

# Gamifying the Annotation of Physical Spaces

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## ABSTRACT

In this paper, we will discuss the topic of crowd sourcing the annotation and documentation of physical spaces through the use of gamification. Gamification has been used frequently to improve user experiences in non-gaming systems, but it has yet to be implemented in such a way that users will be encouraged to extensively document the physical spaces in which they live. The documentation of public spaces can be a very resource heavy task, so a way to distribute the workload among many users would dramatically reduce the time spent annotating these spaces as well as significantly reduce the cost. An idea for a mobile application is presented and described that will be used to address this problem.

## Keywords

Gamification, Annotation, Documentation, Crowd Sourcing, Location-based Systems.

## 1. INTRODUCTION

The main idea behind the annotation of physical spaces is to communicate enough information about an area, such that people are able to accomplish their intentions as easily as possible. We will define the annotation of physical spaces as the creation of information to be conveyed either physically or virtually, relating to places located around the world where people can physically go. Street and building signs are common examples of annotations that are quite necessary for people to find what they need to and although these are common, they are very general pieces of information. A problem lies in the fact that depending on the goals a person has, what information is relevant can change drastically. For example, when searching for a restaurant to eat at, relevant information would include quality of food, service and prices of local restaurants - which often relies on local knowledge and opinions - and would not include nearby clothing or electronics sales. For this reason it is not spatially feasible to create all of these annotations in the form of physical signage. Technology has provided us with a way to make all of this information available without the limitations of space. By virtually annotating physical spaces, individuals can search for and select appropriate information for their needs. The issue now is how collect this information because annotating and documenting a physical space can be time consuming and costly.

Public annotation of physical spaces often obtains a very accurate depiction of how a population interprets a given space. This is often the kind of information people are seeking when looking at annotations. There are currently several systems that already work with this concept such as Yelp and Urbanspoon. These are both restaurant review systems that are designed to take public opinions of restaurants and make them available to anybody who wishes to access them. The information communicated by these systems is a meaningful step above and beyond what a mere restaurant map would communicate because they provide detailed information that people desire in certain situations. This is evident in the growing popularity of these sites. The system being proposed in this paper

will attempt to gather this detailed and publicly driven information about physical spaces, while not limiting the subject matter to strictly restaurants.

We will investigate the concept of crowd sourcing this documentation by creating a system in which users will annotate physical spaces, thereby distributing the work and making it significantly more cost efficient. The idea behind this project is to use game design elements to encourage users to complete the task of annotating spaces without the need to monetarily compensate them for their time.

First, we will further discuss the usefulness of annotating spaces as well as some of the benefits and difficulties that come with allowing the public to partake in the annotation [2]. Then we explore the importance of having this solution be location-based. This includes providing additional motivations for users who use the system as well as increasing the likelihood of information integrity and understandability [1,2,3]. After that we will see what is involved within the process of gamification and what are good ways to evaluate it [4,5]. Finally, we will take a look at a proposed system that is designed with the intent of encouraging users to document and annotate the locations that they visit. We will be addressing the points that have been discussed throughout the paper in order to explain the thought process behind each of the key features.

## 2. RELATED WORK

Previous work that has been conducted relating to this project can be broken up into three general categories; annotation of public spaces, location-based systems, and gamification. We will define public spaces as physical or virtual areas that are open and accessible to all.

### 2.1 Annotations in Public Spaces

There have been multiple papers done on annotations in public spaces, but one that was very closely linked to this project was about GeoNotes [2], a location-based information system for public spaces. This system is designed to connect information pieces to specific positions in physical spaces. The largest difference between this system and the one proposed here is that we shift our focus onto the topic of user motivation through to use of gamification. That said, much of what is discussed in the GeoNotes paper is very important to this project. In their research they discuss different aspects of annotating public spaces as well as location-based annotations. A few of the paper's points that are most relevant to our system are discussed in this section as well as the next one.

