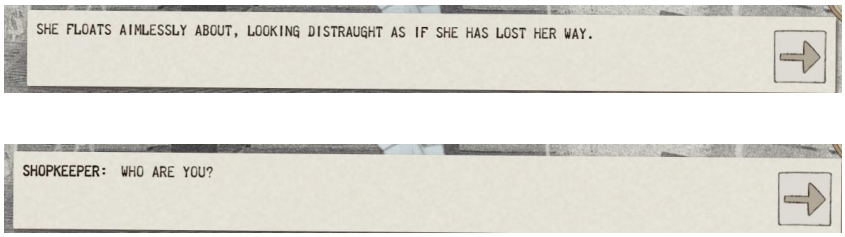


Figure 34. Dialogue lines with and without dialogue labels.

7.5.9. Conditional options and journal entries

To add a subtle realism to the game, a functionality was added where dialogue options and journal text change depending on what choices the player has selected before. If the player has found out that the pedestrian ghost's name is Martin, journal entries would refer to him as "Martin" rather than "the pedestrian ghost." Likewise, dialogue option labels might change based on which conversation branches the player has accessed, such as with "he" being replaced by "your husband" once the player has found out that the man being referenced is the ghost's husband. Some syntax for defining alternate labels and alternate journal entries was thus added, shown in figure 35.

```
"required": ["theMan", "!storyTold"],
"optionLabel": "What did he do?",
"altLabel": [
    {
        "required": ["husband"],
        "label": "What did you husband do?"
    }
],
```

Figure 35. Conditional alternate labels (“What did your husband do?”) display instead of the default labels (“What did he do?”) if the required conditions are met.

```
{
    "text": "But the letter never came.",
    "oncomplete": [
        "storyTold"
    ],
    "journal": [
        {
            "required": ["husband"],
            "text": "The poor bartender's wife was a week from
                fleeing him when she was murdered."
        },
        {
            "text": "The poor lady was murdered with a glass
                bottle to the head."
        }
    ]
}
```

Figure 36. Similar to the alternate labels, alternate journal entries can be defined. These are added to the journal conditionally, depending on if the conditions are met.

7.5.10. Completing quests, releasing ghosts

After the player completes the ghosts’ quests, it becomes necessary to show that they have reached a win state with that particular ghost. A setting, `releaseGhostOnComplete`, is set to `true` on a dialogue line to mark that a ghost’s quest has been completed on accessing that line. This would typically be set on the line where a ghost bids the player their final goodbye, although this varies depending on the ghost. At the time when the dialogue is accessed, this causes the ghost’s sprite to fade away. At the same time, the ghost is assigned the `goodbye` switch, such that the sprite and any unselected responses are no longer displayed when the player attempts to click the ghost.

7.5.11. Dynamic dates

Inside the game, many ghosts ask what year it is, or how many years ago certain events happened. The shopper ghost, for example, died in 1962; on finding out that it is the Year 2020 (the year of writing), declares that it has been fifty-eight years (fig. 37). Both the year and the year difference would change as time moves forward,

and updating the game yearly to reflect the current date would be time-consuming and tedious. As such, a system was added to dynamically calculate and display the year and year differences based on the current date.

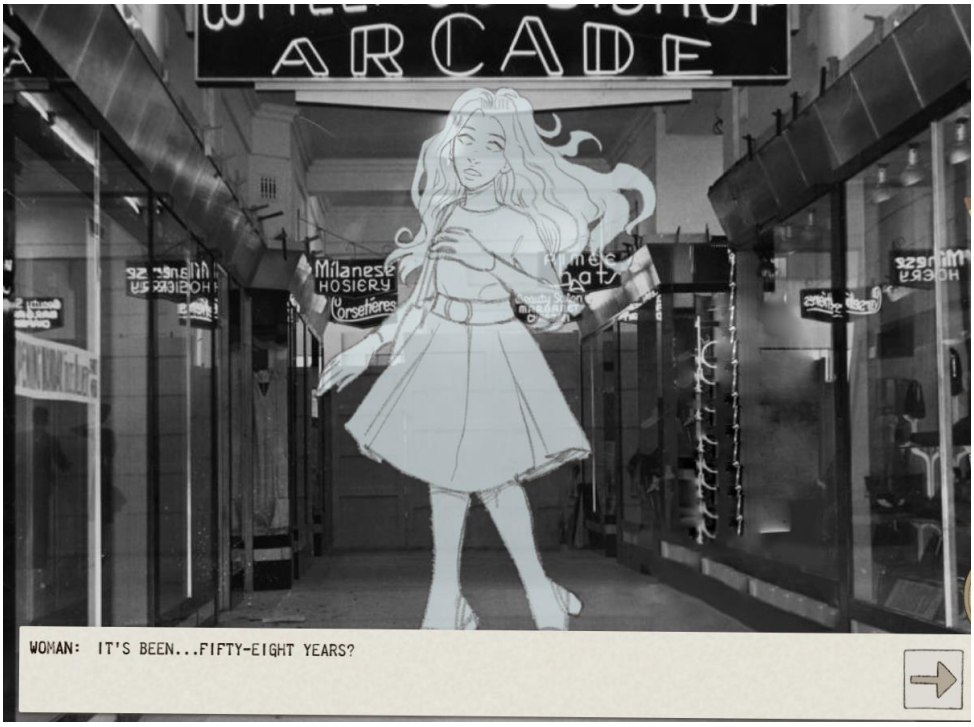


Figure 37. The ghost declares that it has been fifty-eight years since 1962, as of 2020.

The function that processes the text locates placeholder tags enclosed in curly brackets, such as `{CurrentYear}` and `{YearDifference1962}`, and replaces it with the appropriate text. First, it would subtract the given year from the current year (in the current example, 2020) and return the numerical value, as seen in figures 38 and 39.

```
{
    "override": "plague",
    "optionLabel": "That sounds like it was a long time ago, {YearDifference1920approx} years ago.",
    "dialogue": [
        {
            "text": "{YearDifference1920approx}!?"
        },
        {
            "text": "Dear God, has it been so long?",
            "clearOverride": true
        }
    ]
},
```

Figure 38. Year difference tags.

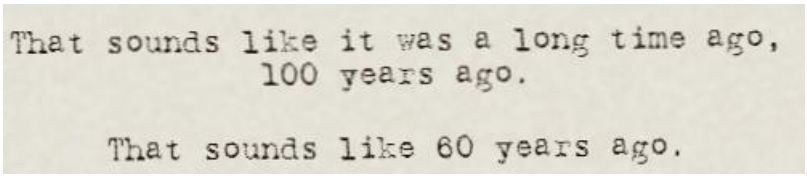


Figure 39. Year difference tags replaced with numerals in the processed text.

To make the numbers flow more naturally with the text, the Number To Words JavaScript library was used to convert numbers to text. The outcome is shown in figure 40.

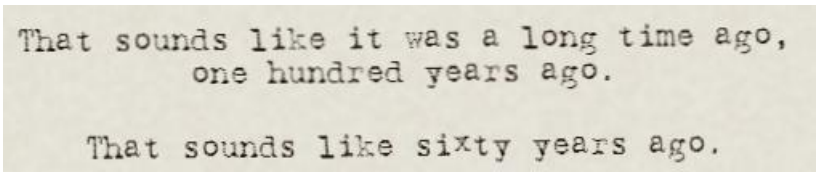


Figure 40. The Number To Words library converts the numbers to their spelled out forms.

Initially, the substitutions for the YearDifference type tags were hard-coded for each individual year: that is, the function explicitly replaced {YearDifference1962} by calculating the current year minus 1962, and {YearDifference1942} by doing the same with 1942. The code was found to be inelegant and inefficient (fig. 41).

```
function processText(input) {
    console.log(input);
    if(input.search(/\{.*\}/g) != -1) {
        let mydate = new Date();
        let output;

        let thisYear = mydate.getFullYear().toString();

        let yD1962 = (mydate.getFullYear()-1962).toString();
        let yD1962formatted = numberToWords.toWords(yD1962);
        let yD1962approx = numberToWords.toWords(10*Math.round(yD1962/10));

        let yD1945 = (mydate.getFullYear()-1945).toString();
        let yD1945formatted = numberToWords.toWords(yD1945);
        let yD1945approx = numberToWords.toWords(10*Math.round(yD1962/10));

        let yD1920 = (mydate.getFullYear()-1920).toString();
        let yD1920formatted = numberToWords.toWords(yD1920);
        let yD1920approx = numberToWords.toWords(10*Math.round(yD1920/10));

        output = input.replace(/\{CurrentYear\}/g, thisYear);
        output = output.replace(/\{YearDifference1962\}/g, yD1962formatted);
        output = output.replace(/\{YearDifference1945approx\}/g, yD1945approx);
        output = output.replace(/\{YearDifference1920approx\}/g, yD1920approx);
        return output;
    } else return input;
}
```

Figure 41. The repetitive text-processing code, in which the conversion for every year is hard-coded.

A new solution was soon arrived at using regular expressions with capture groups. This would find all instances of the given pattern—in this case `{YearDifference<number>}`, parse the given number as an integer, calculate the year difference, convert it to words, and replace the tag with the appropriate string (fig. 42). This code would be applicable across all tags following the above format, and greatly facilitated the use of `YearDifference` tags throughout the game.

```
function processText(input) {
    let output = input;

    const thisYear = mydate.getFullYear();

    output = output.replace(/\{([a-zA-Z]*)([0-9]*)(.*)\}/g, function(x, p1, p2, p3) {
        if(p1 == "CurrentYear") return thisYear.toString();
        else if(p1 == "YearDifference") {
            var year = parseInt(p2);
            var yearDiff = thisYear - year;
            if(p3 == "approx") return numberToWords.toWords(10*Math.round(yearDiff/10));
            else return numberToWords.toWords(yearDiff);
        }
    });
    return output;
}
```

Figure 42. The updated text-processing code, which locates and replaces year tags using regular expressions.

7.5.12. Compass

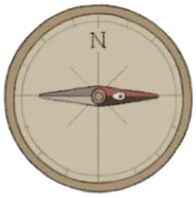


Figure 43. The compass interface element.

The idea of the compass was conceived after the project supervisor noted that the player may require some hints as to how to locate the ghost. As the intent of the game is to offer the player some freedom of exploration, and *not* to offer explicit instructions at large, the compass was arrived at as the compromise between supplying hints and not holding the player's hand.

The compass needle rotates to point at the nearest ghost, which the player may use to identify a direction in which to walk. This programmed behaviour occurs in two functions: `getClosestGhost()`, which identifies the nearest ghost, and `turnCompass()`, which calculates the angle between the player and a given

point—in this case the nearest ghost—and rotates the compass needle towards it. The former simply loops through the list of ghosts, calculating the distance between its coordinates and the player's coordinates with Pythagoras' Theorem, and identifying the closest one. The latter then involves using the `Math.atan2()` function (an inbuilt arctangent function, which applies positive and negative signs to the output) to calculate the angle between the player and the ghost, and rotating the needle accordingly. Visually, the compass needle was layered on top of the compass' background as a separate image, allowing it to be rotated programmatically.

7.5.13. Time of day

The programme simply obtains the time of day by creating a Date object and extracting the numerical hour. This is stored in a global variable, which can then be accessed by any code that manipulates elements based on the time of day.

Initially, this was used to conditionally apply CSS styling to the map based on time of day, as outlined in detail in Section 7.8.2. Day and night). This feature was initially developed to allow ghosts to appear at specific times of day (set within the `stories` object), but this idea was not pursued, as beta testers consistently missed ghosts that appear only at specific times of day.

7.5.14. Sound

As suggested by the project supervisor, sound was added as a way of providing feedback to the player on their movements. The chosen soundtrack, a scream effect track, was retrieved from freesound.org and converted into a more compact MP3 file. This file is set to play at start-up but remains muted by default until the player toggles it on, as the additional audio feedback may not be desired by all players. The volume of the track is manipulated as the player moves, such that the closer the player is to a ghost, the louder the screams are. The screams first become audible when the player enters the visibility radius, and gradually louden, reaching full

volume once the player enters trigger distance.

When the player is within range of more than one ghost, the distance to the closer one is taken. The closest ghost is determined, in a similar fashion to the compass-turning function, described in Section 7.5.12. Compass, by looping through the list of ghost pins and calculating the distance from the player to each one. Because the ghosts' opacities are already set based on distance from the player, and because volume, like opacity, is defined on a scale from 0 to 1, the volume of the scream track is simply set to the opacity of the closest ghost. When sound was added, a mute button was also included, allowing

7.5.15. The playtest version

As suggested, a "god mode" setting was made available to allow *The Spectral Carta* to be played without the player being physically in Brisbane, and also to expedite testing and debugging. In this mode, the player automatically starts at the junction of Elizabeth and George Streets, close to the tutorial ghost, and can jump to various locations by clicking the map. Pins are faintly visible at all times (fig. 44), and WASD controls allow the player to "walk" up, down, left and right. A "playtest" setting was also added, which only includes the altered starting location and WASD navigation. These modes are accessed by appending the queries `?godmode` and `?playtest` respectively to the game's URL.

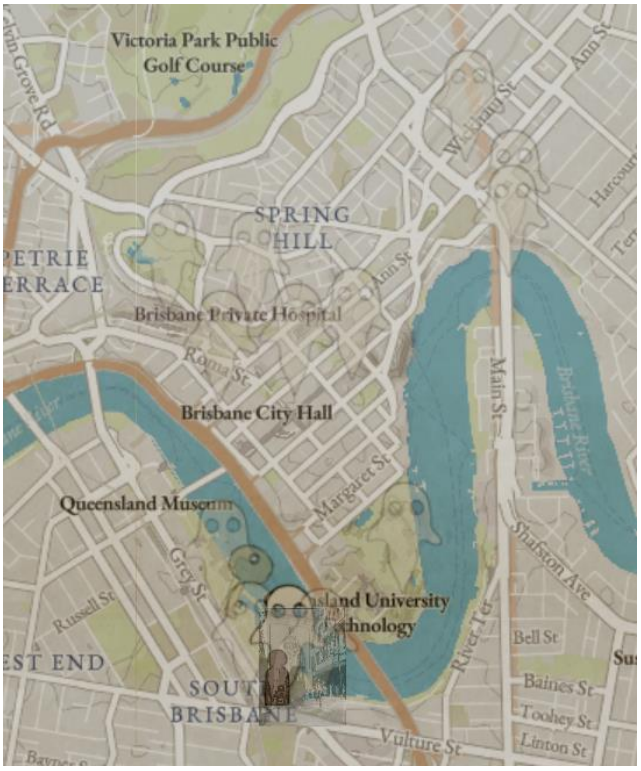


Figure 44. The playtest version, in which ghost and item pins are always visible at a low opacity.

7.5.16. Saving the game

Due to the nature of the mobile platform, where the player may switch applications frequently, the webpage is often refreshed automatically by the browser. In earlier versions of the game, progress was stored across various objects in the browser window: `switches`, `inventory`, `returnedInventory`, `letters`, and `journal`. Put together, the player's progress can be tracked from all these objects. However, that data gets lost when the page is refreshed, and all the objects start again from their blank states.

There were two apparent solutions to this: saving the data in the browser's local storage, and saving the data externally as a file. The browser provides a `localStorage` object that allows the webpage to save and retrieve data between browsing sessions. Data is stored as a string under a key in the `localStorage` object, and can be both read and written by referencing it as `localStorage[key]`. In both cases, the data had to be formatted as a string, so it

was necessary to stringify the player's progress data into a format such as JSON. To facilitate this, all these progress data objects were aggregated into one: the playerData object. Each of the abovementioned objects would be a property of this new object (fig. 45). To convert it into a JSON-encoded string, one would simply have to call `JSON.stringify(playerData)` and the output could either be saved in the local storage or as a file in the device's storage.

```
var playerData = {};
playerData.switches = {};
playerData.inventory = {};
playerData.returnedInventory = {};
playerData.journal = {};
playerData.journalUnread = 0;
playerData.letters = {};
```

Figure 45. All progress-tracking objects have been transferred to the playerData object.

Saving the game in the local storage is relatively simple, involving adding new properties to the `localStorage` object. In contrast, saving it as a file requires the use of some functions which I had, at the point when the file save functionality was developed, never used before. The `saveJSON()` function is derived from some code found on Stack Overflow.[72] It creates a Blob containing the save data as plain text, and then downloads it either using the navigator API (if it is available in the browser) or simply by temporarily creating a hyperlink to the generated file, and simulating a click to download it.

Loading the file would then involve the use of the File Reader API, another feature which I was encountering for the first time. Updating the file input (fig. 46) triggers the `loadSaveFile()` function, which reads the contents of the files returned by the event as a string, and parses them as JSON. This code was adapted from code by Kayce Basques and Pete LePage, found on web.dev.[73]

---

[72] Kanchu, "A very minor improvement of the code by Awesomeness01 (no need for anchor tag) with addition as suggested by trueimage," June 14, 2015, https://stackoverflow.com/a/30832210.

[73] Kayce Basques and Pete Lepage, "Read files in JavaScript," web.dev, June 18, 2010, https://web.dev/read-files/.

Figure 46. The file save and load menu, with a file added to the file input dialogue.

