

DESIGNING CONTEXT-SENSITIVE GEOLOCATIVE MODERATED GROUP ACTIVITY GAMES

PAUL GESTWICKI AND KATELYNN RADER

Abstract

We present two case studies in the design of context-sensitive geolocative mediated group activity games. These are games that: use geolocation as an input mechanism; are constrained to be playable only in a specific geographical location; whose design is infused with the history, culture, or other qualitative features of the location; and whose primary gameplay exists between the players and their surroundings, mediated by a minimal software system. The two case studies cover *Spirits at Prairie Creek Park* and *Fairy Trails* and include an analysis of their requirements, constraints, design process, technical implementations, and informal evaluations. We discuss the benefits and drawbacks of this genre of games, relating both to the case studies, related work, and literature on games and play, as well as the implications of this work for future research.

Modern computing technology provides unprecedented opportunities for playful and meaningful game experiences that diverge from the dominant popular approaches. We are particularly interested in breaking the assumption that gameplay constitutes primarily a player-device interaction. “Video games” can foster player interactions that are unfettered by screens or controllers, strengthening existing social connections and building new ones, teaching something meaningful along the way. In this paper, we describe two case studies that explore unique design spaces for serious games. The cases incorporate general video game design principles with specialized local constraints. We are primarily concerned with the intersection of two design features: context-sensitive geolocation and moderated group activity.

We define *context-sensitive geolocation* to mean that the player’s geographical location is an input to the game, and the game reacts to this input in a way that is contextualized to that location. For example, Conner Prairie in central Indiana includes a historical re-enactment village called 1836 Prairietown. Visiting children are welcome to play a simple role-playing game in which they choose an occupation to which staff and volunteers react throughout the village. The responses and reactions to the players are keyed to the specific locations of the re-enactment; for example, taking the role of a fur trader will result in relevant conversations at the village’s general store. For contrast, consider the context-insensitive geolocative game, *Pokémon Go* (2016): it uses geolocation as an input, but

the relationship of the game's content at that location to its cultural context is essentially arbitrary. Pokémon discovered in Prairietown do not wear 19th-century attire.

We define *moderated group activity* to mean that the screen-based content serves to encourage and reward behaviors that occur outside of video games' conventional player-screen dyad, and that the game is played by a collocated group of players, one of whom moderates the play activity through the provided software system. The game is played out in a combination of physical reality and the digital game space. While it is true that even a single-player game can be modeled as an asynchronous communication between player and designer (Bateman, 2017), we are concerned with collocated, synchronous, group play.

An activity theoretic lens is pragmatic for considering how the game is related to the overall play experience. Activity theory is a descriptive theory that draws upon social and psychological approaches, using activity as the unit of analysis (Engeström, 1987). It has been deployed extensively in human-computer interaction research (Kaptelenin & Nardi, 2006) but less frequently in games scholarship. Notable recent examples incorporating activity theory include: Carvalho et al. (2015), who use activity theory to propose a novel conceptual model for serious games; Phelps (2016), who advocates using Activity Theory as a lens for design and analysis; and our own earlier work using activity theory to study game design and development teams (Gestwicki and McNely, 2016). In Figure 1, we illustrate how this theory allows us to analyze the constituent parts of the play activity. The players are the subjects of the system, and their object is play, which is intrinsically motivating; the labor is divided, however, such that the moderator likely initiates play as well as moderating it, while the other players participate. The activity is mediated by a software system as well as the players' physical location and the technology that permits the integration of these. The rules of the system include those that are manifest through the software as well as cultural rules of play, such as the unspoken but shared admonition against cheating. Taken as a whole, and when functioning properly, the system produces the outcomes of entertainment and—for serious games—learning. The system in Figure 1 focuses on the players' immediate experience, but activity theory lends itself to analysis of nested and overlapping activity systems; for example, our play activity is situated within a larger one that includes the developers and publishers, the Apple App Store and Google Play Store, the agencies that fund the maintenance of cultural and historic sites, and so on. The influence of these factors, which exist outside of the immediate play activity, are discussed within the context of the case studies.

