

# GEMS: The Design and Evaluation of a Location-Based Storytelling Game

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## ABSTRACT

It is now possible to capture geotagged photos and videos and share them with family and friends. Yet the reality is that applications for capturing and viewing this information are not particularly rich offering little more than maps and simple textual information about a location. Given this, we wanted to explore this design space to find new and exciting ways for people to document and share their experiences. We designed a location-based game called GEMS to support storytelling amongst family members and close friends. The game narrative and mechanics prompt players to reflect on meaningful places from their past and create geolocated digital memory. Other players can then visit the locations to collect and view the records. A user study revealed that location can provide a rich foundation for storytelling activities. We learned that location-based storytelling strategies often elicit a sense of discovery through exploration, sharing, and conscious reflection.

## Author Keywords

Location-based games, pervasive games, family storytelling

## ACM Classification Keywords

H.5.3. Group and Organization Interfaces: Computer-supported cooperative work.

## INTRODUCTION

Presently we are seeing a proliferation of digital technologies that easily permit families to capture and share their experiences [28]. For example, the integration of high-resolution image and video capture within mobile phones makes it easy to capture one's experiences anytime, anywhere [18,27,28]. Online tools such as social media and social networking sites make it easy for people to share their thoughts and experiences with their contacts, along with a broader community of individuals [17]. We are also increasingly seeing new commercial and research technologies permit the recording of place-based information along with people's accounts of their experiences. For example, it is now possible for people to

record their geographic location along with captured photos or videos. This creates new opportunities for people to tie records of their experiences to the places that they inhabit.

The challenge is that existing methods for sharing and viewing locative media (e.g., geotagging photos on Facebook, 'checking in' on Foursquare) are limited and the sense of place is not very compelling. Location may be simply shown as a specific point on a map or conveyed through a single line of text, such as "Near Seattle." The goal of our research was to explore new ways for people to capture, preserve, and share location-based experiences. We wanted to understand how to design a flexible system that would enable people to use location as a context for reflecting on and documenting meaningful personal experiences. We imagined that such a system could be used in two primary ways. First, people could reflect on their experiences and leave place-based memories for close contacts to view over time. For example, a parent may create records for a child to see once the child grows older. Second, people could create records for present-day friends or family to view. This would extend current practices of place-based record keeping (e.g., Foursquare usage).

To this end, we designed a location-based storytelling game called the Geolocated Embedded Memory System (GEMS). In the game, players are asked to contribute to a location-based chronicle of human life by reflecting on and documenting meaningful personal experiences. Players record their experiences through photos, videos, and textual descriptions and digitally store them in real-world places. GEMS explores how game systems can not only support the act of storytelling but can also engage the motivations that surround it by structuring the activity with a series of goals and framing it as part of a larger narrative that challenges the player to imagine how much of their personal history could be passed on to future generations or present contacts and how it might be communicated.

To evaluate GEMS, we conducted a user study in which participants played the game for a period of three weeks. Our evaluation focused on personal reflection in two scenarios. First, we evaluated the game's ability for players to create place-based records for future users to view across time. This explored intergenerational play from the perspective of the person creating the content for future players. Second, we evaluated the game's ability for present-day groups of close contacts to record and share

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place-based experiences. Here we explored play by close friends. Our findings show that location-based games offer a compelling way to support place-based storytelling. Yet to be successful, they must support both extrinsic and intrinsic motivation, create an audience or the sense of one in the future (e.g., a grown-up child), and provide both remote and location-based content creation and collection.

## RELATED WORK

### Documenting and Sharing Experiences

There has been a wealth of research that documents how people capture and share experiences using photos and video. We know that people capture a large amount of photos and (more recently) videos and this has increased dramatically since the arrival of digital cameras [11,28]. Photo and video management can be challenging and many people have large archives of media [28]. People also view and review photos in group settings [1,14] where they routinely tell stories about their photos and associated experiences [1,14]. People prefer the tangibility of printed photos [14,28] because it can be cumbersome to view photos on laptops or computers in a group setting [14,23,31,36]. People most often look at recent photos rather than older ones [33]. Viewing also happens while people are ‘mobile’ where they view photos immediately after capture [18] or during meet-ups with others [2,18,28].

Online sharing of photos and videos has rapidly proliferated over the last decade [27,28,36] despite concerns about privacy [1]. Studies have shown that online photo sharing allows people to choose when and how to view photos shared by others, if at all [28]. Online pictures are thought of as being transitory and ephemeral [37]. Despite the success of online photo sharing, storytelling is often lost when photos are shared this way [27] because the ‘storyteller’ (photo taker) is not around to discuss or present the photos to others. We focus on this aspect to make it easy and fun to create stories and share them with others.

Storytelling can be a challenging process where it is often difficult to come up with ideas for a story and know what to focus on out of daily life [22]. Digital storytelling is a workshop practice where computer and media experts help amateurs tell stories with digital media [16,22]. Freidus and Hlubinka identify digital storytelling as a reflective practice that can strengthen communities [12]. History Lines is a tool that allows people to map out places they have lived and share comments and multimedia for each location [20]. Balabanović, Chu, and Wolff report on the use of physical photographs to support storytelling, and developed technology to improve the use of digital photographs for the same purpose [3].