7.5.17. The dynamic tutorial ghost

At a consultation, it was suggested that the player should be given immediate onscreen feedback to direct them on how to start the game. The idea of a tutorial ghost (namely Mary Brown) that was positioned dynamically based on the player's start location was then developed. At initialisation, Mary Brown was placed a short distance southwest from the player, so that she could be easily located. Her mission would be straightforward and easy to understand, involving the retrieval of her key; this mission would allow players to familiarise themselves with the basic mechanics of the game in the most intuitive, least didactic manner possible.

To direct the player to the first ghost, they would receive a letter mentioning her location. As the location is selected dynamically, the ghost's address had to be derived dynamically as well. This was achieved through reverse geocoding using OpenCage's API. On sending the API a request containing the coordinates, it returns an address in standard format. This address is then appended to the prompt letter fig. 47).

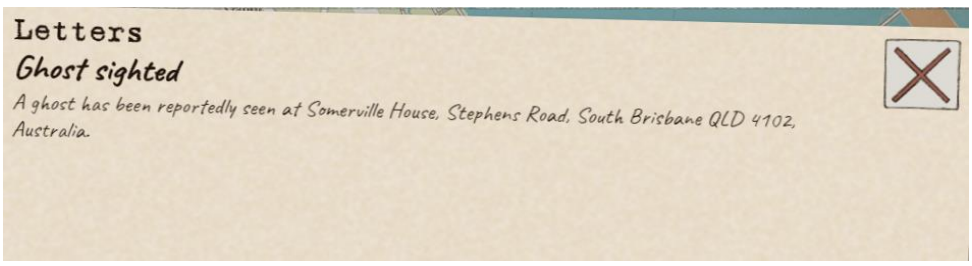


Figure 47. The geocoded address of the tutorial ghost.

However, dynamically positioning a ghost quickly created difficulties, particularly in writing her story in connection with a specific location. This ran directly counter to the central intent of *The Spectral Carta*, of relating stories to places. As such, the dynamic positioning concept was ultimately scrapped; the player would simply receive a letter at start-up informing them of the location of the tutorial ghost. The reverse geocoding function was left inside the code, in case the game was further developed in the future to incorporate such dynamically positioned ghosts.

7.6. Writing and illustrating the game

The writing for the game overlapped with research and the development of the engine. As such, the writing often evolved based on the changing capabilities and limitations of the programmatic elements. The script was not finalised until the game itself was approaching a finished state.

7.6.1. Nonlinear writing

From the outset, it was decided that the storytelling of the game would be distributed across twelve ghosts, each of whom could be approached in any order. As such, the story would be heavily nonlinear, and the writing had to account for the possibility that players might access the story beats in various orders. It was impossible to control that order, and thus the conventional three-act structure had to be eschewed.

Instead, the narrative would be conveyed through what I began to term as “ambient storytelling.” In my proposed structure, the story would be distributed across the connections between the characters, each of whom has a relationship with at least one other. Rather than a sequence of events organised in a clear three-act structure, the “story” would emerge through the common thematic threads explored by the characters’ tales from multiple angles: the death toll of injustice, missed chances and sentimental relationships between people, objects and places.

7.6.2. Characters and plots

The first step to laying out the project was to brainstorm and conceptualise a range of characters to incorporate in the game. In accordance with the project aims, each character would be intrinsically tied to a location selected in the previous phase. The range of characters to be included in the game would span a time range across Brisbane's two hundred-year history, in line with the histories of the chosen locations. Organically, the idea of a game where all the characters' lives were connected emerged, and I set the rule that each ghost would be referenced by at least one other. Beyond simply connecting the characters through their lives and backgrounds, I considered that the ghosts' quests themselves could link up: for instance, one ghost might request that you find an object and take it to a different ghost, or request information from a different ghost. Aside from facilitating the storytelling, this would give the story some much-needed texture to prevent it from becoming a laundry list of fetch quests.

To organise my thoughts and ideas, I drafted a story map, laying out each place of interest by geographical location and writing up a brief profile for each character. A few of these were inspired by Brisbane ghost stories found online: the bartender's wife at the Plough Inn, the convict in the Tower Mill, and the ghost of the Brisbane Arcade. Yet others were inspired by famous deaths: the victim of a 1942 shooting in the Lyceum Theatre, a labourer casualty during the building of the Story Bridge, and a suicide victim who died jumping off the Story Bridge. Creating the rest of the characters involved a combination of delving into the histories of places that particularly interest me, such as the General Post Office, and considering possible relatives for the existing characters.

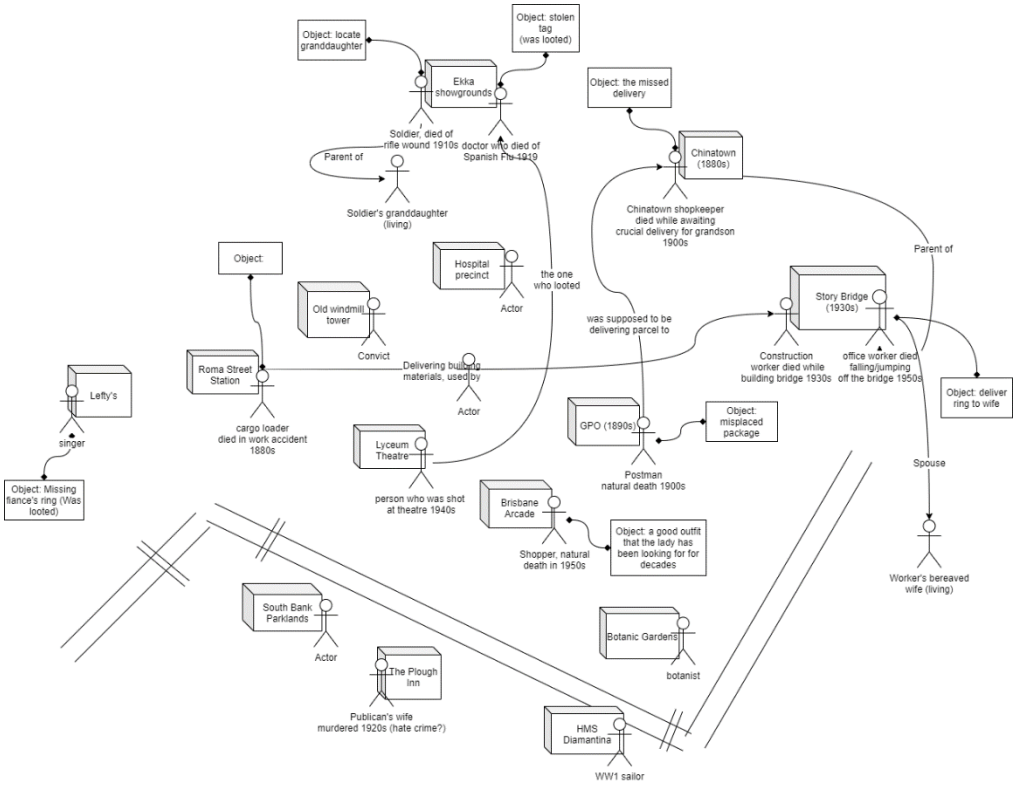


Figure 48. The initial story map for the project, showing the relationships and stories of various characters.

The characters were then further solidified in terms of personality, history and goals. To this end, full backstories were written for each one, outlining their cause of death, year of death, and the reason they might have failed to move on from the living world—typically a lingering regret or unfinished business. These outlines are included in Appendix B.

With the characters and plotlines of *The Spectral Carta,* I sought to write more than just simple fetch quests: each one concerns a subject with social relevance as well as personal significance: grief, intergenerational trauma, the enfranchisement and freedom of women, immigration, war, post-traumatic stress disorder, LGBT rights, mental illness, and suicide, among others. Many of these stories also involve reconnection and missed chances: the convict seeks his mother's memorial locket, which he gave up as collateral for a debt, and the shopkeeper is thrilled to hear news of the grandson she never knew she had. As with Judith, the shopper, many of the ghosts are victims of hatred. As these often concern sensitive topics, I paid extra attention to honouring the subjects and not playing their deaths for shock.

Another character, Wang Wei—the office worker—was a suicide victim. As I previously mentioned, I have an interest in the Story Bridge's bloodstained history and the measures being taken to prevent suicides off the Story Bridge. While this game is inevitably dark in tone, I did not wish for the game's explicit messaging to be bleak, as someone who is vulnerable to depictions of hopelessness myself. As such, I conceptualised Wei as someone who died certain that no one—not even his own wife—would care that he is gone, but who soon learns through the player's actions that this is not the case. Not only does his wife think of him daily, but also his long-dead grandmother is thrilled to know of his very his existence. On that note, Xujin—Wei's grandmother—is a character with some personal resonance. She migrated to Brisbane and started her life over from the ground up; her last lingering regret is that she passed on before she could see her family grow and thrive. The moment of her learning of Wei bears some bittersweet emotions, as someone who also has plans to move permanently to Brisbane, with no certainties about the future.

Due to the nature of the subjects addressed by *The Spectral Carta*, I placed emphasis on not writing their stories as if the player's actions alone would right every wrong in the characters' lives. As such, what resulted was a game that is bittersweet by nature, with many stories left unresolved or half-resolved. While many of these are subjects I have personal familiarity with, the writing undoubtedly wants for some more nuance and research in some areas, which I was unable to engage due to limitations in time and resources.

7.6.3. Conversation scripts

The character profiles written above paved the way to the writing of their dialogue scripts. These scripts capture the most important lines and events in each ghost's story and are generally sparse and to-the-point, laying the ground for the introduction of their quests.

However, the nature of the game presented challenges not found in more traditional forms of scriptwriting. As the engine was developed, the ghosts' stories

changed to better suit its capabilities and limitations. For instance, when the "point of interest" marker type was added, it became possible to write quests that involved engaging with locations rather than other ghosts or objects, and some stories were updated accordingly. Because the characters were frequently relocated to facilitate locative gameplay, it was not always possible to solidify the character's story until their location was finalised. Additionally, due to difficulties in gauging the pacing and tone of dialogue when written in linear format, linking lines, padding and other filler could only be written once these dialogues were coded into the game and tested *in situ*. As such, while the written scripts did outline key events and lines of dialogue, most of the in-game dialogue ultimately deviated from them. Additionally, because the characters' associated items and missions could only be decided once every single character's story had been solidified (as some of them involved communicating with other ghosts), many of the written scripts trailed off without an ending.

To illustrate how these scripts evolved, samples of the postman's scripts are shown in table 5. The first excerpt was written in the drafting document, and the second excerpt is how it appears in the final game. On coding the dialogue into the game, it became evident that it rushed from one topic to the next too quickly, as if trying to arrive at the gameplay goals as soon as possible. Also, the dialogues tended to end abruptly with no explanation or leading questions to prompt the continuation of the dialogue. In the final version, these portions were padded out, with the addition of such lines as "Which served me right, of course" and "would you be so kind?"

Table 5. Excerpts from the original and final scripts for the postman character.

Original script excerpt	Final script excerpt
Q: What is your unfinished business? ○ **A:** Ah, I have a hunch. ○ **A:** I don't remember much, but I remember that in the year of 1907, I lost a package. ○ **A:** And you see, it must have been important, for the intended recipients sued the Postmaster-General's Department. ○ **A:** The entire department, can you imagine? ○ **A:** When it was learned that I was the one who lost it, I lost my job.	**Me:** Is your unfinished business related to the letter? **Postman:** Yes, yes, I was getting to that… **Postman:** You see, it was a document officiating a divorce, and when it was found missing, the intended recipient's family filed a case against the Postmaster-General's Department. **Postman:** The entire department, can you imagine? **Postman:** When it was learned that I was the one who lost it, I was dismissed from my position with great prejudice. **Postman:** Which serves me right, of course…

○ **A:** And I died three years later, all fine and dandy, at the ripe old age of thirty-one. ○ **A:** But clearly, my error has done me in, even in death. And now I am doomed to forever hunt for the letter I will never find. ○ **A:** I cannot leave the confines of this building. ○ A: And you, you can! **Q:** I know where the letter may be. (found out more about letter) ○ **A:** Oh? You can't possibly have. **Q:** When did you die? ○ **A:** Goodness, an insolent one, aren't you? ○ **A:** I do not know when I died. ○ **A:** But in all this time, I have been able to dredge up some memories. The memories of my last days here. ○ **A:** There was news. [insert 1920s event here] ○ **Q:** I can't place the date of that anecdote, but it doesn't sound recent. ▪ **A:** Even I could have told you that. ○ **Q:** That was a long time ago, maybe more than a century ago. ▪ **A:** More than a century… then the envelope must be long gone. ▪ **A:** Or perhaps it is in some archivist's file now. ▪ **A:** How will I ever find it? ▪ **Q:** I'll do my best.	**Postman:** Well, I died three years later, at the ripe old age of thirty-one. **Postman:** But so grave was my error that, even in death, it seems I am doomed to forever hunt for the letter I will never find. **Postman:** I cannot leave the confines of this building. **Postman:** But you, you can! **Postman:** Would you be so kind? **Me:** I will find you your letter. **Postman:** Thank you, thank you! **Me:** Where might the letter be? **Postman:** Oh, I don't know, from that long ago, surely by now it must either be in the Public Library's collection…or lost. **Me:** When did you die? **Postman:** Goodness, can I remember? **Postman:** I do not know when I died. **Postman:** But in my decades drifting dead, I have been able to dredge up some memories. The memories of my last days here. **Postman:** The war…the war had ended. But a plague followed on its heels…we were living in terror. **Me:** It sounds like no more than a few years ago. **Postman:** That it may be, but I'm certain I have been dead for ten years at the very least **Me:** That sounds like it was a long time ago, a hundred years ago. **Postman:** A hundred!? **Postman:** Dear God, has it been so long? **Me:** That sounds like eighty years ago. **Postman:** That it could well be. Eighty years…

Another important concern addressed in the writing of the character scripts was that of distinguishing ghosts from each other by verbal quirks. As a more sombre game, I did not want the ghosts' dialogue to be cartoonishly quirky. Also, as someone who did not grow up in Australia, I did not feel that I had a strong grasp of colloquial Australian English. Instead, various other, more familiar, quirks were used to distinguish the characters. In the example of the postman, he uses certain phrases and interjections such as "Goodness", "Dear God," "would you be so kind," and "that it may be" that indicate a slightly more archaic pattern of speech. The builder instead tends to contract "you" to "ya" or "y'" and to omit the subjects of his sentences (as in "Fell to my death. Died on the riverbed."). Together, these differences would hopefully be able to distinguish the ghosts from each other. These continued to be workshopped for a few weeks with input from the supervisor, as well as a beta reader.

7.6.4. Character design

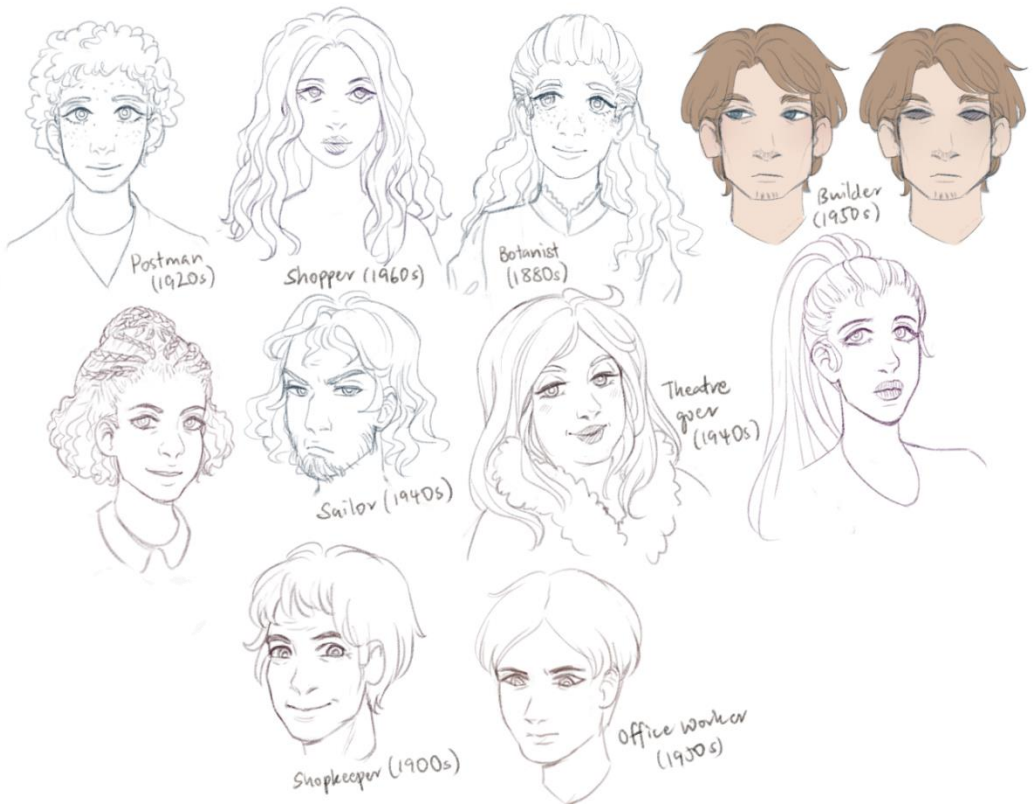


Figure 49. Sketches created during the brainstorm phase, labelled with the corresponding identities.

