SUMMIT: Supporting Rural Tourism with Motivational Intelligent Technologies

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***Abstract*— SUMMIT is a mobile app that aims to gamify the experience of walkers and hikers and benefit the local communities through which they perambulate. It encourages physical activity through gamification of the user experience by adding additional elements of social fun and motivation to walking and hiking activities. It rewards users for their physical effort by offering access to local resources, hence increasing awareness and appreciation of the local assets and heritage and contributing to the local economy. The evaluation results show that both businesses and walkers were very receptive to the idea.**

Keywords; location-based; gamification; personalisation; rewards; tourism.

I. INTRODUCTION

Romanticism era in the 18th century brought forth a shift in attitudes to the landscape and nature leading to the manifestation of the idea of walking through the countryside for pleasure [1]. An explosion of long distance walking routes occurred in the late 20th century with the Appalachian Trail in the USA [2] and the Pennine Way in Britain [3] as early examples. In Scotland, tourism figures from 2012 show that walking and hiking was the second most popular tourist activity among domestic visitors [4]. However, for many of these visitors, the walk can be the sole purpose of their trip and they may not access any other local attractions or local businesses.

SUMMIT is a location-based mobile app that encourages the walking and hiking community to avail themselves of local resources including hospitality businesses, product vendors, tourist attractions and local information. The key goal is to "gamify" the user experience by adding additional elements of social fun, motivation and rewards to walking activities whilst increasing cultural appreciation through promotion of the local amenities and services to the benefit of the local economy.

The idea behind SUMMIT is to challenge walkers and hikers to reach checkpoints (geo-fenced areas) that are located along popular walking and hiking routes. When walkers reach a checkpoint they are presented with a list of rewards on their mobile app from which they can choose their favourite. The rewards are provided by local businesses in the area and may include things like a free muffin or a 20% discount on a product. For example, if the walker decides to choose a free muffin as his reward at some checkpoint, he selects this in his app and a virtual muffin is added to his "reward knapsack". He then takes this virtual muffin to the local shop that offered this reward to exchange his virtual muffin for a real one. While he is there he may also buy a coffee or take friends with him who may also make some purchases.

In this way, SUMMIT benefits both walkers and local businesses. It encourages physical activity by making such activities more fun and rewarding but also introduces walkers and hikers to new local resources in the area that they might not have visited otherwise.

The rest of this paper is organised as follows. Section II presents the related work. The design of SUMMIT is presented in Section III along with an evaluation of the first prototype that was carried out in the wild on Arthur's Seat in Edinburgh, Scotland in Section IV. Section V details and discusses the results of the evaluation while Section VI concludes the paper.

II. RELATED WORK

Pervasive gaming takes the gaming experience into the real world, focusing on introducing game elements into the everyday life of players. It exploits interaction devices such as handhelds to display virtual elements [5], generates location-sensitive responses to interaction [6], employs technology through which human game-masters can exercise control of the game experience [7] and involves interactive actors to perform non-player characters [8].

Pirates! [9] was one of the first successful attempts to port the computer game into the real world and the IPerG project [10] has successfully executed a number of pervasive games in real spaces such as Epidemic Menace [11] and Day of the Figurines [12]. Other groups have produced educational pervasive games such as Virus [13] and Paranoia Syndrome [14]. Artistically oriented pervasive games such as Can You See Me Now? [5] used whole cities as the game environment. Ludocity [15], a collection of pervasive games inspired by theatre, painting, dance and other art forms also exploits public places such as city streets and parks for social play. All Ludocity games are released under creative common license which allows everyone to run the games for free. Ingress by Google [16] is a near real-time augmented reality massively multiplayer online pervasive game with a

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complex science fiction back story and continuous open narrative.

On the other hand, SUMMIT is a real-world outdoor treasure hunt game using Global Positioning System (GPS)-enabled devices inspired by geocaching [17]. Analogous to geocaching, SUMMIT "hides" rewards of different categories at different places along a popular route for users to find and collect. These rewards reflect the distinctive resources offered by the local area and community encouraging users to appreciate and take advantage of the local amenities on offer. SUMMIT also logs users' achievements and allows them to perform social comparison of their performance against others, thus introducing a competitive element to the overall walking/hiking experience.