### Location-Based Games

Location-Based games (LBGs) are games that extend the gameplay experience into the real world by incorporating aspects of the player’s environment into the game system. Over the past decade, researchers and designers have

created and studied a variety of LBGs. This includes games focused on technological issues in present society [5,7], social issues such as trust, security, and privacy [8,24], and aspects of community and culture [4]. We detail the LBGs that are most similar to our explorations.

First, Geocaching is a location-based treasure hunt game where players routinely create places of importance by physically embedding content (i.e., a container with a log book) in outdoor locations [29,30,32]. See It is a location-based treasure hunt game designed to investigate scalability and player-generated content in LBGs [30]. See It expands the treasure-hunt model seen in Geocaching to explore how locative media can enrich one’s sense of place. GEMS iterates on this idea and makes the media the prize rather than the clue: the memory records players create double as content for other players (e.g., friends and family) to view.

Eyespy is a LBG in which players earn points by tagging real-life places with geolocated text and photos and by verifying tags created by other players [6]. While Eyespy uses this create-and-collect pattern to generate a reliable catalogue of visible geographic details for route navigation [6], our design uses it to encourage the sharing of personal stories through the context of place. Feeding Yoshi is a location-based game where teams of players try to collect the most points by moving around the city to gather and deliver digital fruit to digital animals called Yoshis [5]. The authors suggest that mobile games must be compatible with all of “home life, commuting, and work” so that players can find a way to interweave the game with everyday life [5]. We designed GEMS with this requirement in mind.

Serendipitous Family Stories (SFS) is a system that enables family members to create and collect geolocated video messages [9]. Elderly parents record a video message and then link it to a location using a computer interface. Their adult children can then use a mobile interface to track down and view the video in the location it is associated with. GEMS is similar to this yet we explore the idea of traveling to the locations of interest to *record* stories. Moreover, SFS focuses on videos that are conversational in nature; in GEMS, the format is very flexible and users can choose video, audio, photos, and text.

There also exists a set of more casual games that one could argue are location-based. For example, Foursquare allows users to tag locations that they are currently at and record textual descriptions. Yet research has shown that the game attributes found in Foursquare are less motivating over time for players [25]. Moreover, we argue that the manner in which people are able to document experiences in Foursquare is not very rich.

### DESIGN OF GEMS

We created a LBG called the Geolocated Embedded Memory System (GEMS). The design of GEMS was drawn from an interaction scenario for supporting intergenerational communication amongst family members.

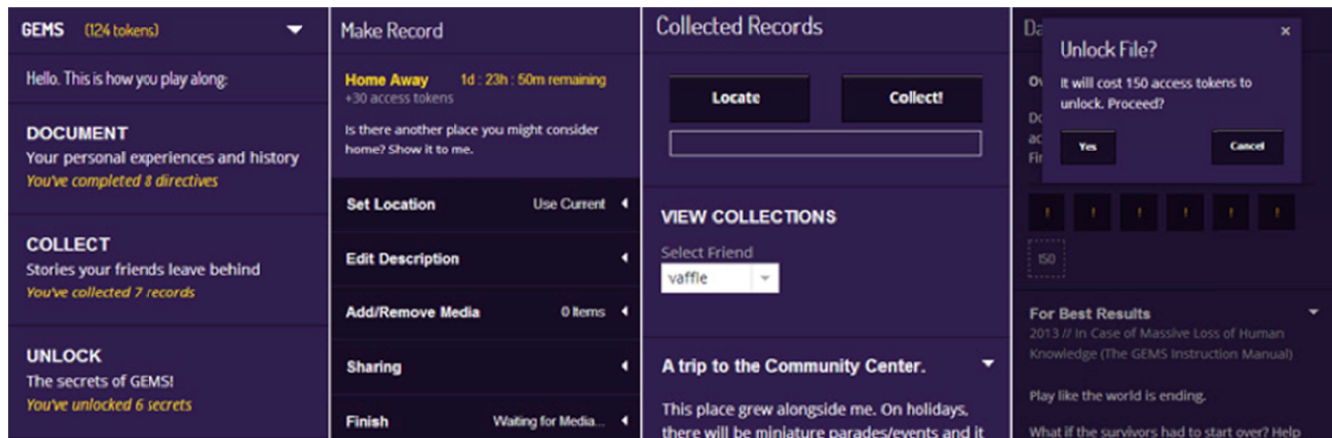


Figure 1. The GEMS interface as seen on a mobile device, from left to right: progress overview, making a record, reviewing a collected record from a friend, and unlocking databank information.

We imagined what it would be like for a person to visit places where her parents or grandparents spent time and to be able to find traces of their past experiences in those places. We also recognized that people may want to share their place-based experiences with close contacts in the present in a richer way than is currently afforded by present day technologies. Thus, we wanted to build a flexible system that would allow users to document and share memories for both types of scenarios.