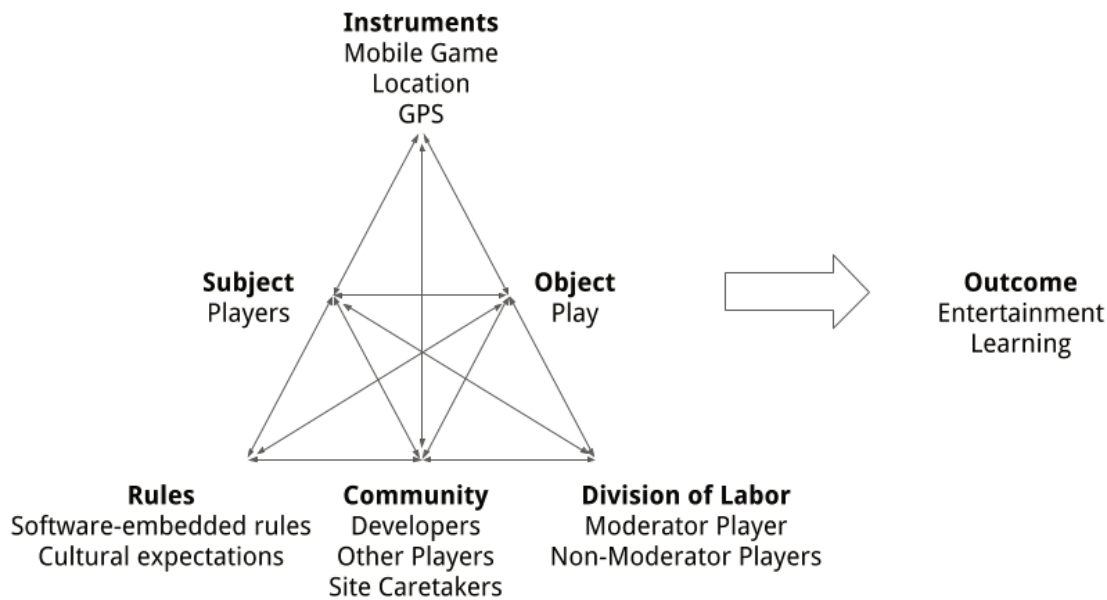


Figure 1: Activity-theoretic analysis of players' experience

Both of our case studies followed the Double Diamond design model (Design Council 2005) as interpreted by Schneider (2015) for software development. The cases were conducted by multidisciplinary teams of undergraduate students at Ball State University, which is a public university in Muncie, Indiana, that enrolls roughly 20,000 students. Each case took place across two semesters, as shown in Figure 2. In the first semester, as part of an introduction to serious game design, the students were given a themed design challenge, where the theme was articulated in collaboration between the faculty mentor and a community partner. The overall approach to design followed the steps articulated by Schreiber (2009), using the principles of educational game design framed by Klopfer, Osterweil, and Salen (2009). Between semesters, the faculty mentor and community partner closed off the first diamond by evaluating the students' prototypes and electing from them the one that identified a solvable problem that was within scope for digital production. In the second semester, another team of students—which included a subset of those from the previous semester—formed a development team that produced the game using iterative and incremental software development techniques. The production team was mentored following the Academic Studio pedagogy, an approach that blends contemporary practices of interdisciplinary project work with traditional academic values (Gestwicki & McNely, 2016). The specific practices of the production team are guided by Scrum (Schwaber & Sutherland, 2017) and informed by theories of agile software development (Cockburn, 2016).