To date, quite a few treasure hunt based pervasive applications aiming at increasing cultural heritage appreciation have emerged including the Regensburg REXplorer game [18] the Global Treasure Apps [19], the National Museum of Scotland Apps [20] and Huntzz [21]. The main difference between these applications and SUMMIT is that these applications do not reward users based on physical achievements but on solving puzzles and clues. Only the Global Treasure Apps include real-world rewards but the focus is on promoting artifacts and attractions rather than local businesses and communities.

Although other stamping schemes for tourist checkpoints exist [22], these schemes usually require all checkpoints to be reached to validate the completion of a tour with the aim of collecting badges or similar rewards. On the other hand, SUMMIT users do not need to reach all checkpoints to collect rewards and have the flexibility of choosing their desired rewards. Instead of automated checkpoint verification, the stamping schemes involve manually dating and stamping of a personal completion brochure or manually entering codes collected from checkpoints on the respective websites for electronic validation.

III. The SUMMIT System

The SUMMIT system consists of two main components: a web app which allows business users to manage the rewards that they provide, and a mobile app, which is used by the walkers and hikers. Fig. 1 illustrates the SUMMIT system deployment including the server where information about business users and app users are stored.

The web app was developed to enable easy sign-up of local businesses as reward providers. Once registered as business users, they can perform the actions depicted in the workflow diagram in Fig. 2. The supplier can add, edit or delete a business. They can add, deactivate, re-activate, delete and edit a specific reward item. They can also approve claims from the mobile app users. Fig. 3 shows the web app dashboard which displays the list of businesses and rewards own by a provider as well as the available actions. Alert icons will appear beside reward items that reach zero count so that the provider can decide to add more of the reward or delete it.

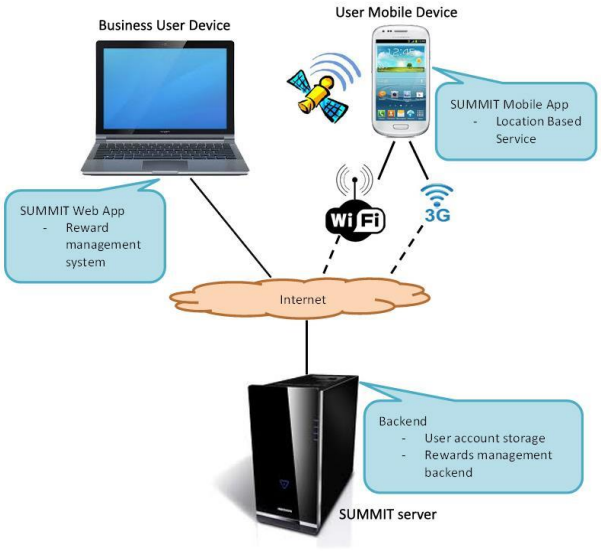

Figure 1. SUMMIT system deployment.

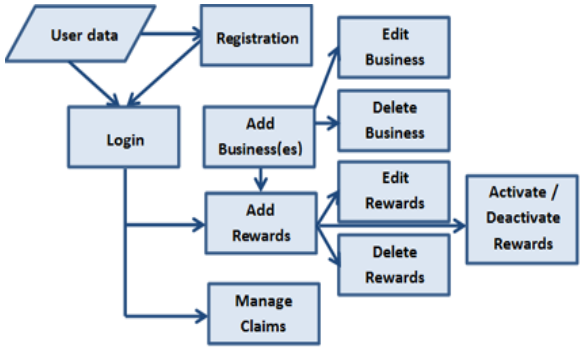

Figure 2. SUMMIT web app workflow.

Figure 3. Web app dashboard.

The mobile app was developed for the Android platform. It aims to enhance the walking activities by supporting the users' personal achievement element through a reward scheme and the social competition element through comparisons of their progress against others via the social network site, Facebook. The mobile app monitors the users'

outdoor locations while they are en route using GPS. Each route has several pre-defined checkpoints, usually selected based on their touristic values to the respective region that are geo-fenced areas. The app does not provide real-time navigation but as users reach checkpoints, the phone will start vibrating and notifications will appear on the system bar. When this happens, users will unlock new virtual reward items provided by local businesses which they can exchange into real rewards. They can also post their achievement onto Facebook if they wish.