With GEMS, players can document location-based stories for personal reflection and, in concept, for future generations to find. Players can also play together to share their stories with close friends or family. GEMS encourages them to reflect on their experiences, to consider which places are worth revisiting, and to consider which experiences are worth sharing. It is designed to situate location at the heart of a set of interactions for recording personal experiences and to implement game mechanics to structure and motivate this storytelling process. The main components of the interface are shown in Figure 1. We describe them in subsequent sections.

The game is set in an alternate reality fiction where the player learns of an impending natural disaster. We selected this kind of scenario to establish a narrative frame that might compel a person to reflect on her personal legacy in the face of instability and tumultuous change. In the game, players are asked to contribute to a location-based chronicle of human life by reflecting on and documenting meaningful personal experiences. We iteratively designed and implemented GEMS over several months, drawing on our past experiences studying [29,30] and playing LBGs as well as our understanding of the LBG literature. We also piloted the game throughout its design.

GEMS was implemented as a cross-platform web site accessible on smartphone and computer web browsers. We developed the site as a Node.js web application with HTML5 and Javascript for the user interface. The system stores persistent data using MongoDB, an open source

document-oriented database system, and it interfaces with a private Amazon S3 bucket to store media files.

### Gameplay Scenarios

This scenario illustrates typical gameplay in GEMS:

*Larry has decided to play GEMS. He learns that by recording a history of his own place-based experiences, he will learn about an upcoming (fictional) natural disaster. It's Saturday afternoon, and Larry is riding a bus on his way to meet friends for lunch at a restaurant. He uses his smartphone to check his directives in GEMS. His current directive reads, "show me a place where you experienced triumph." He takes a few minutes to think, and he realizes that the restaurant he's going to is near Citadel Park—the park where he hit his first and only homerun in little league baseball. He goes to the park and uses his phone to take a picture of home plate and to record a video in which he admits the steep downward slope in right field could turn a well-struck ground ball into a homerun. He calls the record "Homer", and GEMS embeds it at his current position for his family to find later. He also earns access tokens that enable him to reveal part of the game storyline.*

The next scenario illustrates how Larry's story might find its way to another player in his family.

*It's five years after Larry created his "Homer" record in GEMS and his daughter, Lucy, is now playing the game. She is 24 and has a 5-year-old son, Tommy. It's Monday afternoon and Lucy is at Citadel Park for Tommy's first little league game. Between innings she uses her smart phone to see if there's anything stored nearby on GEMS. She checks the map and notices a pin from her dad, Larry. Lucy opens up the record to see what her dad had to say about this park and learns about his first homerun – she is emotionally touched as she sees the present day connection to the park as well. Once Tommy's game is done, Lucy shows him the GEMS record and tells him the story of how his grandfather used to play at the same baseball diamond and hit his first home run there.*

The above scenario illustrates the desired intergenerational play that we imagined for GEMS over time. The scenario shows a time separation of only five years, but one could imagine longer periods of time (given technology and data storage persistence). Similar scenarios could be imagined for sharing with close contacts in present day where groups of friends or family play together at the same point in time.

### Gameplay Components

Play in GEMS is designed to unfold like a conversation. An artificial intelligence (AI) character named “MALColm” periodically asks players about their past, and they respond by recording and sharing a relevant story or memory. We felt that this conversational format would create a sense of an audience for players who are thinking of future generations and encourage players to create content as if it might be read by someone else in the future.

#### Directives

Throughout the game, players receive directives from the AI character. Directives are brief questions or prompts that provide players with short-term goals and help structure the content they must create. For example, Figure 1, Column 2, shows a directive, ‘Home Away,’ received by a player that asks for information about the player’s home. GEMS includes directives we created based on four main themes:

- a. **Specific Locations**, e.g., Where are you from?
- b. **Emotions/Abstract Concepts**, e.g., Show me a place where you experienced fear; Take me to a beautiful place.
- c. **Social Reflection**, e.g., Where are your parents? Is there a place you go with your friends? What draws you there?
- d. **Daily Life**, e.g., Where do you find your favourite meal?

We selected themes iteratively by testing them out amongst the designers during the design process. We chose these themes because we felt they would challenge players to create content that would be meaningful and interesting both in personal reflection and in sharing with close contacts. We wanted the directives to be open-ended enough to allow room for interpretation and reflection so that the content created could vary from player to player. The set of directives is pre-defined, and players cannot create their own; they can, however, create free-form records not tied to a directive.

Directives are a crucial part of the design because they catalyze the storytelling process with both a push and a pull. As a question, a directive prompts the player to reflect and to begin formulating a story. As a game objective, a directive gives the player a short-term goal to work toward in the storytelling process. There is a two-day time limit for each directive. After the time expires, the player loses the directive and receives a new one. This mechanic was included to establish a sense of urgency in gameplay.