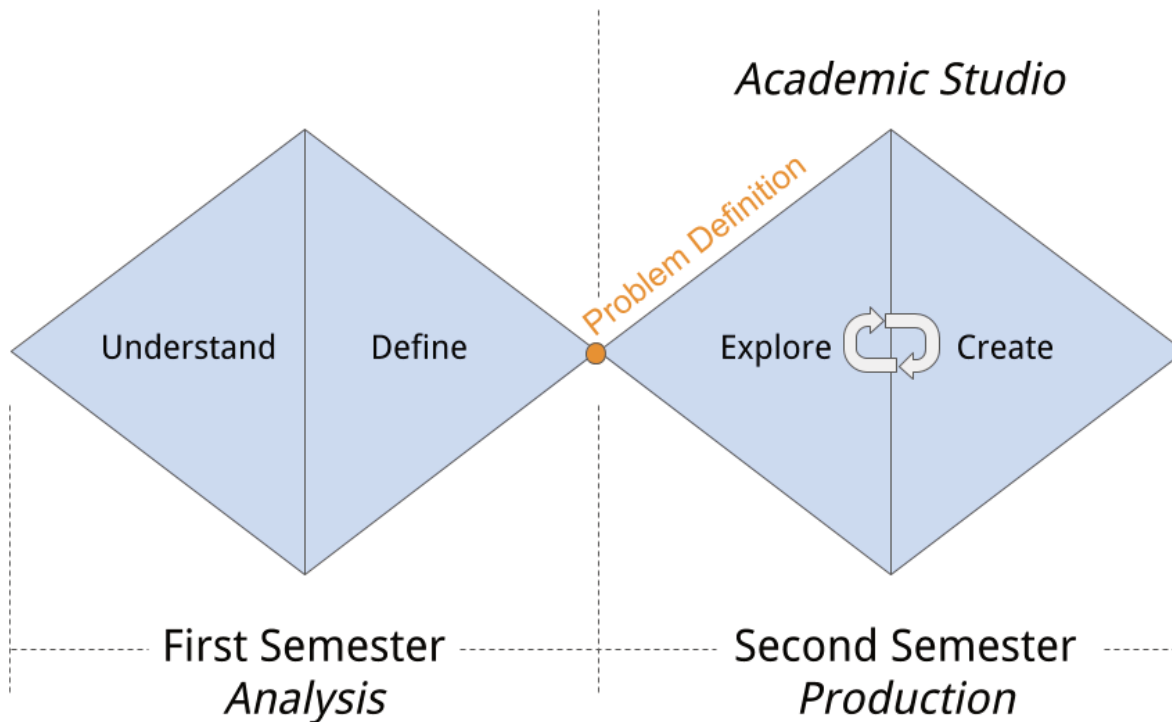


Figure 2: The Double Diamond model used by our case studies. (Adapted from Schneider (2015)).

This work is inspired in part by player practices around board games. Board games and card games have traditionally emphasized systems-based social play, and we observe trends to formally and informally incorporate digital elements that enhance gameplay. BoardGameGeek.com provides an excellent example of an informal enhancement, given that hobbyists have voluntarily tracked play data on that site for many years. Formal integration has included using apps to add new ways of playing existing games, as with the smartphone app *Road to Legend* (Hajek & Kempainen, 2016) that adds a purely cooperative experience to popular one-vs.-all board game *Descent* (Clark *et al.*, 2012). The same publisher—Fantasy Flight Games—has also published board games that require an app to play, including *XCOM: The Board Game* (Lang, 2015) and *Mansions of Madness* (Valens, 2016). Similar phenomena can be found in role-playing games, such as with *Roll20* (Orr Group, 2012), which allows people to play “tabletop” role-playing games without being in the same room.

Many scholars have seen the utility of playful digital experiences that reach beyond conventional video game design. One of the most well-known frameworks for creating geolocative games is ARIS from the University of Wisconsin Field Day Lab. This system allows end users to create interactive simulations and games through the Web that run on an iOS client. ARIS has been used to create many notable educational game projects, including *Occupied Paris* (Nelson, 2017), *Jewish Time Jump* (Gottlieb, 2017), and *Mentira* (Holden & Sykes, 2011). Alternate reality games such as those created and championed by Darvasi (2016; Fallon & Darvasi, 2017) further demonstrate how playful learning environments engage students and provide unparalleled learning experiences.