Designing the characters of *The Spectral Carta* was a loose and organic process. Because the characters did not need to be drawn repeatedly or animated, it was possible to add some detailing and texture to their hair and faces. Basic design principles were followed in the process: each ghost would have a distinct face shape and proportions, and period-accurate outfits. In the ideation phase, a series of face sketches was produced (fig. 49), in a process akin to visual brainstorming; I simply aimed to create faces expressing a range of personalities and styles, and none of them were tied to specific ghosts yet.

Then, with reference to the characters' stories and background, full-body designs were produced. Character expressions, posture and attire were designed with consideration for personality, age, and social background. If there was an obvious

match among the faces sketched in the brainstorming stage, this face was assigned to the character; ultimately, nine of the faces sketched in the brainstorming stage were used in this manner, as labelled in figure 49. Wherever this was not possible, the character was designed with greater reference to personality, occupation, and resemblance to relatives, wherever relevant. One example of this is the office worker, who is the grandson of the shopkeeper; he is designed to have similar face shape, features and hairstyle to her (fig. 50, (3) and (4)).

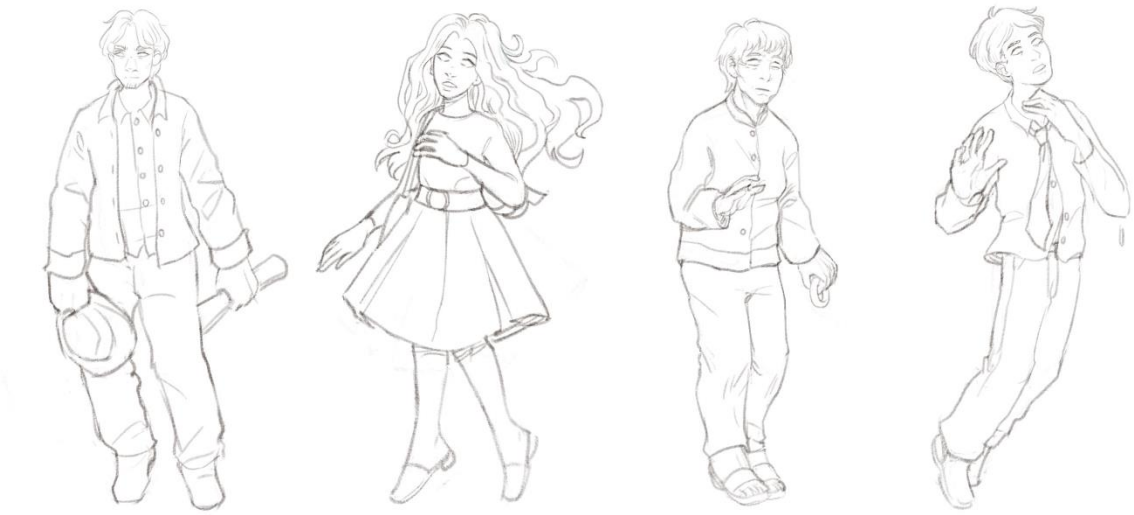


Figure 50. The sketch pass for the sprites of (1) builder, (2) shopper, (3) shopkeeper, and (4) office worker.

The sprites were drawn with a sketchy line quality, both to save time and to reference the fact that they are immaterial ghostly presences. Due to time constraints, only one static pose was drawn per ghost. Through poses or held objects, each ghost's sprite image alludes to either the manner in which the character died, or the nature of their regret. In the four examples seen in figure 50, the builder (1) died in his work attire; the shopper (2) died before a much-anticipated date and appears to be dressed for one; the shopkeeper (3) died of illness holding a jade bangle which was meant to bring good health, and the office worker (4) died drowning in the river.

Once all the characters were designed, they were revised with feedback from the project supervisor. It was mentioned that many of the characters appeared to be too similar in build, and their ages indistinguishable. Accordingly, some characters'

designs were adjusted; the builder, shown in figure 51, was drawn with a broader torso, his neck made larger, and his head smaller to emphasise his height and build. More lines were drawn on his face to better indicate his age of approximately 30 years. Likewise, the botanist was initially drawn with her hands clasped, but was revised (fig. 52), as I noticed her pose was too similar to the theatregoer's (fig. 53).

Figure 51. The builder's sprite design, before and after updates.

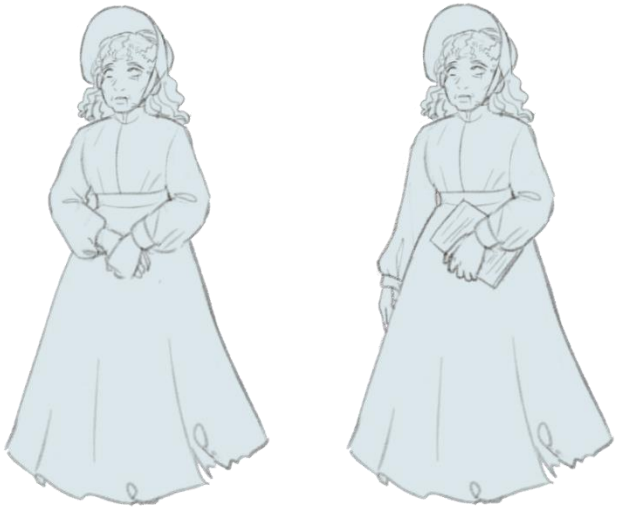


Figure 52. The botanist's sprite design, before and after updates.

Figure 53. The sprite art for the theatregoer's ghost.

Eventually, all fourteen ghosts were designed in full; a collection of all the sprites can be found in Appendix C.

7.7. Location and locative gameplay

The techniques of locative writing are outlined in various frameworks described in Section 3.1. The history and theory of locative games. Many—though not all—were consulted while placing and adjusting the placements of ghosts and objects on the map, particularly the writer's toolkit developed by Heather Packer et al.[74] Particularly, the recommendations of ways to use the physical terrain to shape the narrative experience were considered in a few places. The Convict is found at the top of a hill; it would be presumed that the player has walked up the hill to meet him, which emphasises his remote and frigid response to one as well as his disconnection from the rest of the stories in the game. To tie into this, he also observes that he "saw you climbing the hill."

[74] Packer et al., "Developing a Writer's Toolkit for Interactive Locative Storytelling"

Another of Packer et al.'s recommendations that guided the design of locative gameplay was to take into consideration the frustrations that may come with walking long distances or repeating certain routes. When the locations of the ghosts were first decided, it was based on their stories, before direct observation of locations and on-site testing of the game. After these were conducted, it became clear that locations had to be moved closer to each other overall, to prevent the player from having to walk excessively. In particular, certain ghosts direct the player to meet other ghosts, and their respective quests involve passing messages back and forth between them. Some also direct the player towards the location of an item. It was important to place these characters and pins close together.

One mission that required multiple ghost and item relocations was that of the postman and the bartender's wife. The postman first asks the player to find a letter in the Brisbane Museum; later it becomes clear that this letter is also the one being sought by the bartender's wife. The player then must take the letter to the bartender's wife, before reporting the outcomes of this interaction back to the postman. Initially, the bartender's wife was located at the Plough Inn, as per the ghost stories associated with the place. The letter was located at the Brisbane Museum, which is found in City Hall, and the postman was located at the General Post Office. After considering the distances that the player had to walk to complete these quests, it was obvious that all three markers were too far apart. As such, the bartender's wife was moved to the Fox Hotel, a hotel located along Melbourne Street with a similar history spanning farther back than the 1920s, and the letter was moved to the State Library of Queensland. Now, both markers would be much closer to each other and to the Victoria Bridge, which allowed the player to walk straight between them and the postman along the bridge and Queen Street.

Likewise, the ghost of Marie, previously an usherette at Her Majesty's Theatre (now the present-day Wintergarden), has a quest deeply tied to Wei, the office worker. One beta tester pointed out that the distance between Wei (located at the Story Bridge) and Marie was almost a twenty-minute walk, and suggested that the points of interest be moved around to facilitate walking. Wei's location could not be changed due to his story being intrinsically tied with the Story Bridge; however,

Marie was easily moved because her story is transposable, only involving her being fired from her job after she failed to lock up the office. As such, she was moved to the Customs House, which is significantly closer to the bridge, and another place of historical interest (fig. 54).

Figure 54. Marie relocated closer to the Story Bridge.

However, another issue now arose, in that Martin the Pedestrian's quest now required the player to walk south to find his key at the junction of Queen and George streets, before backtracking north to give it to Marie. As such, the key was repositioned to the road outside the General Post Office. This configuration is shown in figure 55. The player can receive the quest from Martin (marked in blue), retrieve the key, and bring it to Marie (marked in red) simply by continuing up Queen Street. There is the added benefit of the player potentially discovering the postman (opaque ghost) as they pass the GPO.

Figure 55. The key has been repositioned to be between Martin and Marie, to facilitate a more direct quest route.

The Waitress' ghost and associated items were also shifted to facilitate quick movement between key locations in her quest. Initially located at the junction of Ann Street and Wharf Street, where the Primitif Café used to stand, she was later moved to the junction of Queen Street and Creek Street, much closer to the bulk of the ghosts, especially the Shopper at Brisbane Arcade—who asks you to bring a dress to her. An item related to her quest, her brooch, was placed in a house near the meeting points of Creek and Wharf Streets, and her father, the Soldier, was moved from the HMAS Diamantina to Anzac Square, along Adelaide Street. In so doing, all the pins associated with the greater story involving all three characters were grouped together in a fairly contained area, minimising the amount of walking required.

Finally, during various rounds of on-site testing, I found that within certain locations, such as within buildings, my phone received a weak GPS signal. I anticipated that players indoors may have trouble having their GPS coordinates line up accurately with their actual location. The potential outcomes of this were made clear by the case study experimentation with *Death Works*: *Training Day* (detailed in

Section 6.4): the game could become unplayable, if the player was not able to enter the required radius to access a marker. This was the case with the Shopper, who was initially positioned inside Brisbane Arcade, and on-site tests proved that this would be an important issue to address, as the GPS signal almost completely vanished while within the building. She was subsequently moved to the northern entrance of the Arcade instead.

With all these changes—guided by on-site testing and beta testers' feedback—the game became more playable, with all places of interest much easier to access while walking.

7.8. User interface design

7.8.1. Drawing inspiration from history

User interface (UI) design work began during a summer break spent in Singapore, once the proof-of-concept was completed. As this is a game that focuses on history, it was easily decided that the map's visual style would draw upon old hand-drawn maps from the turn of the last century. Stylistic reference was drawn from old maps, such as James Warner's map (fig. 3), and techniques were drawn from past exercises in map-drawing, conducted for my undergraduate thesis project *Compass* (fig. 56). From past methods, I derived the use of a rough brush, paper textures and sepia tones to emulate the appearance of old paper and documents.

Figure 56. A map created for *Compass,* a previous project. Digital image by the author.

In September of 2019, visual mockups were created to demonstrate the aged, sepia "treasure map" palette that would form the basis of the UI design (fig. 57). Beyond just the map, this style would extend to all UI elements, as well as the characters. All assets were drawn in Paint Tool SAI with the same "pencil" brush, which is set to have a papery texture and roughness to emulate a real pencil. These techniques became part of the style guide (table 6), adhering to which the visual elements of *The Spectral Carta* would be designed.

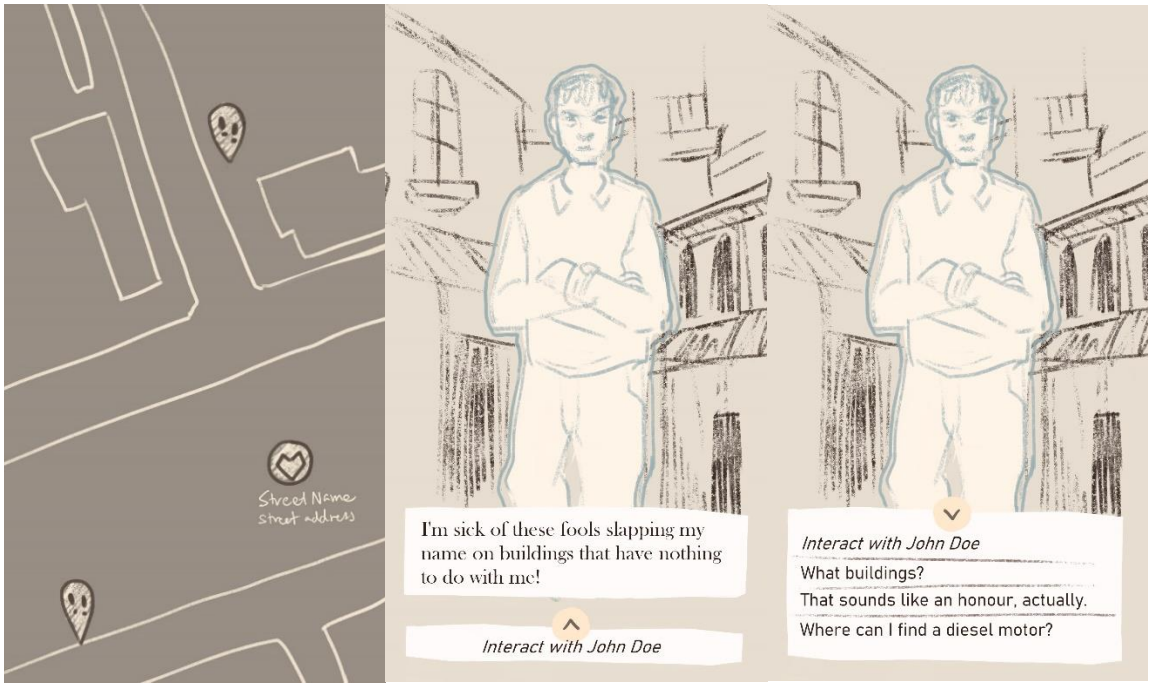


Figure 57. Visual mockups for *The Spectral Carta.*

Table 6. Style guide for *The Spectral Carta*.

Style guide:
- Muted brown palette.
- Images outlined in rough, sketchy lines.
- No neutral blacks and whites, shades of brown are used instead.
- Shade with hatching (rather than tones).
- Imitate the appearance of paper with colours and overlaid textures.

At a consultation, my project supervisor suggested the addition of framing elements such as corner decorations to give the interface. To test this concept in HTML, placeholder cornices were added in the top-right and top-left corners (fig. 58). This had the intended effect of easing the sharp corners of the screen and making it look more organic.

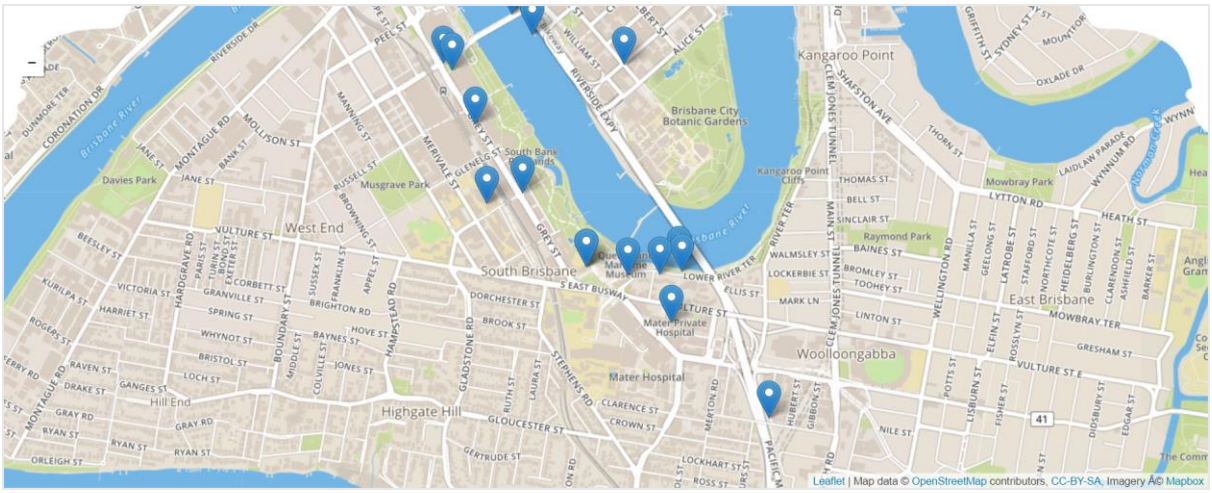


Figure 58. A mockup with framing cornice elements in the top left and right corners.

As outlined in the style guide, all UI elements would be hand-drawn. Taking inspiration from architectural elements from a photograph of a Queenslander house on Wikimedia Commons (fig. 59), new framing elements were drawn including a top bar, two cornices and a repeating railing pattern (fig. 60). These elements were created in parts for two reasons: first, the frame would have to adapt to different screen sizes without excessive scaling, and second, this would minimise their footprint on the webpage and leave as much of the map beneath it interactable as possible.

Figure 59. A Queenslander house. Photograph by brewbooks, "Queenslander," Flickr, accessed June 23, 2020, https://upload.wikimedia.org/wikipedia/commons/7/78/Queenslander_home%2C_Australia.jpg.