#### Memory Records

In order to complete a directive, players must create a memory record. A memory record uses a combination of GPS coordinates, text, audio, photographs, or video clips to

capture a particular experience and the place it originates. There are two ways to create a record. Primarily, players can travel to the location in question and use a mobile device (Android phone or iPhone) to capture media and make a record on the spot. In this case, the game determines the player’s location using the device’s GPS unit. We believe this method of record creation offers the player a unique way to reflect on a personal experience and a novel way to document it. By revisiting a location for the specific purpose of telling the story of what happened there, players can become investigators of their own histories. They can experience the place again in a new context and, using their mobile device, they can produce media that helps to communicate the significance of the place. Alternatively, players may create a record when not at the location by using a map in a computer web browser. In this case, players are expected to upload existing media rather than capture new media at the scene. This method was intended to enable players to document places that they cannot visit due to time constraints, distance, or other obstacles. Figure 1, Column 2, shows the ‘Make Record’ user interface as seen on a mobile device.

#### The Databank

In the context of game fiction, the databank is a pool of secret information relating to the role of the AI character and to the impending disaster. As players make records and complete directives, they earn access tokens that can be used to unlock narrative content in the databank. Recording memories at an actual location, as opposed to doing it remotely from a computer, earns additional bonus points to encourage place-based activities. Figure 1, Column 4, shows the databank interface for selecting and unlocking game information. Each fictitious fragment is presented as a blog post, report, or file pertaining to the storyline.

This fragmented style was intended to give players a sense of a puzzle with missing pieces. In order to gather all of the pieces, they need to indulge the AI character and complete more directives. We believe this kind of narrative can act as a hook to sustain players’ interest and motivation over multiple gameplay sessions. Each directive players complete brings them closer to a clear understanding of the fictional threat and, ultimately, to the resolution of the story. Thus, as can be seen, GEMS includes game elements to increase players’ extrinsic motivation. Our goal was to use this as a way to entice players to play, especially at the onset, in case they did not initially see the intrinsic value in recording place-based information. We hoped that players would gradually become more intrinsically motivated over time to play because they felt the experience was valuable, wanted to leave place-based memories behind for others, or wanted to see what other family or friends recorded.

#### Group Play through Record Collection

Players may ‘follow’ each other in order to locate, collect, and view each other’s records. Figure 1, Column 3, shows the user interface for record collection. Players search for

another player's username and request permission to follow her. If a player agrees, the follower gains access to her content. When created, players can set records to be viewable from anywhere, or only when another player is at the record's location. The former creates an overlap of experiences across distance and time, while the latter creates an overlap of experiences across time. Together, record collection allows players to leave content for one another. Thus, as a flexible tool, it supports personal reflection and intergenerational communication across time as well as sharing of place-based information amongst present-day groups of close contacts.

### USER STUDY

We carried out a user study with fifteen participants over three weeks to understand how people used GEMS as a way to document and share personal memories and as a way to connect these memories to concrete locations. Our evaluation focuses on two scenarios: players creating content for future generations to view and players creating and viewing content amongst present day close contacts.

### Participants

We recruited fifteen participants (five female) via email advertisements within our university and a local elementary school, and snowball sampling through family and friends. Thirteen participants were between the age of 20 and 29, and two were between 37 and 50. Participants' occupations varied and all were experienced with using email, social media, and software for sharing photos and videos.

Participants were comprised of two sets of players: seven participants who knew each other and were all close friends (labeled as Group Players) and eight who were playing individually (labeled as Individual Players). This allowed us to learn from two different perspectives: the experience of those with a present day 'audience,' and the experience of those with the potential for a future audience (e.g., parents leaving content behind for their children or grandchildren). Naturally, in the Individual Players' case, we could only study the perspective of the player creating records and not the future generation finding them. The perspective of the future player would be extremely interesting to learn about, yet largely impractical to study.

Our participant set was comprised of only 15 people because we wanted to observe participants closely over the three-week period. It would not have been possible to attend to the participants with the level of detail that we did (described next) if we had recruited as many participants as studies of shorter duration sometimes include (e.g., 20-30).

### Method and Data Collection

At the beginning of study, we met with each participant individually to conduct a semi-structured interview regarding their current practices relating to documentation of personal experiences, storytelling, and family communication. We also used this initial meeting to explain GEMS and introduce the player to the game interface. We explained that the game

would try to help them document their experiences in two ways: 1) for sharing with future generations, or 2) for sharing amongst present-day close contacts. This pre-play session typically took between 30 and 60 minutes.

Next, players played GEMS over a period of three weeks. Players used their own devices—typically an Android phone or iPhone in combination with a desktop computer—to play the game. We felt this would better allow them to incorporate GEMS into their existing daily routine, as opposed to providing them with a new device that they were unaccustomed to using. During gameplay, players received diary questions from the investigators through the game's mail system. Questions asked them to document their experience playing the game. We also actively monitored participants throughout the three-week period by reviewing server data and checking in through email and in-person visits.

At the end of the three-week period, we conducted a semi-structured interview that focused on enjoyable, problematic, or otherwise memorable gameplay moments. We also asked players to provide step-by-step descriptions of the process of creating a memory record. This kind of information helped us investigate why players chose particular memories or locations and how they put the 'story' together. This post-play interview usually took between 30 and 60 minutes. At the end of the study, all participants were entered into a draw for a new tablet (~\$200). Thus, it did not matter to what extent they played GEMS, and participants were explicitly told so.