Although public spaces in the physical world have been largely commercialized in terms of annotations via messages/logos on billboards, clothing, cars, etc. [2], virtual public spaces remain largely accessible for anyone to express their thoughts and opinions. Some examples of this freedom in virtual space are Yelp and Urbanspoon, which were discussed earlier. These systems provide everyone the opportunity to see what others have thought

about a specific place without having to go out of their way. Having a convenient way to access relevant information is a large factor in why annotating public spaces is so useful.

As was explained before; allowing the public to annotate physical spaces often obtains a very accurate depiction of how the population interprets that space, which is often the kind of information people would want when looking at annotations. The downside of providing this access to the public is that it opens the door to possible inappropriate or offensive content. This ties in very heavily with levels of anonymity [2]. In a system with complete anonymity, there is a higher chance of this offensive content because an author is not morally or legally accountable for statements made. On the opposite side of the spectrum, a system with full non-anonymity will discourage authors from posting at all for fear of public criticism and even possible legal charges. A middle ground between the two is the concept of anonymous signatures where authors have the comfort of knowing that they can express themselves without as much public scrutiny. This system still deters illegal actions because of the increased chance of being caught [2]. This is important to keep in mind when designing this project in order to protect authors while still maintaining a reasonably "clean" space.

## 2.2 Location-Based Systems

Lots of research has been conducted in this area, many of the papers referring to either Geocaching or Foursquare as the system of focus. Geocaching involves hiding a container in a particular location, and then publishing the latitude and longitude coordinates for other geocachers to find [3]. This system is relevant to this project because we can learn how to motivate users to go out of their way to accomplish a task. Foursquare is more of a gamified check-in system where users compete for "ownership" of spaces by the frequency that they visit them [1]. This system is relevant both in the fact that it has gamifying elements as well as being a pervasive location-based application, from which we can learn how this is accomplished and implement these aspects into our own application. I have chosen two papers that each focus on one of these systems and the motivations behind the users of them. This section will discuss some of the points these papers explored relating to this project as well as concepts from the GeoNotes paper mentioned in the previous section.

With the increasing number of devices with GPS capabilities, location-based applications are becoming more and more common. Applications such as Geocaching and Foursquare have large user groups that they have built up and sustained over time. There has been previous research done on the motivations of users who regularly use these types of systems. Some of these motivations included the discovery and exploration of new places [3], personal tracking, and meeting new - or socializing with old - friends [1]. Although the system that this paper is proposing will differ in several ways from these ones, these general motivations can be carried over and used to create a better user experience.

Using location when considering annotations also has many useful functions. Spatial context is a useful tool when communicating about a topic. If it is known that the author and the reader share the same spatial context, then the annotation can refer to that context without a loss of understanding [2]. For example a note on a door saying "make sure that this is properly closed" suggests that the door should be checked when leaving, but without the spatial context, it is unclear what the note is referring to. The notion of

context knowledge for both the reader as well as the author is an important point while designing a system for documenting a physical space. By forcing authors to be in the space they are annotating, we can assume some minimum level of knowledge about the area.

## 2.3 Gamification

Although referred to under many different labels, there has been quite a bit of research on gamification. Gamification can be described as the use of game design elements in non-game contexts. One source that will be referred to defines the term gamification as a large focus of the paper's topic [5]. The other refers to this concept as "games with a purpose" or GWAP, but still discusses the purpose and effectiveness of gamified systems [4].

Gamification has been used in many systems in order to motivate users to become engaged with a higher intensity and duration [5]. The idea behind this process is to tap some of the brainpower that is spent playing video games and use it for a productive purpose. More than 200 million hours are spent each day playing computer and video games in the U.S. alone [4]; if even a fraction of that time could be put towards a useful task, it could majorly cut back on the time and money poured into many trivial tasks. The success of a gamified system is how many people use it and how much information is collected. When evaluating the system proposed in this paper, we will use a previously defined method of sidestepping the philosophical discussions about whether something is "fun" or "enjoyable" and instead observing whether people are inclined to use the system or not [4].