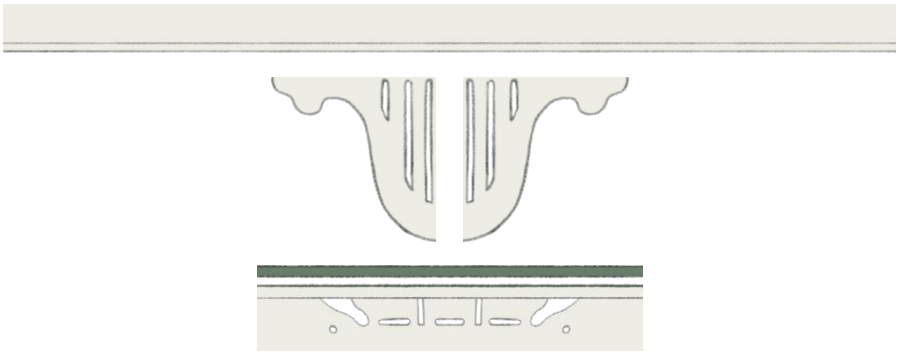


Figure 60. Interface framing elements were drawn with reference to Queensland architectural elements.

Where interface parts could not be drawn, they would have to be manipulated using CSS to match the style guide palette. One such feature was the map itself, whose frames were derived from the map provider Mapbox. As of October 2019, the Mapbox default colours were less than ideal, with vibrant tones that suit navigational apps better than treasure maps (fig. 61).

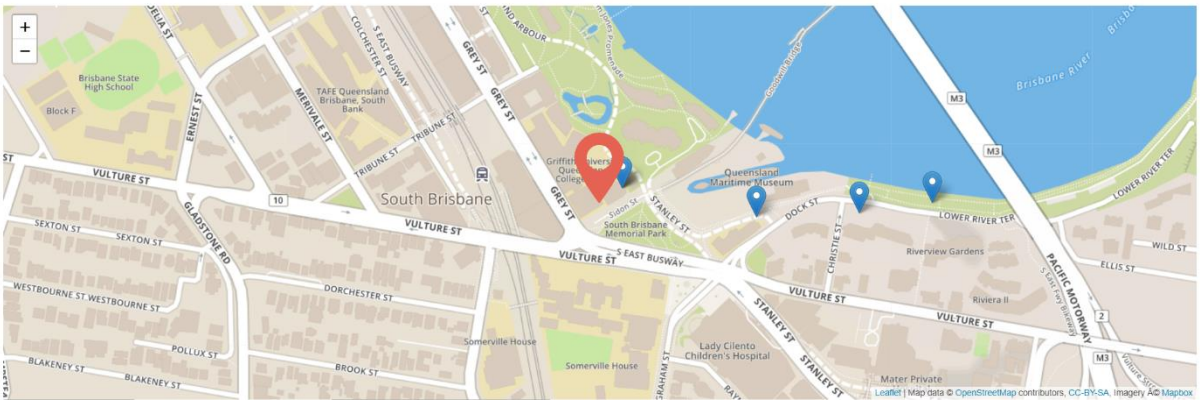


Figure 61. The map before the application of filters.

To achieve the faded, antique look described in the style guide, CSS filters were employed, with the `sepia()` and `brightness()` functions making the map appear lighter and browner. The paper texture could not be added on top of the map, as the map had to remain interactable. The workaround involved placing the texture on a layer below the map and making the map slightly transparent so that it showed through (fig. 62).

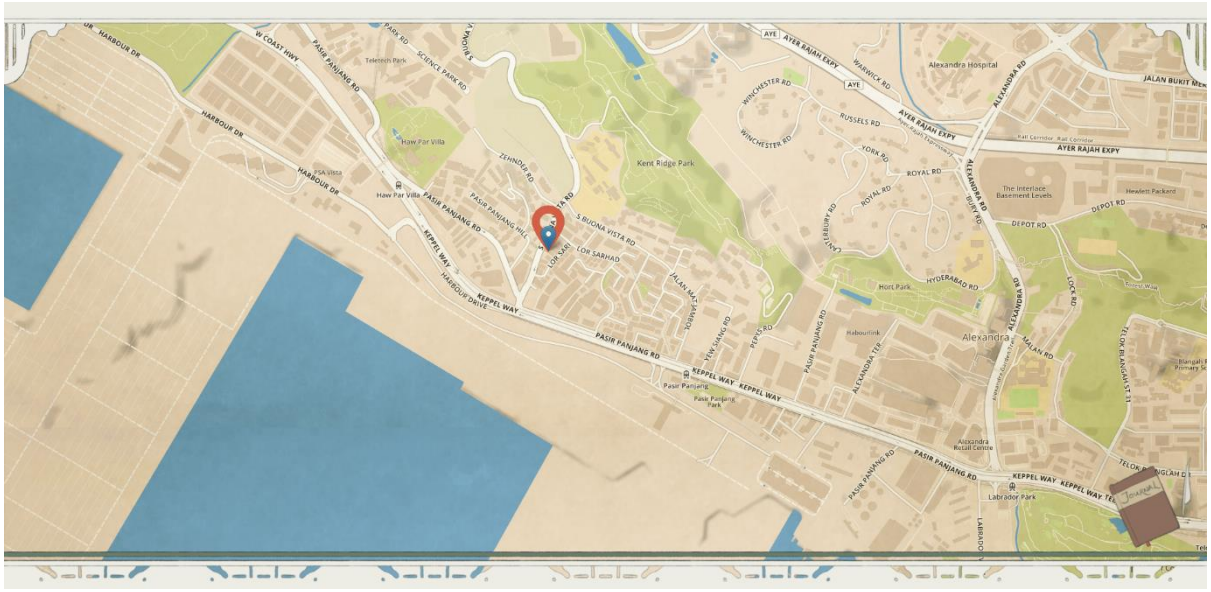


Figure 62. The updated map with filters and paper texture.

Once the framing elements were added, it was also possible to use the empty space formed by the top bar to house a status strip. A holdover from the proof-of-concept, this is a strip of text displaying the player's current location in the form of a text address through geocoding (fig. 63). This portion was ultimately removed as it was rendered unnecessary by updates to the engine.

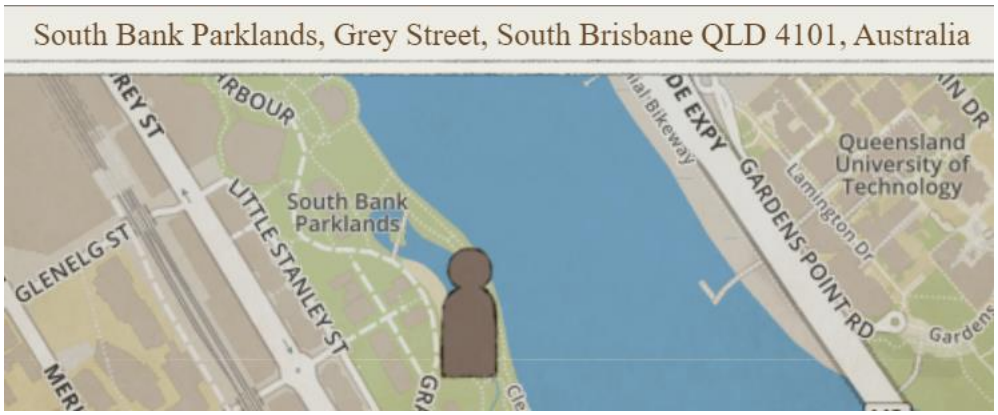


Figure 63. The geocoding status strip. It was later removed.

7.8.2. Day and night

It was decided that applying different styles based on time of day would add a subtle but interesting touch to the visual appearance of the map. As mentioned before, the `timeHours` variable would be updated every minute via the

`getHour()` function, with the current hour as an integer. Then, based on this variable, one of two CSS classes would be applied to the map element: `day` from 6am to 6pm, and `night` for the inverse (fig. 64).

```css
#mymap.day {
    filter: sepia(0.1) brightness(0.75) contrast(1.5);
}

#mymap.night {
    filter: grayscale(0.2) brightness(0.70) contrast(1.5);
}
```

Figure 64. Classes are applied to the map based on time of day.

The visual outcomes of the day and night filters are shown in figures 65 and 66 respectively. The former gives the map a bright, slightly golden tone, while the latter makes the map dim and more muted.

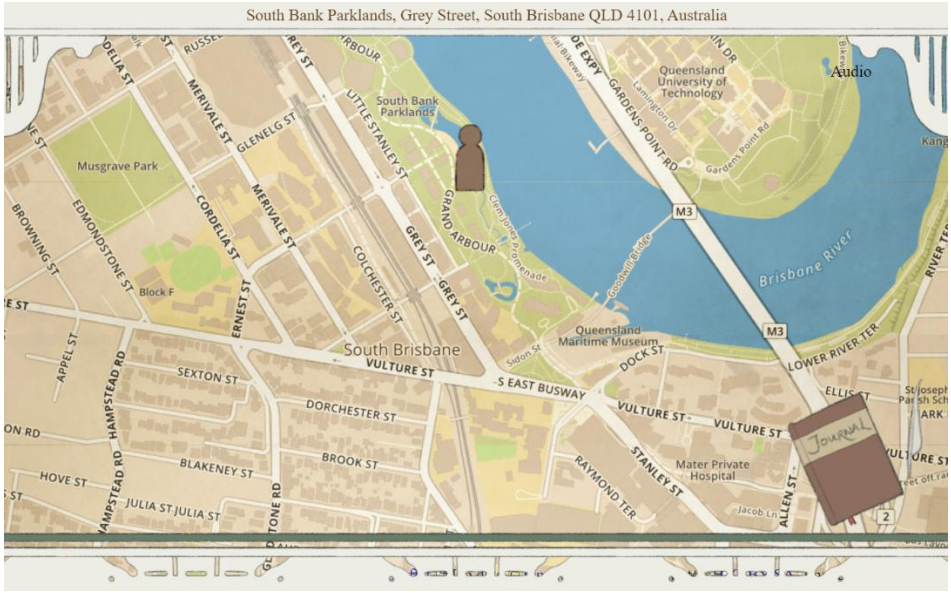


Figure 65. The map with day filter.

Figure 66. The map with night filter.

7.8.3. Mapbox visual updates and custom map theme

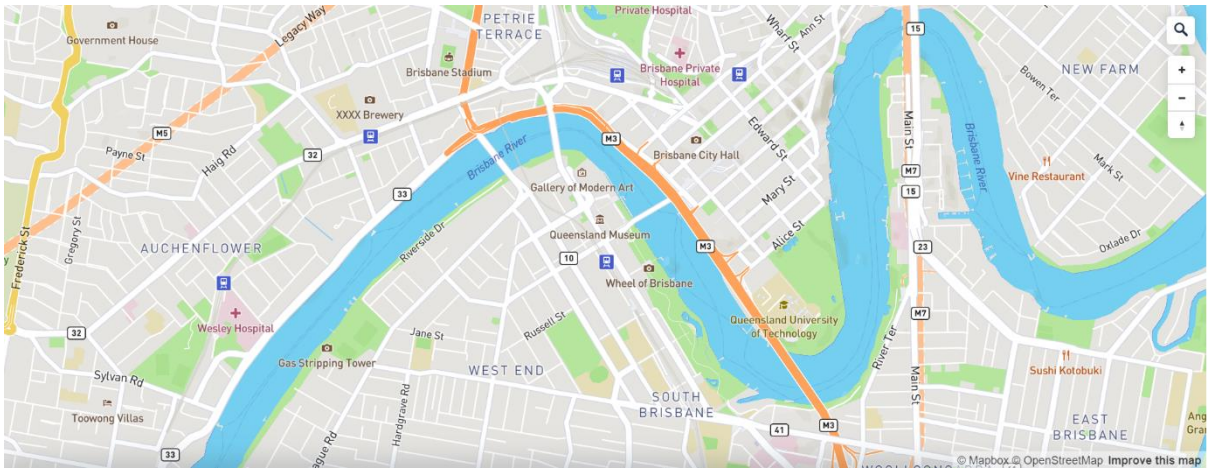


Figure 67. The updated palette of the Mapbox default map.

On 11 March, I discovered that Mapbox had overhauled its map tiles. Aesthetic changes meant that they matched the preferred appearance even less now. Upon delving into the Mapbox website, I discovered that custom map styles can be created and published for public use in the map editor (fig. 68). Once aware of this possibility, I went on to customise the palette and visibilities on the map such that they would map the aesthetics outlined by the style guide as much as possible,

particularly emphasising the outlines around roads, and shifting the colours to be more muted and brown. The outcome of these changes can be seen in figure 69.

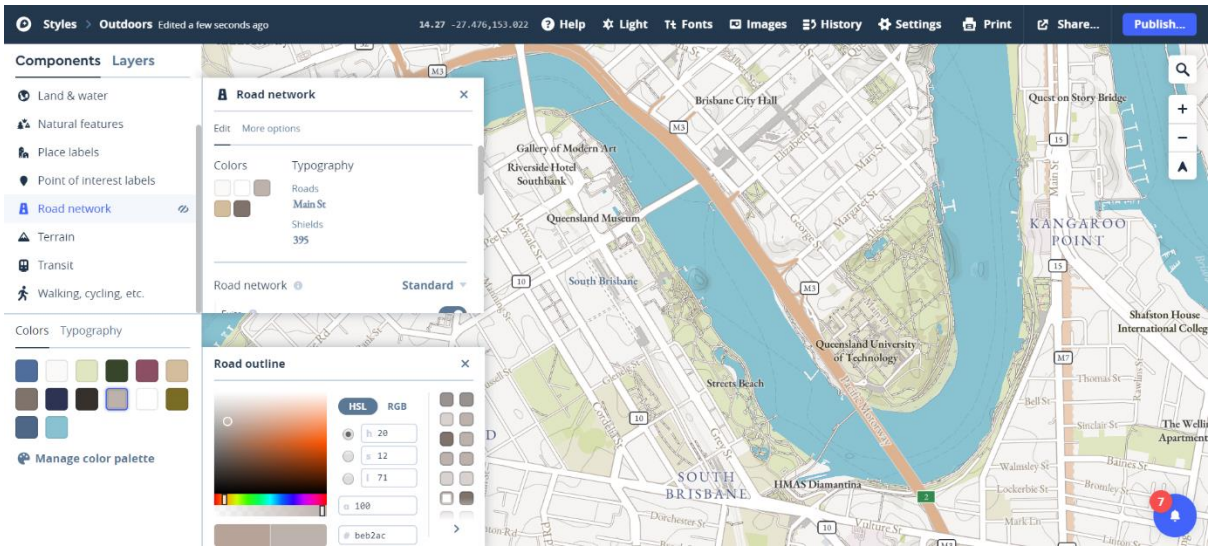


Figure 68. The Mapbox map theme editor, with a custom map theme.

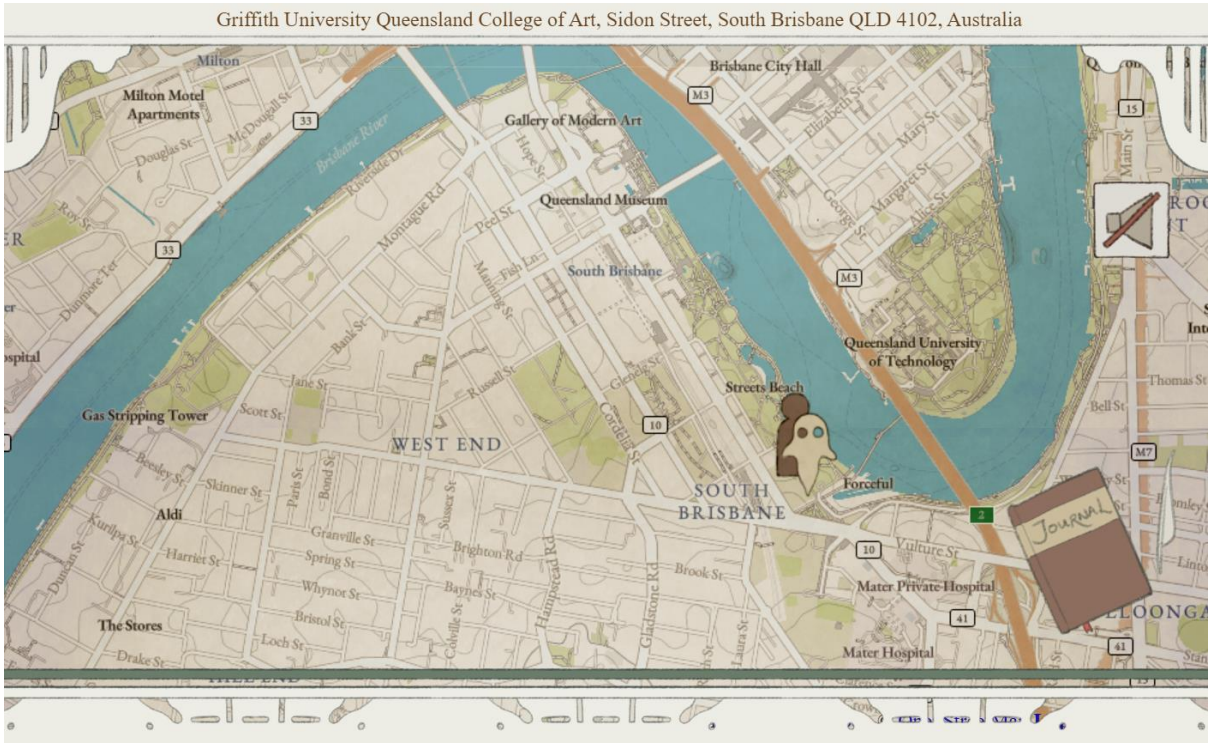


Figure 69. The updated map on *The Spectral Carta*, with filters applied.