### Data Analysis

We gathered the transcripts of both the pre-play and follow-up interviews together with the diary entries into a single collection of qualitative responses. We used open, axial, and selective coding [35] to analyze our data at the individual player level. We present a number of specific quotations that are representative of the trends we discovered.

Our results first explore the ways in which players created and collected records while playing and the processes they used to reflect on locations and create content. Next we outline the ways in which players were motivated to play and how this affected engagement in the game.

### RECORD CREATION AND COLLECTION

In our study, we examined the practices of both Individual and Group Players for creating records and, for Group Players, how they collected and viewed shared records.

### Types of Content

Participants created a total of 54 records (3 median records per person, with a range of 0-11). We had hypothesized that the completion of a directive would take place over a period of hours; however, we were surprised to learn that players often took multiple days to contemplate directives. We learned that they needed time to think of a meaningful place and an appropriate story. Thus, engaging with a directive and creating a record required a significant amount of thought. For this reason, even though the number of records players created seems low, it is actually reflective of the

challenging nature of creating personal records with meaningful content. We discuss this in detail later.

We categorized player records on a number of different axes. First, 67% of records were responses to directives while 33% were free form and not responses to directives. We found the writing style of records included: accounts of specific events (39%), general descriptions of a location's significance (54%), and messages directed at the potential audience (6%). Most records related to public places (e.g., stores, parks) (52%), while others referred to a country or city (11%), private places (e.g., a home) (20%), vehicles (6%), or no real location (11%). For example, P14 documented a run-down neighbourhood. He attached a photo of a city street, and the text he included said:

*"The place near my house is a sight which I pass by everyday, and quite frankly it's less than pleasant. The houses are out-dated, the walls are less than clean, and some of the houses feel like they came out of a ghetto area. A renovation of this hood would be an ideal thing to have, and it has somewhat began as the building which I live in is very modern" (city; general description; concerted effort).*

P9 created a record at a local candy shop that included a photograph of the storefront. The text she added said:

*"This is hands down the best sweet shop in town, and the girls love it." (public place; general description; brief yet complete).*

P1 made a record of a hiking trail where he had encountered a bear. He attached a photo of the bear, and he used text to describe what happened:

*"I was quite intrigued to run into a black bear during hiking and was delighted to see it. I was excited to take a close up look and take some photos until it hit me that this was quite dangerous. The gravity of the situation got even heavier when I realized it was a black bear cub, the threat of a mother bear was a serious possibility and it was a quick decision to move away and be wary of running into the mother bear on the way back to the car" (public place; specific event; concerted effort).*

None of the participants chose to attach audio or video to their records; 78% of records included at least one photo. We did not find any substantial differences between Group and Individual Players in terms of content creation.

### Planned Play vs. Opportunistic Play

Both Individual and Group Players had similar practices for creating records and completing directives. These practices can be situated on a spectrum from planful to opportunistic behavior. A *planned approach* to completing a directive used conscious reflection to identify a relevant place and to recall a story to tell. For example, upon receiving a directive, some players would actively think about the question to formulate an idea and a course of action. Part of this reflection involved interpreting the directive in order to narrow down the range of possible locations to select from.

*"I stopped and thought about [the directive] and came up with an answer. I asked myself, what is the most meaningful place for places where I feel most at peace, most comfortable?" -P9 (on "show me a place for thought")*

Alternatively, an *opportunistic approach* relied on inspiration, convenience, and a chance to create records.

Some players created records when they found themselves in a particularly interesting place. In some cases, this meant stumbling across a place that could be used to respond to a directive. In others, it meant making free-form records (records with no directive) for the sake of sharing an experience that did not relate to the current directive. Either way, these players did not build a record around a pre-formed mental picture. Instead, they waited for a location and a memory to emerge before they created a record.

*"When I was taking pictures one day, I was like, 'That question is asking me where I eat, so I might as well take pictures of that kind of place'. One was really close to my house. I ended up there, took pictures...then later I accepted the directive and put the record together."-P14 (on "show me a place where you find your favourite meal")*

*"I actually liked the free form records... I could take a picture any time and then build something around it and upload and that would be it. The one I made about the library, It happened at the moment. I was there, and then it happened."-P10*

Players' behavior was not always strictly planful or opportunistic. Some participants exhibited a hybrid approach that involved both planning and opportunism.

*"I had accepted [the directive] and left it for a few days. I was thinking of what type of triumph [to document], and I couldn't think of anything. Then when I was walking by my old school, I remembered how I had played a basketball tournament there, so I took a picture and made the entry on my phone."-P1 (on "show me a place where you experienced triumph")*

### Discovery

We found that the acts of creating and collecting memory records could enhance the meaning of familiar places and create new meaning in unfamiliar places. On a personal level, players discovered forgotten or overlooked aspects of familiar places as they reflected on the game directives. This occurred for both Individual and Group Players when creating records and for Group Players when collecting them from other players. As mentioned above, P1 rediscovered a forgotten childhood memory as he struggled to identify a place where he had felt triumph. In this way, he developed a richer personal understanding of that place by documenting his experience of it. Other players had new experiences in the process of documenting familiar places. For example, P14 decided to spend some more time at his favourite restaurant as he was documenting it in GEMS:

*"My favourite directive was the one about where I like to eat...one spot was Cactus Cafe. I passed by, and I was like, 'Might as well go for a drink!' -P14 (on "show me a place where you find your favourite meal")*

These cases highlight one aspect of the value of using location as a medium for storytelling. By revisiting a place as part of the storytelling process, players created a new experience that added to their history with the place. Similarly, players also seemed to connect with new places by consuming the stories created by their friends.

