Vision Statement for the Cognitive Engineering for Mobile GIS Workshop at COSIT 2011

Gamification and Location-based Services

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Introduction

One of my main interests in the area of cognitive engineering for mobile GIS is the role of gamification as it relates to location-aware technology. The theory behind gamification is that users are more likely to adopt (and actively use) an application when there is an aspect of *game play* associated with it [1][2]. A number of location-based services (LBS) have recently adopted this model, combining it with fundamental communication concepts to give rise to a new form of social networking.

As new mobile applications begin to adopt this model, we find more and more users volunteering not only their personal and social data, but also location specific information. Gamification is one possible answer to the question of how we engage users to publicly contribute location specific information. The volunteer geographic information concept defines citizens as sensors [3], but how do we enable citizens to act as censors? According to an increasing number of mobile applications, the answer is to turn data collection into a game.

From a cognitive engineering perspective, what can we learn from the gamification model? What are the social and psychological implications of gamifying our mobile lives? This method is having a significant impact on the development of mobile applications. With recent advances in location-aware technology, this model has found its way into mobile GIS. While noteworthy research has been done in various areas of gamification, this continues to be an area in need of further research from a geographic (and cognitive) perspective.

Background

While gamification has currently become a hot topic in the area of location-based mobile applications, the concept has previously been discussed via several different labels including “serious games” and “gaming with a purpose.” From an educational standpoint, games are an excellent teaching tool, involving students in game-play while they learn [4, 5]. Human-computer interaction

research calls the concept "gaming with a purpose," where people collectively solve large computational problems (e.g. network security, computer vision) though online games [6, 7].

One type of application built on the gamification model is social location sharing applications. Services such as *foursquare, gowalla* and *scvngr*, to name a few, are on the leading edge of this medium and amassing users by the thousands [8]. These location-based social networks (LBSN) allow users to virtually "check-in" to a venue via their gps-enabled mobile device. With every "check-in," a user gains points and badges. These "awards" create a competition between fellow users. In most systems, the user with the highest number of "check-ins" is awarded special recognition.

The original goal for these LBSN applications was to create a multiplayer game out of everyday travel behavior. Recently, big business has seen the benefit of knowing their patrons' locations. Companies such as *Starbucks* have jumped onboard, offering discounts to users with the most number of "check-ins" at a specific venue. The original aim of location-based gaming is being replaced by commercially driven gamification.

Research Needs

From a cognitive engineering standpoint, gamification of location-aware mobile applications offers a plethora of interesting research opportunities. Why would a user choose to share location information? To which locations/venues would a user choose to "check-in" and which would they not? What weights do users place on locations?

Incentives

One of the fundamental requirements of gamification is the need to incentivize the user. The user must have a reason to contribute to the system. This has been and continues to be a major area of research in social psychology, computer science and marketing [9,10]. Research has found that users need some combination of social and economic incentives in order to adopt and contribute to a game-based application [11]. While a considerable amount of research has explored general incentives, very little research has focused on the location-specific aspects. Where is a user likely to share information? Do certain locations offer more incentive than others?

For example, a user might want to broadcast that they are at the trendiest nightclub in town. Publically broadcasting this information increases the user's social stature. The fact that the user is located at a highly desirable location (arguably) increases his social worth. That same user might not

want it known that he visited a medical center last week. Since medical facilities are often associated with disease, the user does not want to decrease his social capital by being associated with the location. In other words, locations hold measures of social value and the ability to broadcast your presence at a location is one way to increase your own social value.

A number of interesting research questions are produced from this argument. What determines a location's social value and how do you measure this value? One might argue that a location's social value is directly related to a user's incentive to contribute information at that location.

Travel Behavior

The gamification of location-aware applications also offers an interesting opportunity to examine travel behavior. Many users adopt these services with the intention of having fun with their friends… and do not realize there is a fee. The cost of playing these games is not entirely financial, but instead involves publically broadcasting personal profile data along with location specifics. This might seem like a relatively low cost to the average user, but the benefits to commercial business are huge. The research community has a lot to gain from the gamification model as well. We now have access to petabytes of previously unavailable spatially-referenced personal and social data. While this data may not completely replace a multi-user travel survey, it could provide considerable insight into a population's travel behavior. Existing studies have focused on the mobility of LBSN users [12,13], but further studies should explore the validity and trustworthiness of data provided via these applications. Examination of the spatial and temporal resolution of datasets produced via this method should also be considered.

Not only could this data be used for studying transportation patterns and studying large-scale travel behavior, but it could also play a role in tailoring navigation and wayfinding models to specific individuals. Local landmarks are often used to enrich wayfinding [14] as users are normally quite familiar with locations in their local region. Since each LBSN user frequents a different set of venues and locations, a navigation model could be customized to make use of frequented locations. These locations could be used as landmarks for route navigation as they would most likely be highly salient to the user. Research has shown that landmark saliency is a result of interaction between the observer, the environment and the landmark [15]. In our case, knowledge of this interaction and the frequency of the interaction could be used to measure saliency. I believe this is an important research question. Can gamification of location-based mobile applications aid in defining a user-centric model for landmark saliency and navigation?

Conclusion

Gamification is playing a significant role in this new generation of location-based services and mobile GIS. Applications are adopting the gamification model in order to attract users and users freely publish spatially referenced information under the guise of playing a game. We as researchers have a tremendous opportunity to make use of the data generated through this method and study the influence gamification is having on the location-enabled community.

This area of research and data collection comes with its fair share of conversation points. Issues of trust, privacy and general data uncertainty are all valid concerns and should continue as topics of discussion. We must also be aware that gamification offers a trump card to society's privacy concerns (for better or for worse). Users want to play games with their friends and are willing to give up a certain level of privacy that they would otherwise not. Substantial research questions need to be asked of the data produced by this method. For one, how accurate and trustworthy is this data?

In designing and engineering the next generation of mobile GIS applications and devices, we must not ignore the power of gamification. I believe the mobile industry will continue to see a rise in location-based gaming, not just as an entertainment medium, but also for the purposes of data collection and profit. The resulting data and the methods used to engage users are certainly worthy of additional study. As is the case with commercialization of this model, research in this area has only just begun.

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