7.8.4. Backgrounds

On interacting with a character, an overlay panel appears, displaying the character against a photographic background. This photograph shows the player's current location as it may have appeared at the time of the ghost's death, as a symbolic representation of how the ghost perceives the location. Initially, a placeholder image featuring Edward Street in 1889, downloaded from the State Library of Queensland's archives, was used. I found that the bright lighting did not suit the tone of the game. As an experiment, I inverted the colours of the photograph, and found that the resultant image had a far more spectral, ghostly atmosphere (fig. 70).

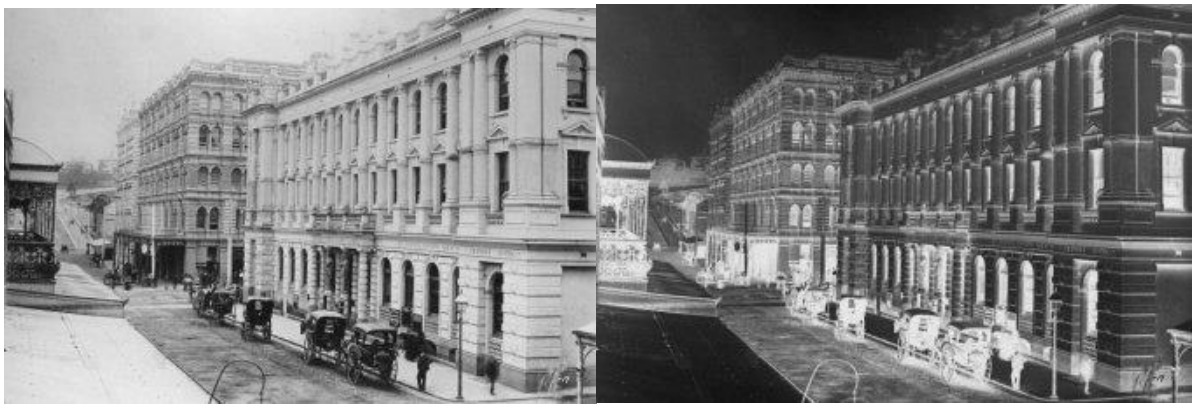


Figure 70. The photograph before (left) and after (right) colour inversion. Photograph courtesy of State Library of Queensland.

The search for photographs was conducted through both Wikimedia Commons, where most Brisbane-related materials were derived from the State Library of Queensland's collection, as well as the Queensland State Archives. Photographs were selected based on the likely era when the ghost was alive; for instance, while numerous photographs of the Story Bridge exist, the background photograph for the builder ghost was selected from 1938, when construction was in progress (fig. 71), whereas the office worker's Story Bridge photograph comes from 1956, when the bridge was fully operational (fig. 72). In some cases, the ghost's era was adjusted based on what photographs were available, such as the postman ghost's; while he was originally meant to be alive in the 1880s, I could find no images dating from that decade, and instead moved the time frame of his death to the 1910s. The above colour inversion transformation was then applied to every photograph whose colours did not suit the game's tone, particularly those shot in daylight.

Figure 71. The Story Bridge in 1938. Photograph courtesy of Queensland State Archives, http://www.archivessearch.qld.gov.au/Image/DigitalImageDetails.aspx?ImageId=16506.

Figure 72. The Story Bridge in 1956. Photograph courtesy of the Queensland State Archives, http://www.archivessearch.qld.gov.au/Search/ItemDetails.aspx?ItemId=1246127

In some cases, photographs had to be altered significantly to remove human figures (in order to preserve a tone of isolation), such as that of the Brisbane Arcade (fig. 73). In yet others, where a period-accurate photograph could not be found, a modern photograph was altered to resemble an older one, and better match with

the aesthetics of the rest. This was the case with the Chinatown photo; no photographs from the 1880s could be found, and a present-day photograph was instead altered to appear black-and-white (fig. 74). In one case—the Tower Mill—no images of the mill when it was operated survive, as noted on House Histories.[75] For this, a later photograph was used, which unfortunately does not include the windmill blades as it would have had in the time when it was operated by convicts. A full list of the original images and the edited versions is found in Appendix D.

Figure 73. A photograph of the Wallace Bishop Arcade in 1939, before and after editing. Photograph courtesy of State Library of Queensland, https://commons.wikimedia.org/wiki/File:StateLibQld_2_101820_Wallace_Bishop_Arcade,_Brisbane,_Queensland,_1939.jpg.

Figure 74. A photograph of Chinatown, edited by me to appear older. Photograph courtesy of Kgbo, https://commons.wikimedia.org/wiki/File:Chinatown_gate,_Brisbane.jpg.

[75] "Brisbane's Tower Mill," House Histories, n.d., https://www.househistories.org/the-tower-mill-of-spring-hill.

7.8.5. Character sprite colours and animations

Creation of the character sprites was conducted in conjunction with the character design portion, detailed in Section 7.6.4. After the designs had been sketched and finalised, two solid-colour variations were created for the test sprites, shown in figure 75. One variant has a slight blue tint while the other is tinted slightly brown, the "standard" white from the game's swatch. These were then composited against sample in-game backgrounds (fig. 76). Blue was selected, as it better contrasts the whites of the photographs, which were often tinted slightly yellow.

Figure 75. Two colour variants of the builder character sprite.

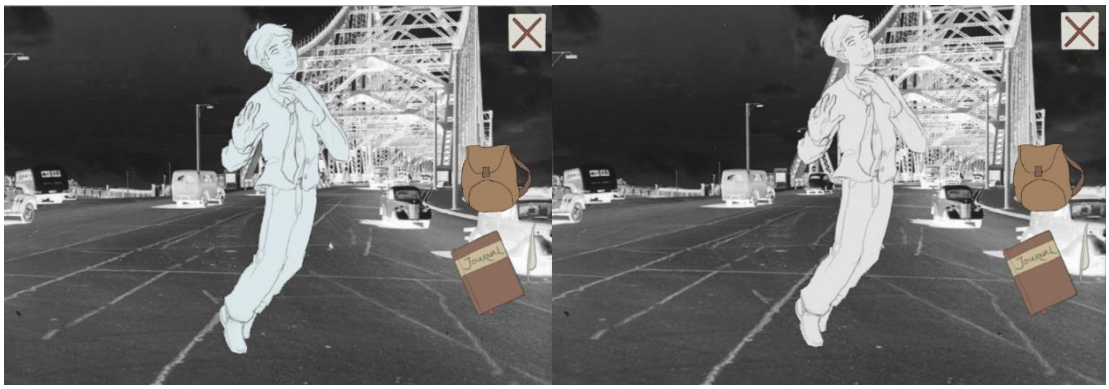


Figure 76. Two colour variants of the same sprite tested against a photograph background.

The sprites were then made slightly transparent in CSS. Using animation keyframes in CSS, the ghost's opacity and blur filter were animated, to make the ghost appear

to be fading in and out of visibility. This ghost would move in a six-point figure of eight (fig. 77). A beta tester pointed out that the ghost moved too mechanically, to a distracting degree.

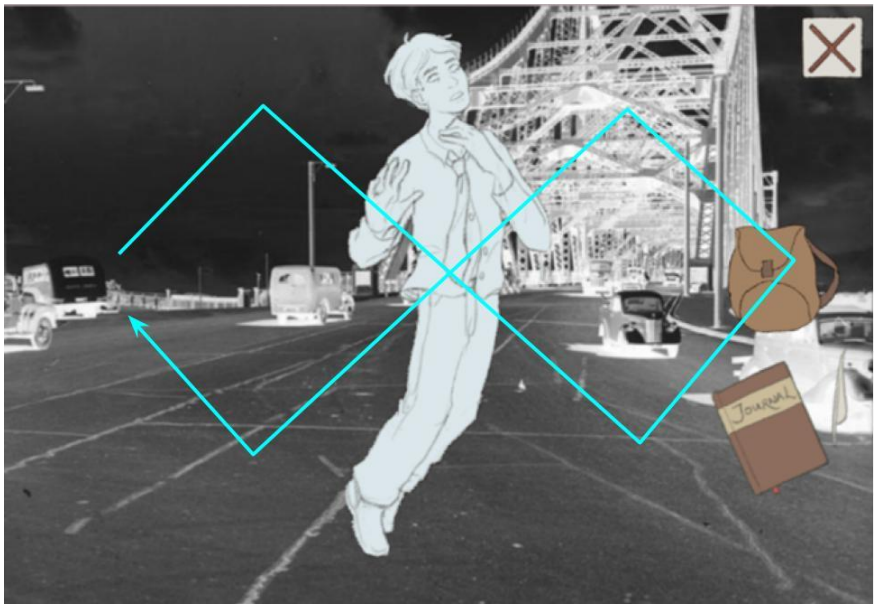


Figure 77. The initial animation path of the ghost sprites.

Following this feedback, the ghost's movement path was updated to have additional vertices (fig. 78), and the animation timing function was set to `ease-in-out` to make the movement more lifelike and less mechanical.

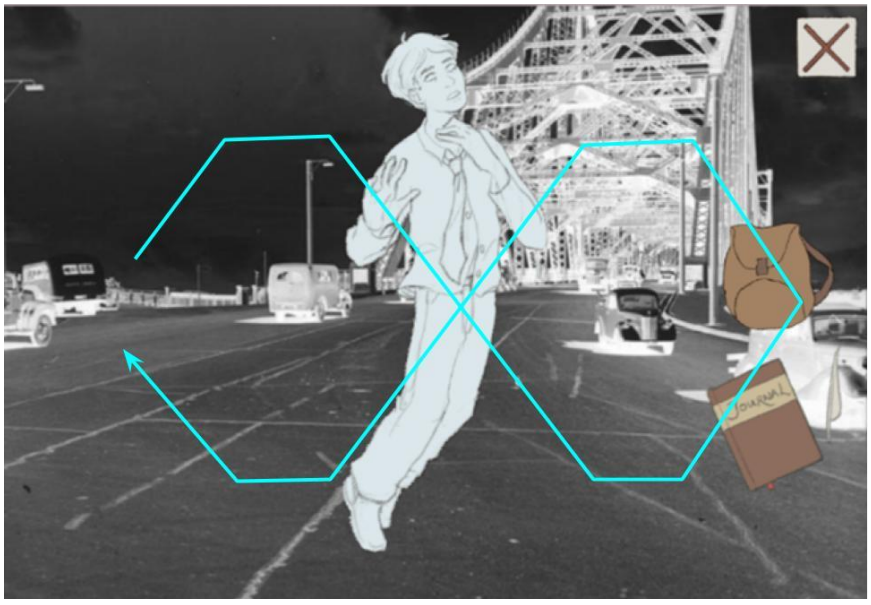


Figure 78. The modified animation path of the ghost sprites.

7.8.6. Panels

The journal, inventory and letter panels display the contents of these respective collections, and can be toggled between invisible and visible states. The journal panel displays journal entries, while the inventory panel displays a collection of objects that the player has collected, and the letter panel displays letters that the player has received.

Being overlaid on the interface, these windows had to adapt to different screen sizes in order to fit. As such, a static background composed of a single image was not ideal, as changing its dimensions would cause visible distortion.

A simple solution with the use of a stock paper texture was employed. Rather than stretching the image to form the panel background, the background was simply set to tile, filling the entire element. In the case of the leather background of the inventory panel, however, the image does not repeat, and is instead set to cover the entire background with the `background-size: cover` property.

To further enhance the feel of the panels being overlaid on the interface, the `box-shadow` property was used to make some shadows appear beneath each panel. The panels were also rotated using the `rotate()` function in the CSS `transform` property. Together, these visual enhancements emulate the appearance of pieces of paper scattered on a desktop, contributing to the organic, vintage style that characterises the game's interface (fig. 79). Similar styling was later applied to dialogue and settings panels.

Figure 79. Overlapping panels of the game interface.

Figure 80. Three different stages of designing the dialogue option border: (1) with a CSS dashed border, (2) with a hand-drawn black dashed border, and (3) with a hand-drawn brown dashed border.

To add to the paper-like feel of the dialogue option menu, dotted borders were added to the individual options, to become visible when the player hovered over or tapped on them. The process of designing these is shown in figure 80. Initially, a CSS-based dotted line was applied with the `border` property, but it appeared too mechanical and contrasted the rounded shapes of the surrounding text and panel. Instead, a hand-drawn dotted line image was created, and set to tile horizontally along the bottom border of each dialogue option with CSS. At first, a black dotted line was used, but it was too bold and created a strong visual separation between the options, rather

than emphasis. Later, a lighter brownish colour was tested, and the effect was the most pleasing of the three by far.

Finally, both the dialogue and option panels were rotated slightly, similarly to the collection panels above, to make them look like slips of paper overlaid on the interface (fig. 81).

Figure 81. Dialogue option and dialogue display panels are rotated subtly to give them the appearance of paper.

All these elements come together such that when all panels are open simultaneously, they do not appear jarringly disorganised, and the clutter appears intentional.

7.8.7. Overlay icons

A few buttons would be necessary for opening and closing the panels described in the previous section. Like the ghosts, these would be hand-drawn in accordance with the game's style guide. Each icon would toggle between an open and closed sprite, to represent when the corresponding panel is opened and closed. These give the user visual feedback upon interaction.

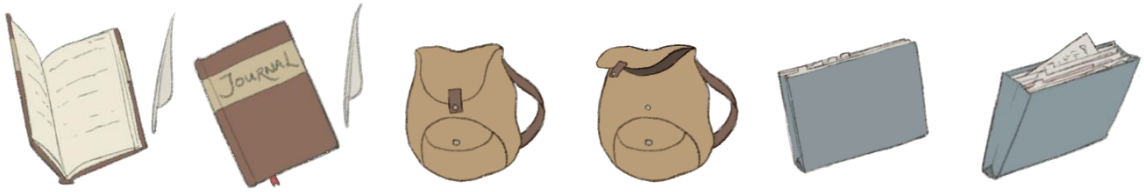


Figure 82. Journal, inventory and letter icons.

The compass is a special type of large icon, with a needle that would freely rotate to point at the closest ghost (as detailed in Section 7.5.12. Compass). The compass was drawn and exported on two layers, with one side of the needle coloured in red and black to indicate that that is the forward end (fig. 83).

Figure 83. The compass icon, composited and separated into constituent layers.

Outside of the large buttons, other utility buttons were added. Rather than opening inventories, these would have more generic functions, such as a close button for closing the panel overlays, a next button for advancing conversations, a volume button for toggling sound and a save button for toggling the save menu (fig. 84). Care was taken to maintain a consistent visual style between these assets, with many buttons sharing colours.

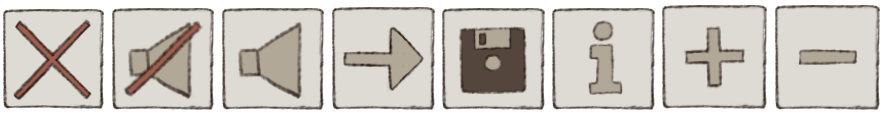


Figure 84. The small button icons: (1) close panel, (2) sound mute, (3) sound unmute, (4) next dialogue line, (5) toggle save menu, (6) toggle project information panel, (7) zoom in, and (8) zoom out.

The large buttons were added to the right side of the interface, out of the way of the main map and panel area, positioned using `fixed` positioning in the CSS. The small buttons were added to the left side of the interface, also positioned with `fixed` positioning (fig. 85).

Figure 85. Positioning of the settings buttons on the interface.

7.8.8 Unread indicators

To introduce obvious visual feedback whenever the player receives new letters or records new journal entries, unread indicators were added to various parts of the interface. The unread indicators function as such: an `unread` property is added to each letter as it is stored in the `letters` object, initially set to true and toggled to `false` when the letter is opened. Each time a change occurs to the number of unread letters in the box, the counter is also refreshed with the `refreshLetterCounter()` function, which loops through the `letters` object to count the unread letters. Visually, the unread counters show up as a badge on the interface icon as well as in brackets after the letter panel's header. It is small but striking, following familiar user interface design idioms, and immediately notifies the player of updates without taking up too much room on the page. These unread indicators can be seen functioning in figure 86.