*"One record I collected showed a place I didn't know about that was in Richmond, so that was interesting. He pinpointed a restaurant at Bridgeport, and I didn't know it even though it was in my neighbourhood. So in my mind I thought, 'Oh, maybe next time I can check that out.'" -P10*

### Effect of a Present-Day Audience

We noticed for Group Players that the players' sense of a present-day audience influenced the content they created. A player's rationale for documenting a particular place or experience often related to their understanding of who would be collecting the record later. This kind of behavior could be considered "impressed management"; according to Goffman [15], an actor performs for a target audience in such a way as to give them an impression that suits the actor's goals. In this way, players explained how they sometimes chose a certain location or took a certain photo in order to elicit a specific reaction from the other players.

*"The game asked me to show a place for thought. There are a lot of places I thought would be helpful for me to think. I ended up doing the washroom which was funny. But it did make me think about, 'Which one do I want to show my friends?' I chose the washroom because I thought it would be funny for them." –P10 (on "show me a place for thought")*

*"[The record] was a different perspective I wanted to share with other people. Something they don't usually see. I felt like I had a responsibility to make that post." –P2*

Conversely, Individual Players typically did not think about their audience when creating records. They found it harder to 'imagine' this audience, and, instead, play was about personal reflection only. When we asked them about whether they would continue to play after the study was over, they expressed an interest in having a stronger sense of audience and playing with a group of 'the right people':

*"I'm not sure it's something I would play for years unless I had the right network of people to play it with... I think people I know would relate to those memories are people I would definitely want to include. Either family or friends I think would enjoy learning about these things." –P12*

*"I would be interested in playing over a longer period of time if it was more social. I would want to see what [other players] are doing." –P4*

This finding suggests that the design of GEMS failed to evoke a strong sense of a 'future audience' in the act of recording place-based experiences and raises the question of how to represent this kind of audience effectively in storytelling interactions. We return to this in our discussion section. Overall, these results also show that a player's motivation and goals may change between individual and group play. Factors such as introspection, reflection, and posterity may be important for an individual player, but in a group setting, they may be superseded by the social goals that drive impression management.

### MOTIVATION AND ENGAGEMENT

GEMS was designed to leverage personal, player-generated content as the core attraction: we wanted players to *want* to play because they were intrinsically motivated [34]. Yet we also had components to encourage play via extrinsic motivation (e.g., game narrative, directives) [34]. We discuss each next and identify how group play and travel acted as additional factors that influenced engagement.

#### Extrinsic Motivation

Our interviews revealed that participants were first motivated to play GEMS extrinsically. The design of GEMS included mechanics intended to help draw players

into the game and prompt them to start creating stories: directives, time limits, and access tokens and narrative.

#### Directives

In general, directives seemed to be effective in supporting the storytelling process. First, they gave players an entry point for the game itself. All but two players completed the first directive which asks the player to document the place that feels most like home. Afterwards, players went on to complete further directives and some began to experiment with free-form records. The directives also gave players a point of departure for individual storytelling activities. As mentioned, interpretation of the directive was the first step in the storytelling process for many players.

*"When I was trying to complete a specific objective, I thought about how certain places have more meaning than others." –P1*

*"[The directives] tried to invoke me to learn more about myself. It helped having someone ask me questions." –P4*

#### Time Limit

When a player accepts a directive, they have two days to complete it and earn points before it expires and they receive a different directive. As mentioned, players were mindful of this limit, but they were not mindful of it in the way we intended. In the design process, we introduced a time limit in order to set a pace for the game that encouraged players to engage on a somewhat regular basis. In practice, however, we found many players would circumvent this mechanic by 'putting off' accepting the directive until they had selected a location to talk about and had prepared media or travelled to the location. They described this tactic as a deliberate, strategic choice. This highlights the fact that participants saw record keeping as a reflective act where they preferred to have time to perform it rather than be 'rushed' and do it 'in the moment'.

#### Access Tokens and Narrative

Outside of content created by other players, the primary rewards in GEMS were access tokens and game narrative, which could be purchased with the tokens. Most players acknowledged access tokens as a light but encouraging reward. They expressed a feeling of delight in accumulating access tokens even though they were not a top priority.

*"[Earning tokens] felt good. It was good. It was nice to get a reward for certain things. I probably would've done it without them, but at the same time, it was nice." –P6*

Moreover, we found that the application of access tokens toward unlocking fragments of information in the databank served as a more substantial reward for some players who were interested in pursuing the narrative. Part of this interest stemmed from a general curiosity for storylines while part stemmed from a desire to complete the game. They understood the narrative as a measure of their progress in the game and wanted to unlock databank items for the sake of reaching the end.

