

Pirates, Firemen and Ninjas: Enhancing a location aware travel training tool

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As a young person matures, their autonomy increases and parental oversight is relinquished. However for young people with disabilities and their caretakers, the situation is more challenging (Standen et al, 2010) and people with disabilities often seem unable or even unwilling to travel independently.

As an adjunct to this situation, we described RouteMate, an accessible location based application developed to help people with intellectual disabilities and other physical disabilities to learn simple routes (Brown et al, 2010). RouteMate is designed for the Android Operating System from Google and provides the user with the option to create a new route through their mobile device or through a desktop console, as well as load and modify an existing route with the help of a parent, caretaker or trainer.

In this paper we will document the process of combining game based learning elements in the design of the application as well as in the actual process of route learning. The main goal is to control the learning curve as well as scaffold the learning of new routes and ultimately independent travel to work and educational opportunities. The methodology is applied in a user sensitive manner in order to ensure that user feedback drives the ongoing development process. Aspects of developmental and game based learning theories are also reviewed and it is suggested that combining games-based learning approaches with location-based services is an appropriate combination of technologies for an application specifically designed to scaffold route learning for this target audience.

Introduction

One of the core skills required for leading an independent and socially healthy life, as well as accessing employment opportunities, is the ability to travel autonomously, accompanied by the confidence to learn and travel new routes (Clark & Hirst, 1989). As a young person grows older, the desire for greater independence increases as parental protection is gradually withdrawn. However for young people with disabilities and their caretakers, the situation is more problematic; carers are often disinclined to relinquish their safeguarding role, and their charges are often unable or even unwilling to travel independently (Standen et al, 2010).

We have previously described RouteMate, an accessible location based Android application developed to help people with intellectual disabilities and other physical disabilities to learn simple routes (Brown et al, 2010). This was supported by structuring the software using principles of game based learning to scaffold the learning of new routes in order to ultimately promote independent travel. The application's intent is to promote independent

travel to work and educational opportunities as well as the learning of new routes, by allowing the user to rehearse the route a number of times and in a variety of ways, accompanied by a trainer or teacher before moving on to independent travel, while still using the app to provide navigational prompts and an emergency contact mechanism.

Early studies of Malone and Lepper (1987) proposed the usage of games as an educational medium, and proved that digital games enhance motivation and learning since the user is more than willing to test prior knowledge, by applying it while gaming as well as learn and assimilate new information while playing and having fun. Games engage the learner in activities and provide immediate feedback so that an activity is easily linked with a learning outcome and the player is motivated to voluntarily complete sufficient repetitions of the activity (Pivec & Kearney, 2007). The same findings apply to users with disabilities as well (Saridaki & Mourlas, 2011).

Even though the game based learning aspect was initially integrated in the project in order to combine location-based services with game based learning elements, during initial piloting research it was revealed that the application and its actual use by users with intellectual disabilities and additional sensory impairments, could be highly reinforced by the motivational and highly engaging qualities of gaming and play.

The research team comprised partners from four European countries: Bulgaria, Greece, Romania and UK:

- Nottingham Trent University, UK
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- Marie Curie Association, Bulgaria, a non-profit, NGO with extensive knowledge of issues in relation to disability, guidance, mentoring, informal learning, education, training and employment.
- Centre of Professional Training in Culture, Romania, one of the main training providers in Romania, providing training in culture, IT, management and human resources.
- Greenhat Interactive Limited, UK, a small registered (not for profit) company working in the field of social regeneration focussing on education, the development of accessible e-learning materials and employment.
- BID Services with Deaf People, UK, a registered charity working to provide services for deaf people and to support the public sector in providing their services to include and support deaf people.
- National and Kapodistrian University of Athens, Greece