Prior to the game, users can check out different routes and rewards associated with each of the routes. They can then select a route that provides the rewards they desire and suits their constraints in terms of time and distance. This flexibility enables users to customise their gaming experience based on their needs at any particular time. Fig. 4 shows the workflow of the mobile app. When users select a route, the route information will be downloaded onto their phone assuming Internet connection is available. By pre-loading the routes, the issue of unreliable 3G signal is avoided as the route information is now locally stored, hence will always be available to users when en route. During the hike, only GPS signal is required to track users' position. Since each checkpoint covers an area of 50-metre radius, a short lost of GPS signals will not affect the performance of the app. These approaches give users the Virtual "Always-On" Connectivity impression allowing them to have an undisrupted interaction experience. The problem of draining the battery power is also minimised as the phone is not constantly connected to the network. Synchronisation with the server occurs the next time network connectivity is available and activated by the user when all logged data on the mobile device is uploaded. To help users locate the rewards, a map that shows the locations of the different checkpoints is provided as illustrated in Figure 5(a). Fig. 5(b) shows a rewards selection dialog box.

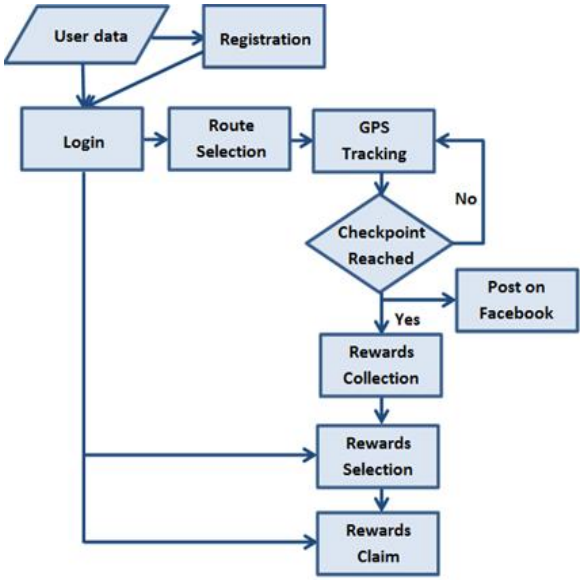

Figure 4. SUMMIT mobile app workflow

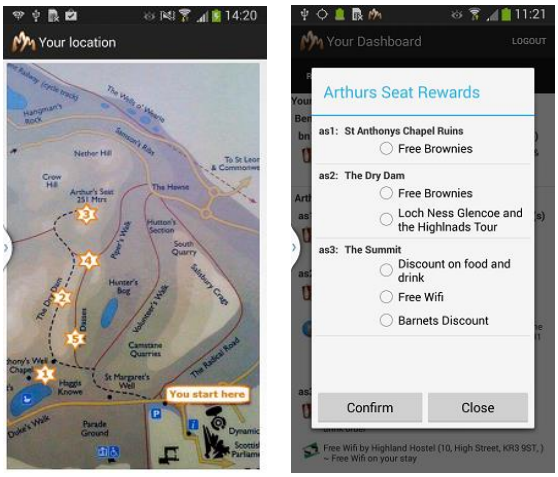

Figure 5. (a) Map with checkpoints, (b) Rewards selection dialog box

IV. EVALUATION

A trial of the SUMMIT mobile app has been carried out with 24 participants; 18 males and 6 females. Participants were volunteers who are either interested in mobile applications or hikers and walkers. They were issued with Samsung Galaxy SIII phones with the game pre-installed and were asked to hike up Arthur's Seat, a popular rural area within the City of Edinburgh. After participants had played the game, they were asked to complete a questionnaire. They were asked to rate different features of the game on a 5-point Likert scale. These features included – S1: route information, S2: map, S3: rewards motivation, S4: advance knowledge of rewards, S5: rewards selection, S6: claim system, S7: rewards choices, S8: claim intention, S9: Facebook functionality and S10: Ease of use of the app. Additionally, they were given the freedom to provide further comments about any part of the game or their experience of using the mobile app. Please refer to Appendix I for the list of questions.