*"I guess it would be the motivation to the game for me. If you didn't have the narrative, it would be more like a twitter feed and the narrative was the motivation for me to continue on." –P10*

*"[Databank items] are kind of the story behind it. I really love stories, so I think it's kind of a fun way and an interesting way to think about what you're doing. It's kind of like reading a book while you're playing a game which is kind of an interesting concept" –P12*

Conversely, some players felt indifferent towards the databank. They did not feel that it was an important or necessary part of the game, or they were not particularly interested in the style and content of the narrative. Consequently, they simply ignored it. Similarly, some players seemed to forget it existed.

*"I didn't know how or why [unlocking databank items] would benefit me. I was indifferent." –P13*

While the narrative was not completely effective, we believe the more positive responses indicate that it can function as a source of extrinsic motivation for some people. Other people may simply not need narrative to be compelled to create records, which we describe next.

### **Intrinsic Motivation**

Our interviews revealed that the motivation for participants to play GEMS was not initially intrinsic. Yet, over time, once players 'got into the game,' personal content engaged players on an intrinsic level. For many players, the moments that stood out from their experience with the game were the ones that involved a novel discovery through personal reflection. They expressed a sense of delight in working through a thought-provoking directive and discovering some new aspect of their own identity or history. One participant said that the directive that stood out for him was one that asked him to show a place of triumph:

*"I expanded my concept and had to think of a triumph that was a little farther back in time when I was a lot younger. I had to think about it more than usual" –P1*

This player was aware of how many points he earned and how many directives he had completed, but the internal discovery was his favorite part of the game. Other players expressed a similar delight in moments that challenged them to produce something personal or think in a new way.

*"I found I became more aware of potential areas that I could document. For example, I would do ritual visits to the library. And I had already done one log of the library, so I was looking to find somewhere besides the library. I wanted to find somewhere new." –P10*

*"Those are definitely places I wouldn't think about when I'm present there. But when it's prompting me to think about these places...where are they? Why are they? It's a more reflective process." –P12*

This kind of engagement occurred for those who were playing with other people they knew. Group play seemed to enhance the level of engagement with the game. Collecting or creating a record with an audience in mind resulted in novel or meaningful moments.

*"For me, I have the disconnect of not being at home anymore. I have friends here who don't know about where I'm from, so I could tell them if you go here, here's an extra reason why it would be kind of fun to check out." –P12*

In these cases, players were interested in creating stories in GEMS as a way to fulfill some interpersonal goal. They

considered location as a reflection of a person's personality and history, and described a level of engagement that reached beyond points or progress in the game.

All but one of the Group Players claimed to be interested in the activities of the others. Moreover, they suggested that a high level of activity among friends generated interest playing the game. Conversely, they admitted to losing interest during periods where their friends were not creating many records.

*"As I got busier with school, it became the last thing on my mind...But the least I could do was collect other people's records." –P2*

*"I tried to see who was uploading new things. My ritual of checking on them started to taper off when they didn't make any records for a while." –P10*

For most players, this group of players needed to include people they were comfortable sharing with and people who had some similar interests and experiences with a social tie to them. They described this as close friends or family.

### **Travel**

We learned that players were much less willing to travel for the sake of creating and collecting records than we anticipated. In the design process, we assumed players would enjoy the opportunity to experience the past and present 'simultaneously' by physically visiting locations. In practice, the cost of time and distance outweighed the novelty or nostalgia of authoring or consuming a story in its location of origin. Most participants felt it was too difficult to travel to each location to embed stories.

*"Some of the places were not as easy to get to. When they were too hard to get to, I didn't feel like I was really playing properly. But it was awesome to get the bonus points for making the record in place. That made me want to go make the entries in the actual location more." –P1*

Similarly, many players felt that it was too difficult to collect distant records because they did not have the time to travel to far-away locations. We allowed players to decide if their own records had to be physically visited in order to be collected or if they could be collected remotely. Most Group Players commented that it was too difficult to collect the ones that required them to travel.

*"I wish I could venture out and collect the far away ones, but I don't know when that's going to happen. It makes it more interesting, but it's also too hard." –P2*

*"[Collecting records] seemed like a really interesting idea. I did do that. I did the general pickup. I didn't go looking for records...I'm confined to transit, and most participants were out of my range. It was like, 'You are here. Everyone else is over here. Darn.'" –P6*

### **DISCUSSION**

We now summarize and discuss our findings and outline the lessons we learned for the design of new experiences to capture and share location-based experiences.

#### **The Role of Location for Storytelling**

First, our design work and study revealed that location can function as an entry point for storytelling. When we asked players to think about location first, they were able to generate meaningful content. This happened both



opportunistically and in a planned manner with additional reflection. Location also provided opportunities for rediscovery. Together, this illustrates the value in designing richer interactions for collecting and sharing location-based experiences that go beyond simple ‘check-ins’ and geo-tagged pictures and video. It also shows a different pattern of usage than studies of people who play Foursquare [25]. Systems like Foursquare allow individuals to visit a place and say, “I was here”. GEMS shows that there is room beyond this basic ‘check in’ to enrich a place with detailed personal stories: people can not only indicate the places they have been to but also the reasons they had for going, the things they did, and the feelings that had.