RouteMate and Route Learning

RouteMate is designed for Google's Android Operating System, which currently has over 60% of the smartphone market; a dominance that is predicted to continue over the next 5 years (IDC 2012). RouteMate has three modes Plan, Use and Challenge. The Plan mode gives the user the option to create a new route, or load and modify an existing route with the help of a parent, carer or trainer. It can be designed either using the application itself or using a web based console that uploads the designed route to the Android Smartphone. Start and

end points can be added either using an address / postcode or by selecting from the map; the start and end times of their journey and daily alarms can also be set. An emergency contact must be specified and points of interest should be set between the start and end points, using images from the phone's camera or gallery; these waypoints break the journey up into a number of smaller routes connected by key landmarks to more effectively scaffold route learning. This process of route design and review can be repeated, and conducted both in the field, with the device, and back at home/school, by using the console and the additional resources available in this context, such as Google's Street View and/or physical maps. This element of planning develops the learners' capacity to relate the maps they see on screen to the real world. First use of a route differs from subsequent journeys in that the path taken is recorded to act as a reference for subsequent journeys. Route duration is also recorded, and the start and end time estimates are compared with actual journey times, and modification of start time is suggested if necessary.

Use Mode reinforces the learning of new routes, by allowing the user to rehearse the route a number of times accompanied by a trainer or teacher before moving on to independent travel, where the route learner will rely less on the application and more on their own skills. The application eschews turn-by-turn route guidance (familiar from in-car satellite navigation systems) and instead uses the device's location awareness to monitor the user's location and compare it with the previously recorded path. This is important because over reliance on turn-by-turn instruction from the device might be dangerous where, for example the user is looking down at the screen whilst crossing a road unaccompanied. As the user follows a route, the application will alert the user if they stray from their recorded journey. As landmarks approach, RouteMate challenges the user to select the next key landmark from three of the pictures with which they themselves have personalized their route.

Challenge mode seeks to bring more gaming approaches to the interaction between the user and the device, by adding a number of gaming elements to the standard use mode. This will be achieved by extending the landmark style and interactions in different ways, and using them to scaffold different phases of use of the app. These activities are proposed to be:

- Pirates – a sequential treasure hunt - associated with route planning and creation activities (arrange waypoint photos in their correct order to reveal treasure)
- Ninjas – a “scavenger hunt” to find as many items as possible - associated with using route (identify/photograph a specific item at each waypoint)
- Firemen - find fires and put them out - associated with developing independence / confidence (on a particular route) (RouteMate issue “fire alarms” at random points en route, and the player must put the fire out by pointing the device in the direction of the “fire”)

Integration of these elements was not complete when the piloting discussed below took place.

Issues During Initial testing

The majority of testers with disabilities were very keen to be able to travel independently and welcomed the assistance that would be offered by a fully functioning system such as RouteMate. However, trainers and carers, were a little less enthusiastic regarding independent travel. This was for several reasons reported on a previous paper by Standen et al (2010) such as:

Practical Limitations: Physical accessibility of buildings and public places was reported as being extremely limited. Moreover, the cost, both of Android smartphones and the need for 3G (to download map data).

Safety Issues: While users could benefit from help in learning a route, their lack of road safety awareness could put them in danger. At the same time, there were concerns for students' safety and their vulnerability to bullying and abuse if they were travelling independently, (especially with an expensive and desirable device in public view).

Motivational Issues: Many trainers and carers considered that there was a strong likelihood of the user becoming distracted or lost. Children especially were seen as being easily distracted by various elements in their surroundings and they might then abandon the idea of reaching the final destination. There was a suggestion from those consulted in Greece that the local community might help by, for example, asking shopkeepers to act as checkpoints and remind users' their initial goal.

(Standen et al, 2010).

In light shed by these findings, a games based learning approach integrated in the tutorials to provide a review of the main features of the application was thought to be important for both people with disabilities and their carers and trainers and was ranked highly by members of the research group. Moreover, the integration of gaming narrative during the actual sessions as well as the use of game based learning elements in the design of the application could assist the carers to control the learning curve, scaffold the learning of new routes and augment the intrinsic motivation of the users.