Case Study 1: Spirits at Prairie Creek

Our first case study is *Spirits at Prairie Creek Park* from Flame Llama Studio (2017) in collaboration with Muncie Sanitary District’s Office of Stormwater Management. The goal of the design was to

explore themes of environmental sustainability and water quality. The game takes place at Prairie Creek Reservoir, which is approximately five miles outside of Muncie and comprises roughly 1275 acres of water and 750 acres of land for recreation. Prairie Creek Park is on the east side of the reservoir, and it includes a playground, basketball court, docks, picnic pavilions, and a swimming area. When the city's public pool was closed for repairs in the summer of 2009, the Office of Stormwater Management started Camp Prairie Creek—a free week-long summer day camp for children in first through eighth grades. The activities of Camp Prairie Creek are designed to make children comfortable in nature and reflective about sustainability, while maintaining an atmosphere of fun and engagement; it also served as a vehicle to inform children and families about the possibility of swimming in the reservoir while the city pool was closed. It was in this ecosystem of ideas that *Spirits at Prairie Creek Park* was born, sharing the educational goals of Camp Prairie Creek. Note that the wide range of ages served by Camp Prairie Creek presents a significant design challenge, since what engages and educates a first-grader may not be the same as an eighth-grader.

One of the inspirations for this game was local stories of *pukwudgies*—mischievous creatures from Native American folklore who play tricks on humans who would disrespect them. Various *pukwudgie* stories and tales are told throughout many regions, including parts of the United States and Canada (“Legendary Native American,” 2015). There are many different stories that depict *Pukwudgies* as being kind-natured spirits who would only play harmless tricks on humans who came through their forest, but in other regions of the world, and among tribes in southern New England, *Pukwudgies* were known to be more malicious by committing deadly acts of sabotage upon those who entered their forest. Stories of *pukwudgies* provided inspiration for the game, but the team decided to avoid using them directly. There were challenges identifying authoritative sources on these mythical creatures, given the variety of cultures and folklore involved; more importantly, however, was that iterative prototyping informed the team that purely beneficial spirits were more aligned to our educational goals than trickster spirits.

Any children visiting Prairie Creek Park must have been brought by parents, teachers, or other adults. The team realized that this had important implications for the design: rather than presume the conventional player-screen dyad, the game design could take advantage of the number of players, the likely distribution of devices (for example, parents would tend to have a smartphone whereas their younger children would not), and the high levels of trust among the players. We do not think that it is a coincidence that the relationships among play, trust, and friendship were contemporaneously being explored by Koster, Cammarata, and their team at the Google Advanced Technology and Projects group (Koster 2018) as well as a Project Horseshoe working group (Cook et al. 2017); rather, we suspect that these groups recognized the trends and opportunities discussed in the introduction, and we see this in the synergy of our conclusions and results. *Spirits at Prairie Creek Park* leverages the fact that our players already know and trust each other, that they are willing to be guided through activities by their responsible adult, and—particularly for family units with young players—that multisensory, active experiences will be intrinsically motivating.

Gameplay

Spirits at Prairie Creek Park is played by groups of people, but only one player has the app on a mobile device. We will call this player the “facilitator,” borrowing the nomenclature used by Falk and Dierking (2013) in a way that will help connect this case study to the next. The game can only

be played at Prairie Creek Park, and attempting to run the game from anywhere else will produce directions to the park instead. Once on site, the facilitator’s screen will display a map of the park with icons marking five locations (Fig. 3a). Walking to one of those locations will prompt the facilitator to instruct the rest of the players to engage the environment using a specific sense while a thirty-second timer begins (Fig. 3b): players are asked to observe, touch, smell, or listen to their surroundings. When the timer expires, the players are presented a list and select the items they experienced (Fig. 3c). They are rewarded by meeting a friendly spirit (Fig. 3d), whom they can choose to name—a feature that we found gave players a strong sense of attachment to the spirit and motivated their desire to find (and name) more. After visiting all five locations, the players are shown a montage of their five spirit friends arranged in a heroic lineup.