### Presence vs. Convenience

We did not expect players to perceive distance as a discouraging obstacle for location-based storytelling. Originally, and perhaps naively, we imagined that players would be excited to visit unfamiliar or forgotten places and that distance would be understood as more of a measurement of challenge or a sign of potential adventure. Instead, players often considered physically travelling to a location (for both creation and collection) an obstacle and used the remote creation features more often than expected. This suggests that games or systems designed for users to create location-based stories should consider alternative, remote methods of creating and collecting records.

Comparing this to commercially-available systems (e.g., Foursquare, geotagged photos), we see this is not the norm where content must be created at the location of interest [25,28]. We also see that this contrasts play in other LBGs like Geocaching where players *must* go to locations to create content [29,32]. When consuming content, players of games like Foursquare can view content anywhere. This reflects the way participants in our study wanted to view records created by others. Conversely, for Geocaching, many people report on the enjoyment in visiting new locations to consume content [29,32]. We believe this difference stems from the volume of players in Geocaching when compared to our study of GEMS. In Geocaching, players can consume content placed by anyone and because of this, there are large amounts of it around. Yet in GEMS, content is much more limited and widespread across large distances, depending on where other players reside. Thus, players are likely to have to travel further to view content.

### The Role of the Audience

We also learned that the ‘audience’ is important for player-created content. Participants purposely thought about who would view their content when they created it. This was especially the case for Group Players who had an easier time since they were playing with others they knew. On the other hand, Individual Players had a more difficult time with this and talked about the need for some kind of more explicit audience or group when they imagined leaving content for future generations to collect. In related systems, like Foursquare or Geocaching, an audience is implicitly

provided because of the large volume of players [29,32]. Yet with games like GEMS, the audience will be much smaller and more targeted, and harder to ‘imagine’ when creating content for future players.

This suggests that presentations of a future social circle, albeit fabricated by the game, may be compelling to try to explore for the case of intergenerational play. For example, games could create representations of what a future child may look like and include this person in the game’s narrative or structure. Of course, this is a preliminary idea that needs to be tried and tested. There are also likely many other ways to create the sense of an audience for intergenerational play. Designers should think carefully about how future players are presented to support the wide range of individuals and relationships that players may wish to create records for.

### The Value of Motivation

GEMS included elements to support extrinsic motivation and we also hoped the activity of recording location-based experiences would encourage intrinsic motivation. Open-ended objectives (our directives) worked well for structuring the storytelling process and inspiring reflection. People also wanted to have the time to think about a directive and reflect on it without feeling pressure to complete a record in a short time period. This contrasts the way people quickly check-in to systems like Foursquare [25] or take multitudes of digital photos on cameras [18,28], often based on fleeting thoughts and moments. It was obvious from our interviews that recording stories of one’s experiences in GEMS was emotionally-involved and sometimes felt like work. Thus, participants required additional intrinsic motivation to fully engage with the game and create records. This is more similar to the ways in which people carefully plan and construct content in Geocaching [29]. Overall, these findings suggest that both extrinsic and intrinsic motivation are important for games designed to support the act of location-based reflection and storytelling. Without extrinsic motivation, it is unlikely that players will actively engage with the game, at least initially. Similarly, without intrinsic motivation, players will not have a deep enough investment in the game to create and leave behind compelling content.

### Generalizing to Other Applications and Scenarios

Beyond the scope of personal record keeping and intergenerational communication, we believe GEMS could provide a model for designing similar systems in other areas. It could, for example, be adapted for tourism to help tourists connect with locals or with other tourists. One could imagine that a digital network of geolocated personal stories would be compelling for travellers in search of ‘authentic’ or novel places in popular destinations. This kind of application suggests a system like Bedwell et al.’s Anywhere game [4] but with a focus on personal stories. Similarly, we believe a system like GEMS holds potential to enhance genealogy and family history activities. If the

game directives were adjusted to refer to the player's family members instead of to the player, the game could help family historians match different branches of their family trees to specific places. Of course, these are initial design ideas, and they would need to be further refined and evaluated as part of future work.

### CONCLUSION

In this paper we have contributed the design and implementation of a fully-playable location-based game called GEMS that provides people with a new way to document and share place-based experiences. GEMS explores how designs can give location a prominent role in the process of documenting and sharing experiences. Our goal was to leverage location both as inspiration for telling stories and as a strong context for listening to them. We also contributed a study of GEMS where players participated in the game over the course of three weeks. Our study findings show that narrative and game mechanics can encourage storytelling, yet intrinsic motivation is also needed to support longer term play and full engagement with the creation of meaningful content. Audiences are also important and designs that attempt to capture user content over time and share it with others must ensure appropriate audiences exist, even if they are future users.

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