The paper which attempts to define gamification discusses how the line between gamified systems and full games can often be blurry and can depend on the context of the specific person who is using the system. Some people may "use" your system and others may "play" it. This makes it difficult to say exactly what a gamified system is [5]. For the context of this project, we do not need to define whether the system is a gamified system or simply a game; the purpose is to make a system that encourages users to consistently want to input data. That being said, this other paper does mention several game elements and game design elements that are often found within games and have been thought, by many people, to increase the amount that users enjoy a system. Some of the elements we will make use of are: self representation with avatars; reputations, ranks and levels; marketplaces and economies. As said in the paper, simply having these elements does not make a game, but the inclusion of them is thought, by some, to improve the experience.

## 3. PROPOSED WORK

This project will be a location-based mobile application designed on the Windows Phone in which users will be incentivized to create annotations about the spaces that they visit.

### 3.1 Gameplay Scenarios

Scenario 1: Larry checks his phone and sees that his pet, Bonkers, is craving a burger. Larry goes to a burger place and takes a photo of the area. Sparky gets fed from this photo and Larry gets bonus points for satisfying Bonkers' craving. Larry can now see all of the other pets that have recently been here.

Scenario 2: Larry goes on a hike and finds a spot with an amazing view. He takes a picture of it. Bonkers is entertained by it and Larry receives points for being the first one to annotate this place.

Scenario 3: Larry has saved up quite a few points from annotating spaces and checks the store. He sees a hat that he wants to get for Bonkers. He spends his points to get the hat and his pet can now wear it.

Scenario 4: Larry walks into a Mac Hall. He pulls out his phone and checks the most recent and most popular annotations. He sees that someone posted about how good their food was, so he decides to try it out. After eating, he joins the other user's annotation so that others will be more likely to see it.

### 3.2 Game Aspects

In this application, users will have a pet to take care of. This pet will have different satisfaction bars corresponding to different needs, for example food, entertainment and exercise. Throughout the day, users can make annotations in order to increase the satisfaction of their pet. Users may also earn points by doing special tasks, such as completing a challenge, being the first one to annotate a space, or making an annotation, that other people like. They may then spend these points to either buy things for their pet, such as hats or glasses, or they may spend them on ways to customize their annotations, such as different fonts or lens filters.

### 3.3 Annotation Creation

Annotations that users create can either be in text or picture form. These annotations will be linked to their account so that their friends can see what kinds of things they have annotated. It will also help reduce the number of inappropriate annotations that are made because users will know that this information can be traced back to their profile.

### 3.4 Location Usage

When a user creates an annotation, the latitude and longitude of their location will be stored along with it. The annotation will then be anchored to that space so that other users near the area are able to view it. The locations will also be tied into gameplay to encourage users to go to places they may not go on a daily basis and make it more exciting for them with a "treasure hunt" type of feel.

### 3.5 Social Aspects

This application will encourage users to interact with one another's annotations by rewarding both the author and the reader with points that they can use towards in-game purchases. This should create an open community where users will support annotations that they like which will create a more accurate depiction of how the user population feels about a space. Users will also be able to add friends so that they can keep track of people with similar interests and opinions as themselves. Meeting new people and keeping in contact with old friends has been said to be one of the motivations for using systems such as foursquare, and will likely be a similar case for this system as well.

## 3.6 Evaluation

After the system has been designed and implemented, it will be put through an evaluation period where multiple users will be recruited to test it. The evaluation will be used to understand what users think about the application and whether or not they enjoy using it. Then, based on the feedback that is received, potential changes will be suggested for future iterations of the system.

## 4. TIMELINE

Table 1. Timeline of task completion dates

Date	Task
Jan. 25	Hand in proposal
Feb. 8	Finish learning Windows Phone API
Feb. 15	Complete annotation module of application
Feb. 22	Complete location-based module of application
Mar. 1	Complete game module of application
Mar. 8	Complete mobile application
Mar. 22	Complete evaluation of application
Apr. 5	Hand in final report
Apr. 10-16	Final presentation

## 5. REFERENCES

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