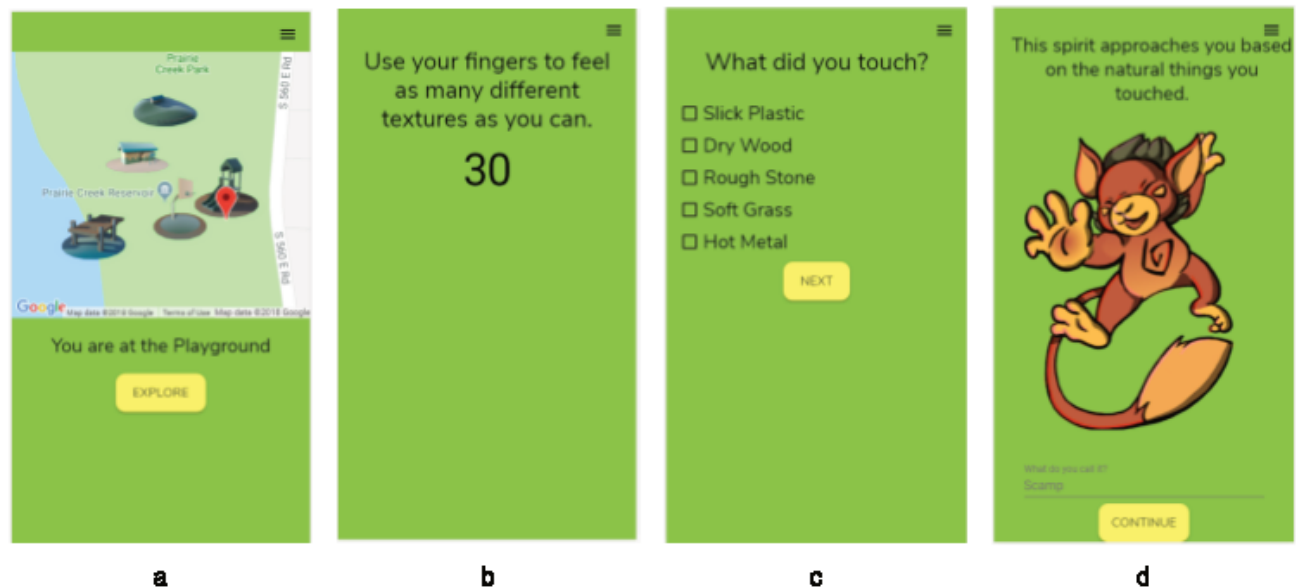


Figure 3: Interaction sequence in *Spirits at Prairie Creek Park*.

The items in each location’s list were carefully chosen to include natural and man-made items, and each location has two potential spirits. Under the hood, each item has a “nature score,” and which spirit they befriend is determined by whether they record having seen more natural or more artificial phenomena. The “natural” spirits draw inspiration from nature, while the “artificial” spirits include visual elements drawn from man-made artifacts. The mechanics for how players befriend specific spirits and the presence of multiple spirits are not revealed to the player directly; it is through replaying the game, potentially with different player groups, that players may come to understand the underlying systems.

Production and Playtesting

Prairie Creek Park has poor cellular connectivity and no Wi-Fi capability, which means that our solution had to be as lean as possible. The team used Polymer Web components to build *Spirits at Prairie Creek Park* as a Progressive Web App: it can be downloaded and installed directly to the home screen on both iOS and Android, and it caches all of its data to be robust in the face of network disconnection. The team had hoped to integrate social media features in order to compensate for the app’s low discoverability: allowing Snapchat filters or Facebook photos of players with their fairies

would encourage others to try the game. These features were lower priority than core gameplay features, however, and they were not incorporated into the final build.

The art direction for *Spirits at Prairie Creek Park* required designing spirits that would be enjoyable for young players, entertaining for older players, and appropriate for both the location and the artificial/natural distinction. The artists generated many concept drawings that were subjected to internal evaluation and review by the community partner. The final decision for which two spirits to choose for each location came down to a combination of fitness for purpose and representation of the various artists.

There was limited playtesting of the game prior to release, primarily with family groups. The players uniformly enjoyed the game: children and adults alike enjoyed exploring the park with different senses. We observed parents spontaneously engaging their children in discussions about nature and their relationship to it, in accordance with the goals for the design. Unfortunately, although *Spirits at Prairie Creek Park* was designed to be played at Camp Prairie Creek, it was not deployed for lack of technology support. Park attendees were informed that they could return to play the game, but this did not overcome the game's severe lack of discoverability: it can only be played at a single location, but there is not any indication at the location that there is a game that could be played. The game is available to everyone and played by almost no one.