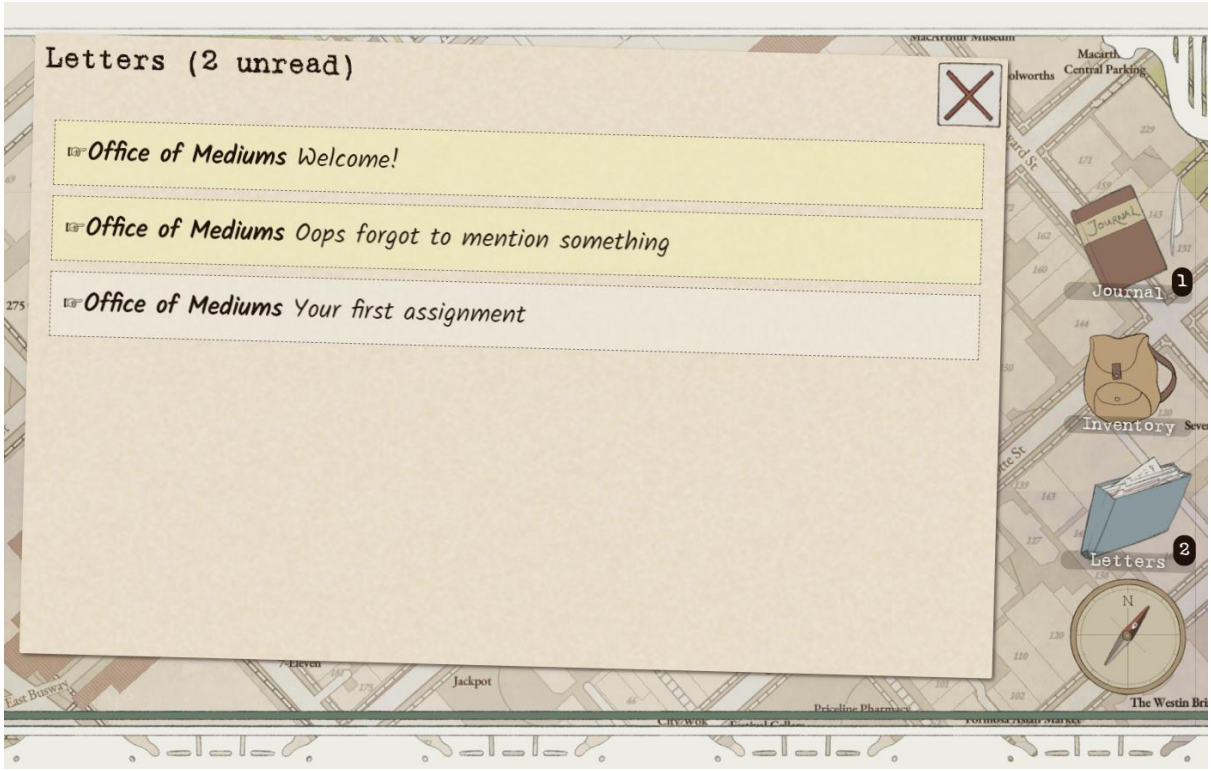


Figure 86. Unread indicators for the letter folder and journal.

7.8.9. Map pins

There was a need for visual markers showing the locations of the player, characters, and objects on the map, to replace the default red and blue pins. Just like the journal icon, these would be drawn with a rough and sketchy brush. Markers would come in four kinds: player, ghosts, points of interest, and items. Due to their varying functions in the game, each was designed along slightly different principles.

Figure 87. Ghost, player and point of interest marker icons.

The Player marker marks the player's current in-game location. This marker would be simple and unintrusive, standing out against the map at all times. It appears as a simple pawn-like playing piece.

Figure 88. Item markers icons.

Ghost markers mark the locations of ghosts. Since the ghosts can be visited in any order, all ghosts will share the same marker design, to maintain a sense of mystery and not to reveal their nature prematurely. It plays on the shape of the traditional map pin icon, with a rounded top and the bottom tapering to a point.

Like ghost markers for ghosts, point of interest markers mark the locations of interest in the story, including locations from which a ghost has departed. They have the appearance of four arrowheads pointing inwards; all points of interest have this same icon, as an abstraction of the concept of a place.

Item markers mark the locations of items to be found at the prompting of ghosts. Unlike the ghost pins, these are designed to be harder to find, and must be found at specific points in the narrative. To minimise frustrations with locating these objects, these would be immediately recognisable from a glance, and as such, each object had to have a different marker image.

The Leaflet.js API is structured such that the dimensions of every marker's image must be set when the marker is created. To streamline the process of generating pins dynamically, every item pin would be drawn with the same dimensions, so that they could be easily created by looping through an array.

7.8.10. Popups

Leaflet popups were added as a means of providing contextual information about ghosts, objects and points of interest (fig. 89). When the player is outside the range of a ghost but able to see it, tapping on it will reveal its name, simply to ensure that there was a visible response to the player's attempts at interaction with visible

pins, even when they were outside the trigger radius. Like the other panels, the popup background was set with CSS to show a repeating paper texture.

Figure 89. Two instances of popups in *The Spectral Carta*.

7.8.11. Fonts

In line with the style guide of *The Spectral Carta*, the fonts chosen for interface text and dialogue were Telegraphem and Harting Plain, which resemble text produced by old print devices such as typewriters and telegraphs.

Figure 90. The Telegraphem font used in the defunct status strip, one of the main fonts of *The Spectral Carta*.

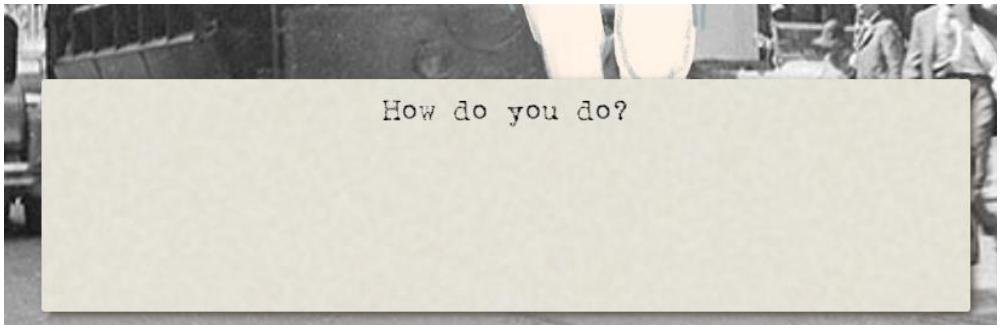


Figure 91. The Harting Plain font, used in the dialogue options.

The game also contains some dialogue written in Chinese, which was not rendered in a similar typewriter-esque style, as both of the abovementioned fonts do not

have character sets for Han characters. For these, a separate font, Qing Ke Huang You, had to be installed via CSS; it more closely emulates the roughness and narrow characters of the Telegraphem font (fig. 92).

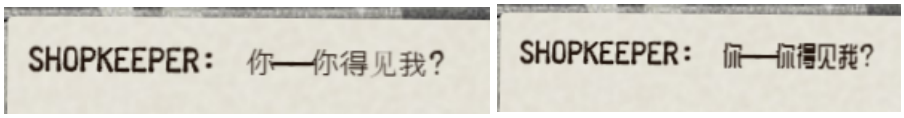


Figure 92. Han characters in *The Spectral Carta,* displayed in the default font (left) and in the Qing Ke Huang You font (right).

7.8.12. Layering

When bringing all these elements together, it was important to decide the order in which they would be layered. The layering order would be manipulated with the `z-index` property. Logically, core setting buttons such as the volume button would be on the very topmost layer, as they should be accessible from both inside and outside the overlays. Next, the journal and inventory buttons should always be visible, even when the journal and inventory windows, as well as ghost conversation overlays, are open. This allows the player to click on those buttons to toggle both windows between open and closed. Positioned correctly, they do not overlap the settings buttons and all lie on top of the main map area (fig. 93).

The journal and inventory windows should appear on top of the ghost conversation overlay, as the player may have to access the journal or inventory during a conversation (for example, to check their notes to guide their conversation choices). Finally, the save panel should be rendered on the top layer, to indicate that it exists outside of the game. The inclusion of a dark overlay further underscores that separation (fig. 94).

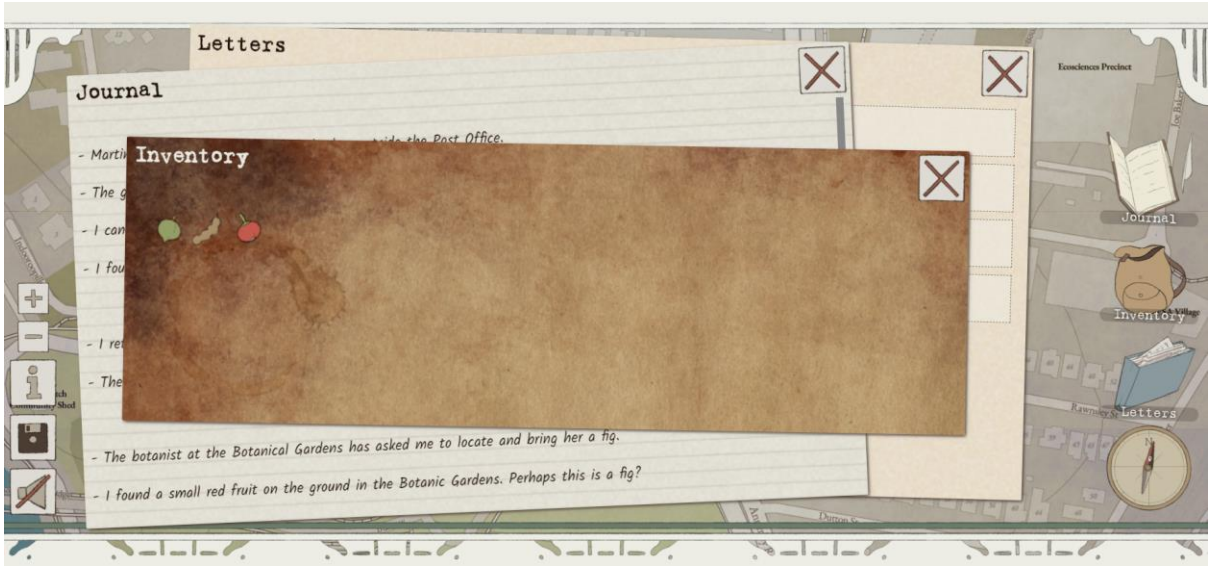


Figure 93. Panels are overlapped such that all buttons are clickable.

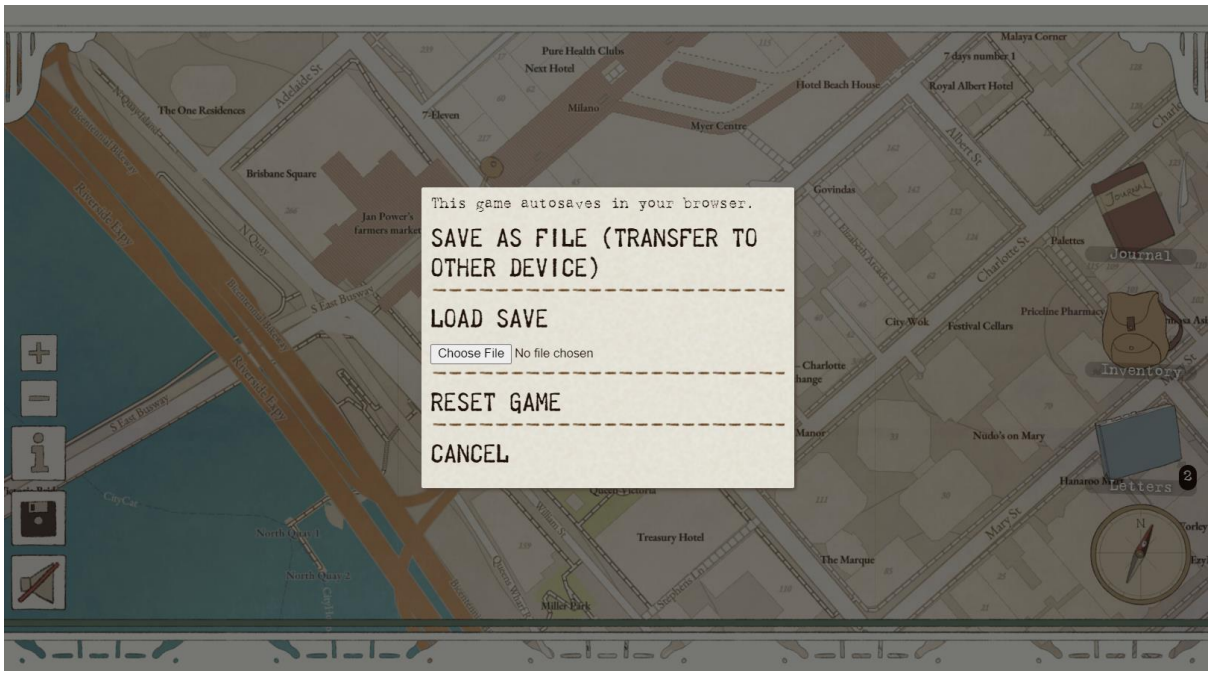


Figure 94. The save menu.

7.8.13. Mobile adaptation

Although development and testing for *The Spectral Carta* was conducted on a web browser, the game is meant to be played primarily on a mobile device. Some issues arose when the game interface was accessed on a mobile screen. The buttons and fonts were were excessively large, blocking out large portions of the screen.

Figure 95. The mobile interface before adjustments.

Additionally, the button areas were positioned such that the addition of another button to either panel would cause them to overlap and be impossible to interact with (fig. 95). The process of cleaning up the interface involved including an `@media` rule for screens smaller than 980px in width, and defining new styles that would make the icons smaller and place them at the margins of the screen.

Thereafter, panel titles were reduced in size, and panels were repositioned such that the titles and close buttons were fully visible and accessible when the panels overlapped. When this change was made, it became obvious that the inventory button, the rucksack, blended too much into the background of the inventory panel. As such, the bag was recoloured, and the panels were further repositioned so that the buttons overlapped them as little as possible. The button positions were checked against other layouts, such as the ghost dialogue interface, to ensure that no important elements were being blocked. To better differentiate the three panels, the paper textures used for their backgrounds were substituted such that all three were slightly different colours. The final outcome can be seen in figure 96.

Figure 96. The mobile interface after adjustments. All text and buttons can be seen and interacted with.

7.9. Testing and iteration

The Spectral Carta was not developed in discrete iterations or rounds, but continuously, while in dialogue with playtesters, and concurrent with on-site

testing. The game had four playtesters, most of whom played the desktop version where free movement across the map was possible with keyboard controls. Their perspective and input were essential, as they aided me in discovering issues that would have gone missed otherwise, particularly since I am familiar with the game's full functionality, and have developed a habit of playing it in a specific way.

The bulk of these issues involved typos and incorrect linkage of options. One beta tester pointed out that they did not know how to continue after completing the first two quests, without any prompts from the game. Following this piece of feedback, more letters were added to prompt the player to proceed, should they require clues as to the ghosts' locations. Another mentioned that the ghost animation was distractingly mechanical. Two of the testers observed that the ghosts should disappear from the map after they were "released," a suggestion that was later implemented. Information was also gleaned from what was not said. For instance, none of the players found the shopkeeper, who only appears from 7am to 6pm daily, on the initial play-through. When she appeared later for one player, they voiced confusion that that they had not seen her before.

Wherever relevant, these comments, issues and recommendations have been described throughout Section 7, along with the changes that were made accordingly.

7.10. Publicity

For the publicity of *The Spectral Carta*, I produced three posters in InDesign. All three are collages of screen captures and assets produced for the game. The first two of these are meant as a visual summary, while the third is a more detailed visual rundown of various features of the game. These posters can be viewed in Appendix E. I also produced a publicity video, whose link can be viewed and accessed in Appendix F. The video contains footage of the game being played, both onscreen and on the street, to show how the physical and virtual experiences overlap with each other.

8. CONCLUSION

8.1. Future extensions of the research

This project has involved the development of an engine for writing locative stories. Numerous foreseeable extensions are possible, which I may potentially explore during the higher degree by research that I intend to undertake.

The engine was developed with consideration for the possibility of other users creating their own locative games in it. Settings for the game's characters, items and points of interest are stored in separate JSON files and referenced through a list in `entities.json`, meaning that files can be added, edited, updated and deleted easily to alter the core fabric of the game. While not all aspects of the game are mutable outside the main script (the ghost pin icons, for instance), this engine could easily be altered to allow other developers full control over the story and layout. Due to the lack of existing engines that combine locative gameplay with a visually-versatile interface, there could potentially be great interest in making this project available on such a platform as Github.

The story of *The Spectral Carta* itself could easily be extended to delve deeper into the history of Brisbane. As of now, only fourteen ghosts are found in the game. With a much larger number of ghosts, and potentially the addition of crowdsourced ghosts and stories, the game could become far more varied and interesting, and easier to play as new gameplay opportunities can be discovered on every junction.

8.2. Areas for improvement

The placement of characters on the map and their relationship with space tended to rely primarily on finding the most logical locations for each character. This was often at the expense of effective use of locative storytelling techniques: terrain was rarely used to shape the story, and some ghosts were still located a long walk away from each other, such as the botanist. In a future game, more locative game principles could perhaps be explored in the placement of story nodes.

Plans to test more aspects of the game in person were disrupted by the COVID-19 lockdown in the first half of 2020. The game would have benefited from more on-site testing; while some was conducted wherever possible, the game

The programme on which the game runs is 1,300 lines long; at times it was difficult to navigate the file, despite efforts to include comments separating it into sections. In part, this is because I created the code so rapidly that I left little time to focus on project organisation. It may be more efficient to store the code in multiple separate files and include them via HTML script elements.

The historical research conducted for the game was also largely informal, and a great amount of the historical information presented in this project was not derived from peer-reviewed sources. It is entirely possible that most of this information is anecdotal at best. With time willing and a greater focus on accuracy, the story could have undergone far more thorough research.

Furthermore, as someone who is not native to Brisbane, or Australia, there is undoubtedly some measure of inauthentic contrivance to the writing for the game. It may have been truer to local culture if it had been authored by someone with a more intimate familiarity with Brisbane and colloquial Australian English.

8.3. Conclusion

Creating *The Spectral Carta* has been a fulfilling challenge, and the fitting culmination of two years' postgraduate education in Brisbane. Every aspect, from writing the conversational scripts, to building the engine and testing it with beta users, to producing publicity materials, required me to employ skills and knowledge that I have learned over the past two years, both in the classroom and outside it.