A total of 7 businesses signed up to the rewards scheme. A week after the trial ended, they were contacted to gather their feedback on the web app. The questions included the number of customers the mobile app brought into the shops, other desired features for the web app and free comments on the web app and their experience in using it. Please refer to Appendix II for the list of questions.

V. RESULTS AND DISCUSSION

The chart in Fig. 6 shows the overall average rating of all 24 participants. On average participants were neutral on the usefulness of the route information (S1). Taking the level of significance, $\alpha = 0.05$, a Mann-Whitney test on this variable between the younger (less than 40 years old, n=17, M=3.418, SD=0.425) and the older (more than 40 years old, n=7, M=2.286, SD=0.694) users showed a significant difference with U(24)=13, Z=-3.050, p=0.002 (see Fig. 7).

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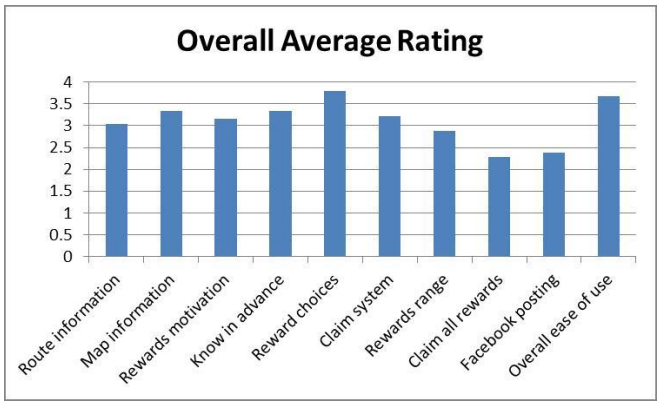

Figure 6. Overall average rating of all 24 participants.

The older generation found the route information not useful while the younger generation found it useful. This might be because the older users were used to using guidebooks when walking and were expecting directional information such as descriptions of terrain and photographs of each checkpoint which was not provided via the app and might have led to some of them getting lost along the way.

On average the participants found the map informative (S2). However, they would have preferred an interactive map. The participants found the rewards motivated them to go on the hike (S3). Some participants mentioned in their questionnaire that the rewards served as an initial motivation. As they moved from one checkpoint to another, the fact that there were rewards attached to each of the checkpoints became less important to them and, instead, their ultimate goal was to reach all the checkpoints and complete the route. This interesting finding suggests that the gamification aspect of numbering the checkpoints itself provided enough motivation for the user to carry on once they had started.

Overall, participants thought that it was important to know the rewards in advance (S4) and to be given the option to choose from a selection of rewards (S5). They also found the claim system easy to use (S6).

In terms of the range of rewards provided (S7), there was again a significant difference between younger (n=17) and older (n=7) users. This was revealed by applying the Mann-Whitney test, with U(24)=17, Z=-2.842, p=0.005, to the results in Fig. 7. The younger users seemed to be satisfied with the type of rewards provided which included discounts on food, drinks, shoes, sweets, clothes, souvenirs and tours, while the older users were not. The older users would have liked some rewards that they could redeem immediately after the hike, for example, refreshments, discount at a local hotel or B&B and rewards targeted at kids.

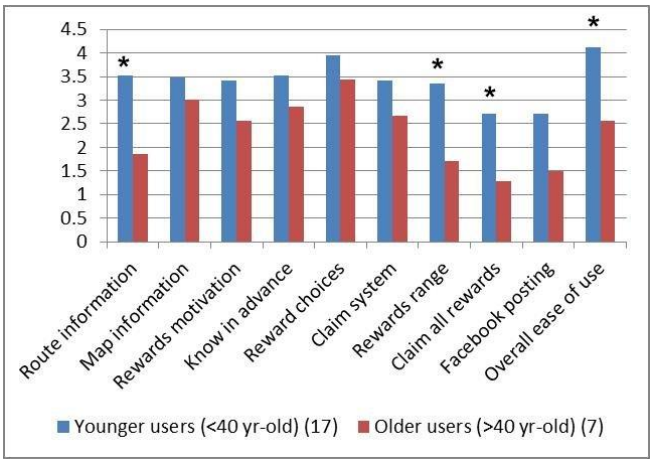

Figure 7. Average rating comparison between younger and older users. (* denotes variables with significant differences, $\alpha = 0.05$)