Case Study 2: Fairy Trails

Fairy Trails (Guy Falls Down Studio, 2018) is a collaboration with Minnetrista—a cultural center in Muncie, Indiana. Its 40-acre campus includes gardens, a historic home, museum building, a nature area, and a portion of the riverside walking and biking trail that runs through the city. Its property includes the original homes of the Ball brothers, who were pioneers in glass production, founders of the Ball Corporation, and philanthropic benefactors of Ball State University.

A part of Minnetrista's mission is to support and communicate the legacy of the Ball family, and this provided a theme for the student designers' creative work. The original design team explored many different aspects of the Ball family's life and legacy, but the piece that captured most designers' imaginations was the story of Elizabeth Ball. Elizabeth was born in 1897, and as a child she showed a particular fascination with fairies. This fascination was evident in the Ball family's extensive collection of children's books (Schiller, 1997). Elizabeth's love of fairies is featured in many of Minnetrista's educational resources and activities, including the popular Fairies, Sprites, and Lights event. This annual event engages children in meeting fairies throughout the grounds, and it is a highly-structured event that includes significant investment in materials and staff. *Fairy Trails* was designed to explore similar themes to Fairies, Sprites, and Lights on a much smaller scale, allowing for family and group engagement without needing paid staff or volunteers to coordinate the activity.

Minnetrista has used a psychometric model for analyzing museum visitor behavior (Falk & Dierking 2013) to determine that their primary visitor types are *facilitators*, *explorers*, and *rechargers*. Rechargers tend to visit by themselves, using the expansive grounds as a retreat, whereas Facilitators and Explorers come in groups. In particular, a group often consists of one Facilitator and several Explorers, where the Facilitator is interested in bringing a good experience to their group. These

are often intergenerational groups, such as parents with children or a college student with visiting parents.

Transitioning from Rechargers to Facilitator-Explorer Groups

Fairy Trails evolved from *Down the Wishing Well* (Mills-Rittman, 2017), a prototype created during the first semester of the project. *Down the Wishing Well* was designed as geolocative interactive fiction, implementable in a system such as ARIS. It is a single-player experience targeting rechargers: a single player could use the game to meet fantastic fairy creatures while wandering the grounds. The game's main dramatic theme encouraged the player to consider whether they embraced imaginative play. The faculty mentor and community partner agreed that while the structure of the game was appropriate for the context, it would be more fruitful to target facilitator/explorer mixed groups. Rechargers, after all, do not need additional engagement in order to recharge, whereas facilitators regularly seek new means of engaging the explorers they bring.

The second semester production team was given *Down the Wishing Well* and were introduced to the recharger-facilitator-explorer taxonomy. In consultation with Minnetrista, the team defined their mission statement, which was printed and posted on the studio wall:

We are making a geolocative, narrative-rich mobile app that helps facilitators engage with explorers at Minnetrista—an app that features the varied grounds of Minnetrista's campus and the early 20th-century fairies beloved of Elizabeth Ball. The app will bring people together to be creative and engage the group in imagination and reflection.

Despite agreeing upon this mission, the design team found it to be a difficult target. They found that single-player, single-screen motifs kept creeping into their prototypes. This is potentially attributable to their being novice designers and also to many being video game hobbyists. That is, their conceptual model of video games led to the inappropriate inclusion of familiar tropes. For example, many designs featured extended dialog with fairy characters as commonly seen in computer role-playing games. While these may be appropriate for an individual's reading (or skipping) screens, it does not scale well to groups of players. The point of the mission statement was to be able to throw away good ideas; yet, even when the conflict with the mission was pointed out, some team members were too attached to their ideas to evaluate them objectively.

The team spent many iterations refining a single fairy meeting, each time coming closer to understanding the unique design space of this project. This is appropriate given the design approach described in Fig. 2, although retrospectives revealed rising tensions as the project deadline drew closer. There was a watershed moment halfway through production when one of the key designers realized that the *facilitator* in our vision statement was akin to the *Dungeon Master* in *Dungeons & Dragons*. Once he realized that our fairy encounters were like *D&D* modules rather than like conventional video games, he became much more productive and also helped the rest of the team to better understand the design space.

Gameplay

Fairy Trails is playable only at Minnetrista, and directions are provided for those who are elsewhere. Once on campus, the player is shown a screen that lists the names of three fairies and their locations