Through it I was able to learn efficient coding strategies, and became more confident in my ability to produce web, audio-visual and interactive visual content. The final outcome, too, is a game that could see use and significance with the public, beyond the academic context in which it was created. I believe that this game will

be interesting to anyone who is curious about Brisbane's histories. That said, I too would like to have the time to delve deeper into that history and better capture it in this work. The unanticipated outcome of producing *The Spectral Carta* has been that I have grown familiar with, and fond of, the multitude of histories represented by the buildings and spaces of Brisbane. I have every intention and desire to pursue further studies at the doctoral level in this very same city, and to bring my evolving personal connection to Brisbane into my future work.

9. REFERENCES

Arthur, Charles. “How the smartphone is killing the PC.” The Guardian. Accessed August 25, 2019. https://www.theguardian.com/technology/2011/jun/05/smartphones-killing-pc.

Atfield, Cameron. “Brisbane venue manager on a mission to halt Hillsong theatre takeover.” Brisbane Times. May 2, 2018. https://www.brisbanetimes.com.au/national/queensland/brisbane-venue-manager-on-a-mission-to-halt-hillsong-theatre-takeover-20170502-gvxjx4.html.

Basques, Kayce and Pete Lepage, “Read files in JavaScript.” Web.dev. June 18, 2010. https://web.dev/read-files/.

Boggo Road Gaol. “The Ghosts of Boggo Road Gaol – Boggo Episode 4.” Boggo Road Gaol. October 22, 2018. https://boggoroadgaol.com/the-ghosts-of-boggo-road-gaol-boggo-episode-4/.

“Brisbane.” Story City. Accessed April 4, 2020. https://www.storycity.com.au/stories/brisbane-street-reads/.

“Brisbane's Tower Mill.” House Histories. n.d. https://www.househistories.org/the-tower-mill-of-spring-hill.

Chess, Shira. “Augmented regionalism: Ingress as geomediated gaming narrative.” *Information, Communication and Society* 17, no. 9: 1105-1117. https://doi.org/10.1080/1369118X.2014.881903.

Cowdell, Paul. "Ghosts and Their Relationship with the Age of a City." *Folklore* 125, no. 1 (2014): 80-91. www.jstor.org/stable/43297734.

Creighton, Drew. “The dark history of Brisbane’s oldest building.” Brisbane Times. October 2, 2018. https://www.brisbanetimes.com.au/brisbane-news/the-dark-history-of-brisbane-s-oldest-building-20181001-p5072m.html.

De Certeau, Michel. “Walking in the City.” In *The Practice of Everyday Life,* trans. Steven Randall, 93. Berkeley: University of California Press, 1984.

Debord, Guy. “Theory of the Dérive.” *Les Lèvres Nues,* November, 1956.

El-Rabbany, Ahmed, “Introduction to GPS” in Introduction to GPS: The Global Positioning System (Norwood: Artech House, Inc., 2002).

Farman, Jason. “Locative Life: Geocaching, Mobile Gaming, and Embodiment.” Paper presented at *UC Irvine: Digital Arts and Culture, Irvine, December 12-15, 2009*. https://escholarship.org/uc/item/507938rr.

Hjorth, Larissa and Ingrid Richardson. “Pokémon GO: Mobile media play, place-making, and the digital wayfarer.” Mobile Media and Communication 5, no. 1, 3-14. https://doi.org/10.1177/2050157916680015.

Felton, D. *Haunted Greece and Rome: Ghost Stories from Classical Antiquity*, ix. Austin: University of Texas Press, 2010.

Fong, Ho-Yin. “A Ghost Tour In Rouge.” *Journal of Modern Literature in Chinese* 12, no. 1 (2014): 98-107. https://www.researchgate.net/publication/278684035_A_Ghost_Tour_in_Rouge.

Fraser, Joy, “Never Give Up The Ghost: An Analysis of Three Edinburgh Ghost Tour Companies” (Master’s diss., Memorial University of Newfoundland, 2005), 4-5.

Ghost Snap (Bielefeld: WhiskyGuerra, 2016), mobile game, https://play.google.com/store/apps/details?id=de.whiskyguerra.GhostSnap.

Gregory, Helen and Dianne McLay, *Building Brisbane’s History* (Warriewood: Woodslane Press, 2010).

Guy Debord, “Introduction to a Critique of Urban Geography,” *Les Lèvres Nues*, September, 1955.

Hillsong Brisbane, “Hillsong Church to renovate Brisbane’s disused Tribal Theatre,” Hillsong Brisbane, April 8, 2018,

https://hillsong.com/brisbane/blog/2018/04/hillsong-church-to-restore-brisbanes-disused-tribal-theatre/#.XogUI4gzY2y.

Ignatieva, Maria E. and Glenn H. Stewart. "Homogeneity of urban biotopes and similarity of landscape design language in former colonial cities." In *Ecology of Cities and Towns: A Comparative Approach*, edited by Mark J. McDonnell, Amy K. Hahs and Jürgen H. Breuste, 399-421. Cambridge: Cambridge University Press, 2009. https://doi.org/10.1017/CBO9780511609763.024.

Jolly, Martyn. "Practice Led Research." ANU College of Arts & Social Sciences. Accessed March 26, 2020. https://cass.anu.edu.au/practice-led-research.

KANACKI. "Phantom of the Plough Inn Brisbane QLD." Paranormal.com.au. Accessed June 23, 2020. https://www.paranormal.com.au/public/index.php?topic=11383.0.

Kanchu. "A very minor improvement of the code by Awesomeness01 (no need for anchor tag) with addition as suggested by trueimage." June 14, 2015. https://stackoverflow.com/a/30832210.

Kjeldskov, Jesper and Jeni Paay. "Augmenting the City with fiction: fictional requirements for mobile guides." Paper presented at *Workshop on HCI in Mobile Guides, Mobile HCI 2007, Singapore, September 9, 2007*. http://www.medien.ifi.lmu.de/mirw2007/papers/MGuides2007_Kjeldskov.pdf.

Lack, Clem Jr. "Ghosts will stir in the old Windmill." The Courier Mail. January 10, 1950, 2. https://trove.nla.gov.au/newspaper/article/49709168.

McEvoy, Emma. "Ghost Walking." In *Gothic Tourism,* 107-126. London: Palgrave Macmillan.

McMillen, Andrew, "Brisbane's Story Bridge: a tale of tragedy for far too long," The Australian, September 5, 2015, https://www.theaustralian.com.au/weekend-australian-magazine/brisbanes-story-bridge-a-tale-of-tragedy-for-far-too-long/news-story/bbf77992212ae6378601469a71f788ea

Meinig, D.W., "The Beholding Eye: Ten Versions of the Same Scene," in *The Interpretation of Ordinary Landscapes: Geographical Essays*, edited by D. W. Meinig and John Brinckerhoff Jackson. New York: Oxford University Press, 1979. https://www.uccs.edu/chuber/sites/chuber/files/inline-files/5-Meinig-BeholdingEye.pdf.

Millard, David and Charlie Hargood, "Location Location Location: Experiences of Authoring an Interactive Location-Based Narrative." Paper presented at *9th International Conference on Interactive Digital Storytelling, Los Angeles, November 15-18, 2016*. http://dx.doi.org/10.1007/978-3-319-48279-8_40.

Millard, David and Charlie Hargood, "Tiree tales: a co-operative inquiry into the poetics of location-based narratives." Paper presented at *ACM Hypertext 2017, Czech Republic, July, 2017*. http://dx.doi.org/10.1145/3078714.3078716.

Millard, David and Charlie Hargood, "Tiree Techwave - The Isle of Brine," StoryPlaces, accessed May 6, 2020, http://storyplaces.soton.ac.uk/tiree.php.

Millard, David, Charlie Hargood, Michael O. Jewell and Mark J. Weal. "Canyons, deltas and plains: towards a unified sculptural model of location-based hypertext." Paper presented in *ACM Hypertext 2013, Paris, 1-2 May, 2013*. https://doi.org/10.1145/2481492.2481504.

Montola, Markus. "Exploring the Edge of the Magic Circle: Defining Pervasive Games." Accessed August 25, 2019. https://www.markusmontola.fi/exploringtheedge.pdf.

Naliuka, Katsiaryna, Tara Carrigy, Natasa Paterson and Mads Haahr. "A Narrative Architecture for Story-Driven Location-Based Mobile Games." Paper presented at *New Horizons in Web-Based Learning - ICWL 2010 Workshops, Shanghai, December 7-11, 2010*. https://doi.org/10.1007/978-3-642-20539-2_2.

Norman, Donald Arthur, "Affordances and Design," January 2004, https://www.researchgate.net/publication/265618710_Affordances_and_Design.

Paay, Jeni and Jesper Kjeldskov. “Location-based Storytelling in the Urban Environment.” Paper presented at *20th Australasian Conference on Computer-Human Interaction: Designing for Habitus and Habitat, Cairns, December 8-12.* http://2012.agib.dk/docs/Location-based_storytelling_in_the_city.pdf.

Packer, Heather S., Charlie Hargood, Yvonne Howard, Petros Papadopoulos and David E. Millard. “Developing a Writer's Toolkit for Interactive Locative Storytelling.” Paper presented at *10th International Conference on Interactive Digital Storytelling, ICIDS 2017, Madeira, November 14–17, 2017.* https://dx.doi.org/10.1007/978-3-319-71027-3_6.

Plant, Sadie. *The Most Radical Gesture*, 58. London: Routledge, 1992. https://monoskop.org/images/2/24/Plant_Sadie_The_Most_Radical_Gesture_The_Situationist_International_in_a_Postmodern_Age.pdf.

Richards, Jonathan, “Historical changes of the lower Brisbane River,” in *Moreton Bay Quandamooka & Catchment: Past, present, and future,* edited by I.R. Tibbetts, P.C. Rothlisberg, D.T. Neil, T.A. Homburg, D.T. Brewer and A.H. Arthington. Brisbane: The Moreton Bay Foundation, 2019. https://moretonbayfoundation.org/articles/historical-change-in-the-lower-brisbane-river/.

Ritchie, James Neil Graham and Anna Ritchie, *Edinburgh and South-east Scotland*. Portsmouth: Heinemann Educational, 1972.

Salen, Katie and Eric Zimmerman, “Unit 1: Core concepts” in *Rules of Play: Game Design Fundamentals* (Cambridge: MIT Press, 2004), 74.

Schlatter, Barbara Elwood and Amy R. Hurd. “Geocaching: 21st Century Hide-and-Seek.” *Journal of Physical Education, Recreation & Dance* 76, no. 7: 28-32. http://doi.org/10.1080/07303084.2005.10609309.

Tateno, Masaru, Norbert Skokauskas, Takahiro A. Kato, Alan R. Teo and Anthony P.S. Guerrero. “New game software (Pokémon Go) may help youth with severe social

withdrawal, hikikomori." Psychiatry Research vol. 246 (2016): 848-849. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5573581/.

Thomas, Jeannie Banks, Diane E. Goldstein, and Sylvia Ann Grider. "The Usefulness of Ghost Stories." In *Haunting Experiences: Ghosts in Contemporary Folklore*, 25-59. Logan: University Press of Colorado, 2007.

Weiss, Amy Schmitz. "Exploring News Apps and Location-Based Services on the Smartphone." *Journalism & Mass Communication Quarterly* 90, no. 3: 425-456. https://doi.org/10.1177%2F1077699013493788.

Wu, Keping. "'Ghost city': Religion, urbanization and spatial anxieties in contemporary China." *Geoforum* 65 (2015): 243-245. https://dx.doi.org/10.1016/j.geoforum.2015.08.005.

Yin, Robert K. *Applications of case study research*. Thousand Oaks: SAGE, 2012.

10. LIST OF FIGURES

11. APPENDICES

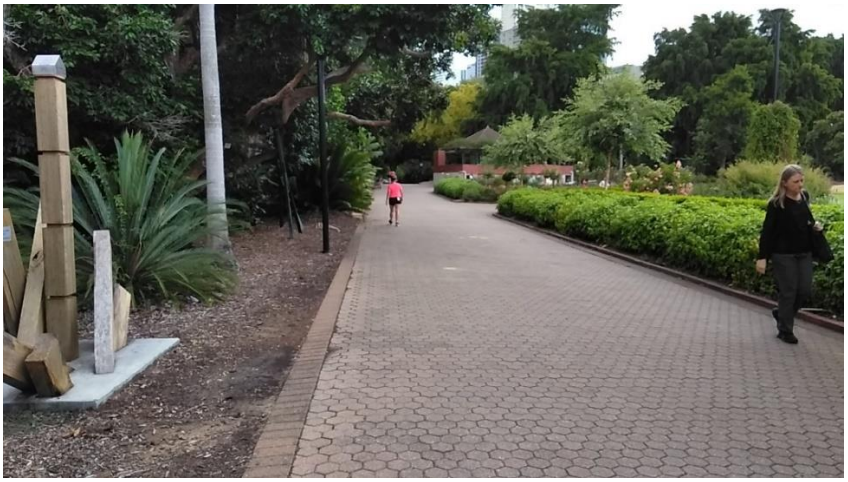
Appendix A. Direct observation of game sites

The Plough Inn

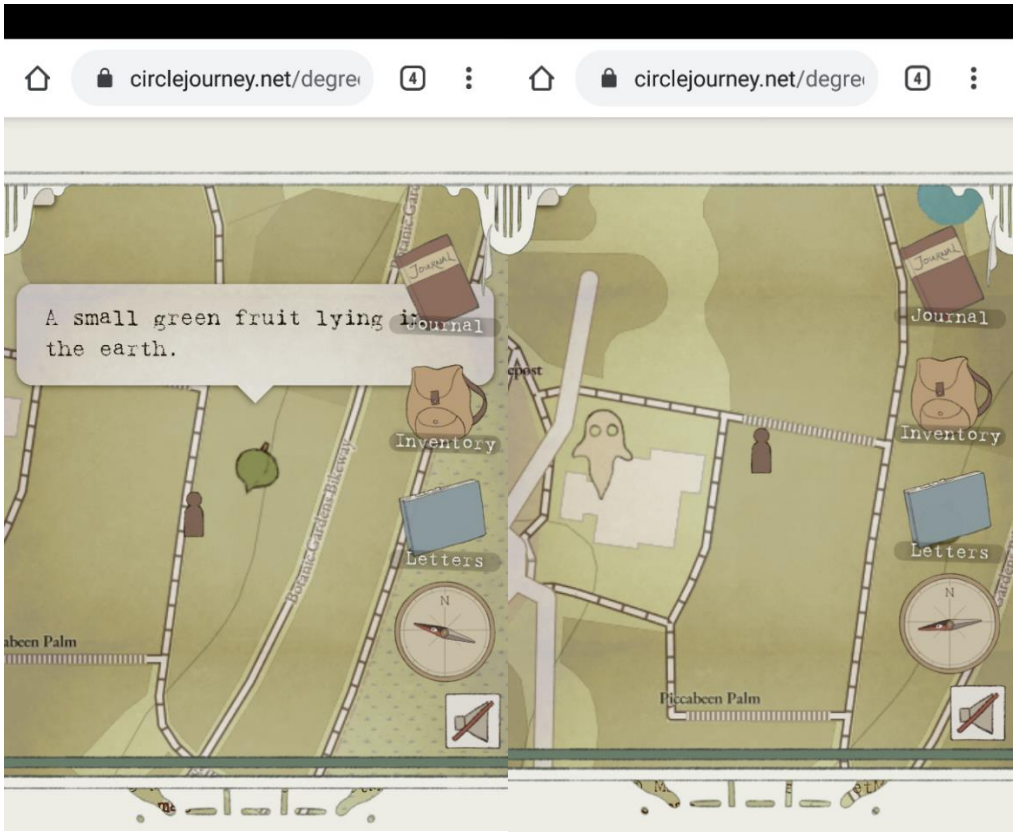
- Crowded when open
- Open area in front with music performances
- Can pass under canopy to get to Stanley St

Botanic Gardens

- Empty, quiet, lots of wildlife, easy to get distracted
- Very broad area so I have to be specific about which part is of interest
- Banyan fig? Has a plaque on the subject
- Relatively remote to other locations in the game
- Markers placed on main pathways might be easier to find than markers on forest trails

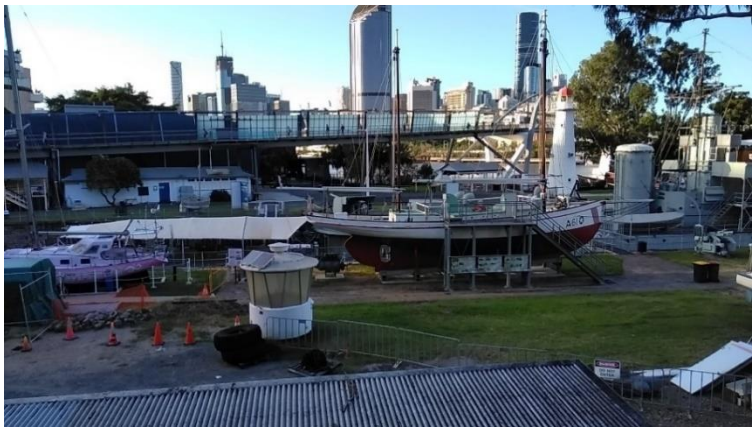


- Playing game in the area: finding the fruit is quite easy; in person the visible radii are larger than they appear onscreen. Inadvertently found a fruit without trying.



