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TrailView: Combining Gamification and Social Network Voting Mechanisms for Useful Data Collection

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Abstract

There is a dearth of structured, organized photographical information of hiking trails and nature in general. Although people frequently photograph these locations and some efforts have been conducted to create virtual walk-throughs of select locations using specialized equipment (Stranger 2013; Olanoff 2013), the information is largely scattered across different social networks and other websites. With TrailView we aim to utilize the efforts and photographs of everyday hikers to create a structured view of hiking trails and nature. TrailView boasts a gamified system to encourage user-interaction and focuses on social interactions, feedback, and competition to drive data collection. TrailView also contains a point/incentive scheme designed to motivate users. This incentive scheme relies on a social voting model to drive useful data collection, and global leaderboards to encourage competition.

TrailView: A Game With a Purpose

Games with a purpose center around the construction of games where users, as a side effect of playing, perform tasks computers are unable to perform. Games with a purpose have, in recent years, been created to crowdsource the tagging and indexing of images (von Ahn and Dabbish 2004), and aid computers in folding proteins (Cooper et al. 2010). The application presented in this paper, TrailView, attempts to crowdsource and gamify the acquisition of photos for hiking trails and, in doing so, acquire trail information. The gamified system described in this paper aims to drive user engagement, content generation, and structured data.

TrailView is a system designed to provide structured photographical information of hiking trails, mountains, and nature. The goal is to acquire enough information to create virtual walk-throughs of hiking trails throughout the world similar to what Google has done for streets with Street View. Unlike Google's Street View, the acquisition of information cannot be automated by using motorized vehicles along the trails as this would negatively impact the quality of the hiking trails. Thus, we argue that hiking photos require a distributed, crowdsourced acquisition method.

The contributors to TrailView will be hikers and adventurers of all levels. However, the target users of TrailView can range from hikers looking to plan their next hike, or casual users looking to browse through some beautiful hiking trails. Much as Google Maps users use the service to plan a route, TrailView can be used to plan a hiking trail and preview the terrain that lays ahead. TrailView can also be used as a storage engine to keep track of personal photos from hikes and place them geographically and chronologically on a map. TrailView will utilize mobile applications and a website to reach the target contributors and users. It is designed to be minimally invasive, creating a thin layer between normal hiking routines and the TrailView data collection layer so as to not interfere with existing hiking patterns.

Figure 1 below shows the typical TrailView user cycle. Users examine the GPS map to view potential trails. Trail photos are examined and used to both decide on a trail and see what areas have been photographed. The user then goes on a hike and takes new photos which are uploaded to TrailView. The corresponding photos earn points, badges, and titles. The user then returns to the map to begin the planning cycle for subsequent hikes.

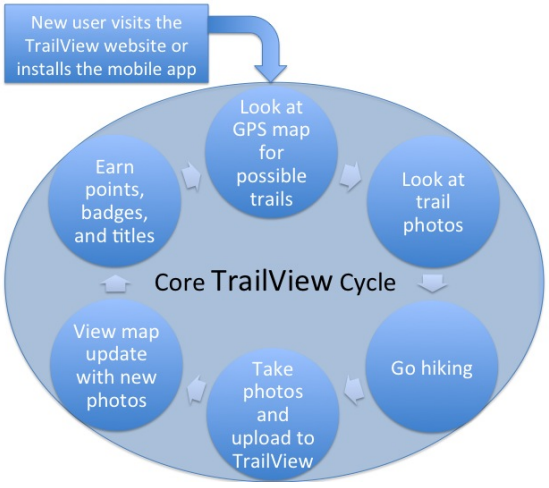

Figure 1: The TrailView user cycle.

Social, Competition and Feedback

As detailed by Huang and Fu (Huang and Fu 2012) and PhotoCity (Tuite et al. 2011), social aspects, competition,

and feedback within a gamified system lead to generation of higher-quality data. Bearing this in mind, we explicitly incorporate ideas from game design into our system. In particular, TrailView's gamified interface includes titles to be earned, points, badges, and friend/social networks.

The points, badges, and titles depend on the quality of the photograph uploaded, and in turn the quality of the data that can be extracted. Photographs that cover previously undocumented areas are worth many points as well as photographs that *complete* a trail. Completion of a trail is defined as a photograph that cover every part of the trail (the entire trail with photos every 5 meters). However, as the goal is to furthermore highlight important features of the trail, interesting photos will also garner points. To gauge the appeal of photos, a 'liking' system akin to that employed by social networks will be used to earn points, badges, and titles.

As per the research of Antin and Churchill (Antin and Churchill 2011), badges will be used to instruct users as to the type of data demanded (high quality photographs of previously unexplored areas). Furthermore, badges will serve as a mechanism for status/affirmation (feedback) and provide reputation (competition).

The incorporation of Facebook and custom friend networks is designed to not only add a social aspect to the application, but will also encourage competition throughout social networks. Point leaderboards as well as badge leaderboards will further encourage competition between users and provide feedback as to standing.

Voting to Drive Useful Data Collection

One mechanism to earn badges, points, and titles is through *likes* on photos; effectively a voting mechanism. Marquis de Condorcet proposed the view that if a majority votes for an alternative, then it is statistically most likely to be the best choice (de Condorcet 1785). This view was reinforced by Young (Young 1988) and by AI researchers (Mao, Procaccia, and Chen 2013) who examined different vote aggregation mechanisms in a crowdsourcing setting and the error associated with each mechanism.

Treating *likes* on a photo as an indication of a 'vote', the photo with the most *likes* is the photo that has received the highest amount of votes. As per Mao et al. (Mao, Procaccia, and Chen 2013), a plurality voting rule can give good results from aggregating human votes where each voter casts a single vote for a preferred choice. However, it is unclear whether conclusions drawn from this can translate to the social network space where one person can *like* multiple photos. Further research and data collection is needed to examine how closely *likes* and other social network voting mechanisms approximate the true best alternative.

Votes on photos will be accumulated and, with some variance, the photos with the most votes will approximate the true best quality photos. In this case, quality is an ambiguous term that refers to what users deem to be of high value and worth. It is the hope that the quality metrics users use to decide whether a photo is *like*-worthy will coincide with the goals of TrailView.

The social voting scheme will be essential in the data collection. As *likes* are required to earn maximum amount of points, users will upload photos that they believe will garner *likes*, and thus a psychological cycle of reinforcement learning is created where user behavior will be guided toward quality metrics defined by other users.

Future Work

We have described our design of TrailView and intend to being data collection in order to illustrate its effectiveness shortly. Using mobile applications as well as a website, users will use the system to upload hiking and trail photos. Concurrently, user patterns will be analyzed to reach conclusions about the effectiveness of different game elements. It will be interesting to see what user behavior trends and patterns emerge. It is the hope that this application can be used to examine the further application of gamification models onto human computation, as well as discover the effects of social network voting schemes to drive useful data collection.

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