The intention to claim all rewards (S8) also revealed a significant difference between the two age groups. Many of the participants were exhausted after the hike and selected their rewards only after they were home and once they were not in the vicinity of the shops. They were therefore less keen to make the effort to return to the area to collect their rewards at a later date. Again, the Mann-Whitney test showed a significant difference between the older and younger users, U(24)=21.5, Z=-2.529, p=0.013. Since the older users were less interested in the rewards, they were also less inclined to claim them. The participants rated the ability to post their achievement onto Facebook (S9) fairly low. One reason for this might be because, as the game was only a prototype, the users had to use test user accounts instead of their own accounts. As a result the achievement posts did not appear on their own Facebook wall or timeline. Finally, the average rating for ease of use of the app (S10) was good. However, there was again a significant difference between the older and younger users, as confirmed by the Mann-Whitney test, U(24)=17.5, Z=-2.801, p=0.005. This could be due to the fact that the younger users were more accustomed to gaming and more familiar with mobile apps and thus had a better idea about the flow of control and operations of the mobile app and phone in general.

The feedback on subjective questions revealed that some participants would have liked the mobile app to provide more interesting information about the route and checkpoints. One of the experienced hikers suggested that it would be useful if the app could show real-time progress such as the time he took to go from one checkpoint to another and the overall time he took to complete the route. This would allow users to compare their real-time progress with each other, hence increasing the competitive element of the game. The game has also been found to provide motivation for a second time visitor to hike a hill/mountain that they have conquered before, as one of the participants stated:

> "Thanks for giving me a reason to walk up Arthur's Seat. I am feeling revitalised and refreshed now I'm

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home! This serves as an excellent reason to walk up hills/mountains that you have already conquered (I've been up Arthur's Seat twice)."

From the perspective of the suppliers, overall they were very satisfied with the usability of the web app. Unfortunately they were not very meticulous in recording the actual rewards that were redeemed so we are unable to report actual numbers but we were assured that rewards were indeed claimed.

In order to encourage claims after the trial, one of the suppliers offered an additional deal on top of those provided on the mobile app if participants claimed within a particular period of time. The suppliers remained very enthusiastic about the SUMMIT system following the trial and one of the suppliers suggested that it might be useful to include an online claim facility which might encourage more claims as the participants would be able to redeem their rewards anywhere at their own convenience.

VI. CONCLUSION

SUMMIT has successfully added the elements of social fun and motivation to walking and hiking activities. It helps to promote local resources around a route by making users aware of their existence through its rewards scheme and checkpoints assignment. Business users were satisfied with its ease of use and appreciated its potential as a useful medium for advertising and delivering their wares and services. The authors are now investigating other ways in which the concepts and business model underlying SUMMIT can be deployed to support the mobile, rural and tourist sectors.

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Appendix I: SUMMIT Android App User Trial Questionnaire

About You

Username : _____

Age : _____

Gender : male female

Prior experience with mobile apps:
novice intermediate experienced

Hiking experience :
novice intermediate experienced

How often do you go on hiking trips? _____

About SUMMIT Android App

Please rate your degree of agreement with the following statements: From Disagree (1) to Agree (5)

1) The route information was useful

2) The map was informative

3) The rewards motivate me to continue hiking

4) It is important to know what rewards are available in advance

5) It is important to be given some choices of rewards to select from

6) The reward claim system was easy to use

7) I found the rewards useful

8) I intend to claim all the rewards I have chosen

9) I found the ability to post my achievements onto Facebook useful

10) Overall, the SUMMIT Android App was easy to use

_____

What other type of reward would you like to be included?

_____

Other comments

_____

Appendix II: SUMMIT Web App User Trial Questionnaire

About You

Age : _____

Type of business : _____

Have you used any app for advertising purposes before? :
Yes No

About SUMMIT Web App

Please rate your degree of agreement with the following statements: From Disagree (1) to Agree (5)

The registration process was straightforward

It is easy to add business(es)

It is easy to add reward(s)

The claim management system is easy to use

The SUMMIT App is a useful advertising medium

_____

Did the SUMMIT app bring you customers? If yes, how many?

_____

What other features would you like the app to provide?

_____

Other comments

_____

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