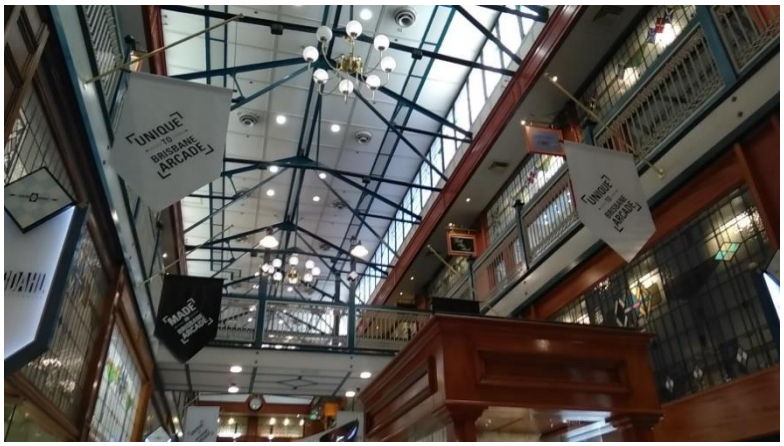
HMAS Diamantina

- There's a nearby memorial park with a statue commemorating WW2 soldiers
- Very close to goodwill bridge, can easily walk to botanic gardens and south bank parklands



Brisbane Arcade

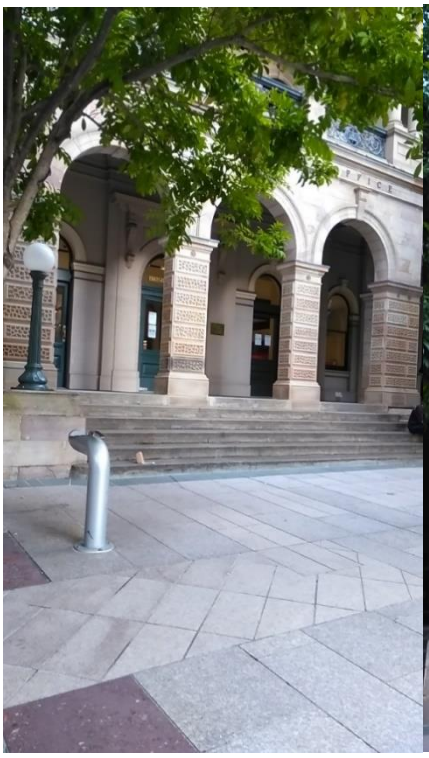
- Very pretty, but located in a crowded area
- Interior looks old, well lit, may not be a “ghost story” sort of location?
- Standing in the middle of the space may cause blockage

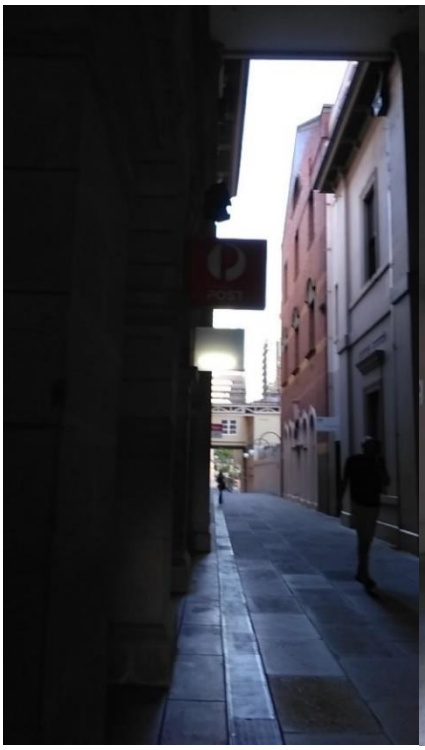


- Playing the game: having the ghost indoors makes it hard to reach with GPS.
- Reposition the marker outside the mall.

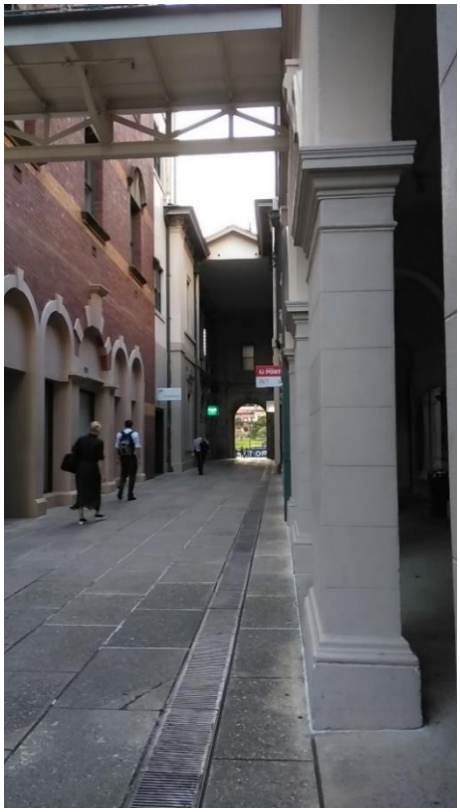
General Post Office

- Very visually appealing location
- There's a public thoroughfare passing under an arch and an enclosed alleyway
- Alleyway could be a good site for the marker. Enclosed space mirrors the enclosed post office area shown in the background image.
- Wide passageway, space at the sides/on stairs to stop and do things on phone.



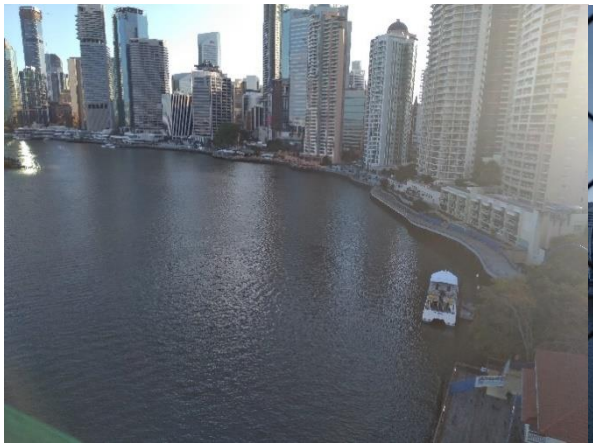


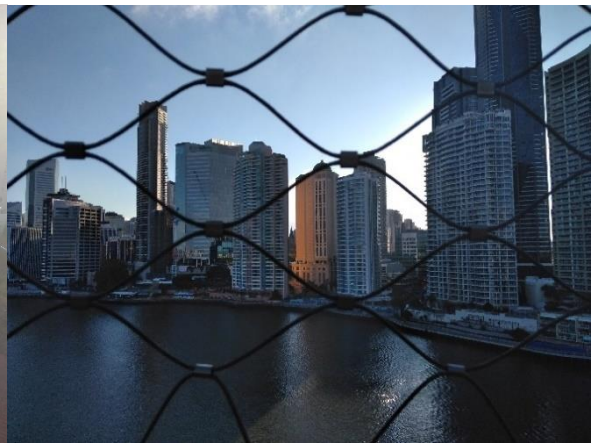

POST
24/7

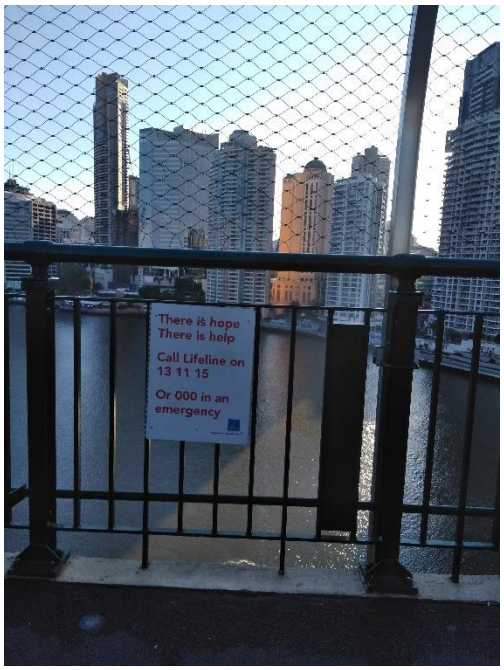


Story bridge

- Big, scenic, a nice view
- Be careful of taking eyes off path as people do jog and cycle across the road
- Regular reminders about suicide risk, hotlines. Fences are a present reminder






There is hope
There is help
Call Lifeline on
13 11 15
Or 000 in an
emergency

Appendix B. Character summaries and outlines

Martin the tutorial ghost, died 1960s

- Lost key

Plough Inn ghost, died 1921

- Wife of a bartender
- Murdered by a drunkard
- Wants revenge

WW2 soldier, died 1950

- Born in 1910s, saw the building of Story Bridge. Knew the lady at the Plough Inn, was a teen when he saw the news when she died.
- Childhood friends with the Story Bridge builder
- Died in action at age of 30+.
- Doesn't know the whereabouts of the daughter he left behind
- Wants to find her whereabouts, offers you a description of her—she frequents Brisbane Arcade

Judith, shopper at Brisbane Arcade, died 1960s

- WW2 sailor's daughter's girlfriend? She and her gf used to hang out at Brisbane Arcade.
- Searching for the dress she bought—for the date she never survived to have with girlfriend
- She will tell you where the gf is if you find the dress.
- The dress has been sold in a garage sale and is now owned by the office worker's wife.

Helen, sailor's daughter, waitress

- Literally waiting
- Girlfriend of Judith

Mark, sailor, died 1950s

- Waitress' dad, was rescued by a ship, treated and died in Brisbane.

Xujin, shopkeeper, died 1900s

- Died from medical causes while waiting for child to get married
- Never got to see their child's marriage
- Wants to know that her family is well.
- Had connections to the Botanic Gardens, received herb orders from it.

Wei, shopkeeper's grandson, office worker, died 1950s

- Father owned the corporation that built the bridge, fell short of his expectations
- Committed suicide off the Story Bridge
- Regrets this and wants you to deliver his wedding ring to his wife
- His ring has floated downstream.
- Tells you about the grandma who worked at Chinatown.

Marie, office worker's wife

- Fired from job
- Asks you to keep the ring that belonged to her husband

Windmill convict, died 1880s

- Sentenced for petty theft, died working on the mill.
- Knew about the Botanical Gardens, used to eat food grown there. Mentions a doctor something.

Botanist, died 1880s

- Died while still working on introducing a plant to Brisbane at the botanic gardens
- You have to find the place where the grove of plants grows, "take a photo", and bring it back

Dawn, theatre murder victim, died 1940s

- A lady who went to the theatre and was shot dead.
- Used to walk in Botanic Gardens and had a favourite plant, coincidentally the one the botanist is looking for. Gives you the exact location.
- Has a letter she never delivered, meant to be her disowning her daughter. Asks you to burn it because she regrets writing it.

Story Bridge builder, died 1938

- Born 1910s, was friends with the WW2 sailor at school.
- In his 20s when he died.
- One of the three people who died while building the Story Bridge, fell from the height.
- Boss was the father of the office worker above.
- You talk to the ghost of the office worker and find out that the guy quit his job and decided to live a slow life in the country for the rest of his life.

Postman, died 1924

- Had a delivery that went missing.
- You have to find the letter.
- The recipient of the package was supposed to be the Plough Inn bartender's wife. It would have allowed her to separate from her husband, but it never arrived.

Cargo loader, died 1950s

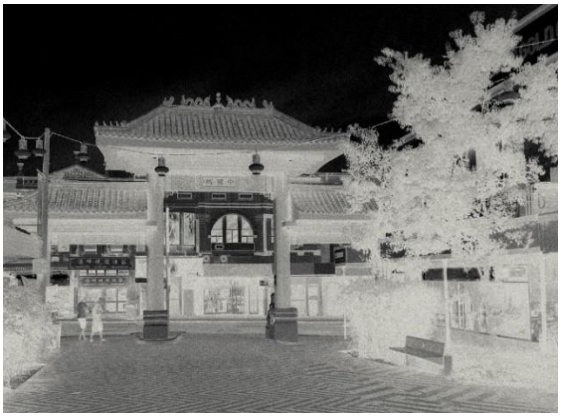
- Died in a work accident while delivering cargo (wood?) for the building of the bridge.
- Knows about the murder at the theatre.

Appendix C. Character sprites

Appendix D. Backgrounds before and after alterations

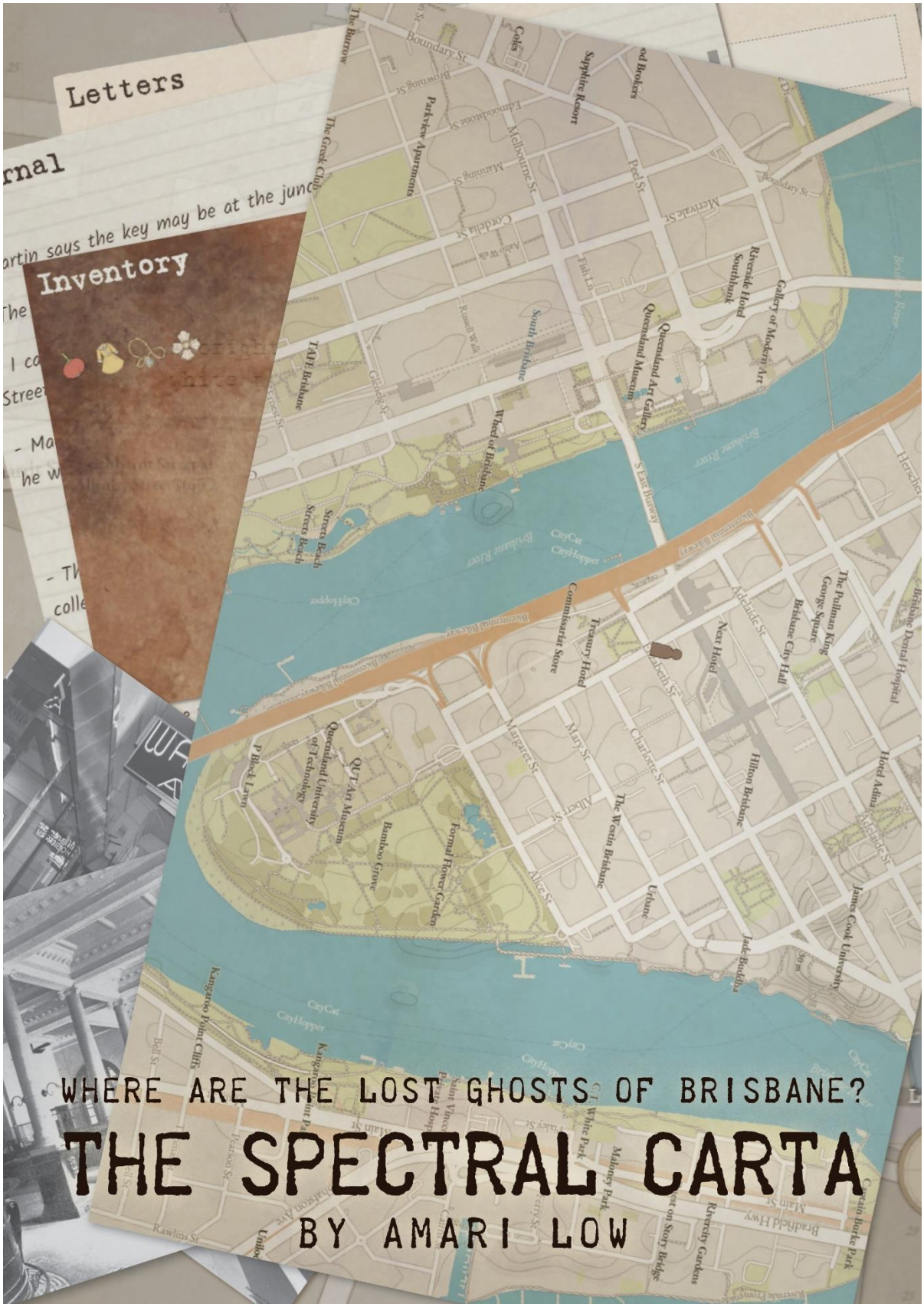
Original creative commons photograph	Altered photograph
	Same as original
	
	

	
	
	Same as original

	
	
	Same as original

Same as original

Appendix E. Publicity materials




Journal
A bright yellow dress with white polka dots.
Journal
Inventory
- The waitress ghost says Judy has long wavy hair down
WAITRESS: STILL I LINGER HERE, BECAUSE MY HEART DOESN'T CARE FOR WHAT IS TRUE OR POSSIBLE.
Letters
Office of Mediums Your first assignment
Your first assignment as a member of our board has arrived!
A ghost has been reportedly sighted near the Queen Street bus station. Members of the public claim it was wandering about and muttering as if searching for something on the ground.
Milanese HOSIERY
Journal
Inventory
Letters
☞ Well, it's not yours just because you saw it.
☞ What does the dress look like?
☞ I'm sorry, but you're dead.
BRISBANE ARCADE SINCE 1923
Discover 50 of Brisbane's best stores
Journal
Inventory
Letters


WHERE ARE THE LOST GHOSTS OF BRISBANE?
THE SPECTRAL CARTA
BY AMARI LOW

Appendix F. Link to publicity video

https://youtu.be/I5DssH_1eRc