Combining location based experience with game based learning has several documented advantages. Games engage the learner voluntarily in sufficient repetitions of the activities to ensure learning takes place (Pivec, 2007). They provide immediate feedback so that an activity is easily linked with a learning outcome (Pivec, 2007). They can also be structured with different levels of challenge to scaffold the planning of new routes and the first instances of travelling these new routes. The scaffolding can also be structured to support collaboration with peers or teachers, and then be programmed to offer less intervention as the user develops the confidence and skills to, ultimately, travel these routes independently.

Game Based Learning and Route Learning per partner country

As has been mentioned, we had different piloting sites in four different countries focusing on users with different disabilities such as intellectual, physical, sensory, learning, mental health issues and others. Research teams were free to choose whether they would follow a games based learning approach to their piloting sessions or not. All piloting sites used the integrated photograph game whilst learning and actually following routes and we will try to document their efforts on using additional gamelike approaches during the pilots in each country.

In the Greek piloting site, users' age varied from 21 to 27. They were young adults with intellectual disabilities and were all trained in the same school. The Greek piloting site used locative gamified scavenger hunt scenarios, using premade narratives with pirates and ninjas. Using RouteMate as a tool integrated on the gaming narrative, users tried to find the next spot in order to achieve their final goal and win the game. Users had to work alone or collaborate in teams and use RouteMate in order to get to the next point safely and successfully. The entire process was assisted with stickers and tags in order to achieve goals and provide feedback to the users. The trainers were confident that engagement, comprehension as well as the memory of the trainees was benefited by the gaming scenarios while using RouteMate, augmenting the experience of the users. Both scenarios revolved around being safe in the street and using smartphones cautiously while having fun and being motivated towards a goal. The entire process was benefited by the playful scenarios since the entire process became more appealing, motivating and less frustrating when inevitable technical issues arose. It was actually observed that using a game scenario lead to faster and more successful memorizing of the route landmarks, however these findings require further investigation.

In the Bulgarian piloting sites, user's age varied from 26 to 68 and they face visual and hearing impairments, mobility impairments and/or mild intellectual disability. They also used a scavenger hunt gamified approach. Quoting the researchers "the facilitator said to the user that today's session will be as a game - to find the "treasure" at the end point. If the user completed the tasks successfully at the end of the session he/she will receive a gift". During the session, the facilitator supported the user by using game-like questions and keep the user immersed in the narrative e.g. "Lets find the way to the treasure? Will you be better than your previous peer? etc." . According to the researchers, this approach was very important for the inexperienced users who were frustrated with their lack of skills while using a smartphone and GPS for the first time. The users showed high engagement, concentration and memory concentration.

UK piloting sessions were arranged between different UK partners and the age range varied from 16-48. In one of our piloting sites, all users had some form of hearing loss, ranging from hard of hearing to profoundly deaf plus additional needs, e.g. autism, learning difficulties/disabilities, while on another UK piloting site users' disabilities varied from moderate learning difficulties, autism/Asperger's, ADHD and mental health issues to sensory impairments (visual). The first piloting site did use a playful approach during the sessions, using very basic games around map reading skills to locate places on route. They mainly used very simple quiz e.g. 'what do you do at this building? - matching words with pictures'.

They motivated the users by promoting discussion about places on route aided memory when later walking the route. According to the researchers gaming factors assisted with the engagement, route comprehension as well as the memory of the users.

The second UK piloting site did not use any further game like approach apart from the integrated photo game due to lack of time but they expressed interest in using it in the near future since trainers at piloting site were very keen on the idea of using integrated games and a gamified approach.

At our Romanian training site, the age range of their users was between 11 to 39 years. They had no prior experience with smartphones and technology and had learning and mental disabilities. The researchers stated that they did not have to use any further game scenarios or scavenger hunt game since their users perceived the Routemate application per se as a game. They also expressed their interest in using educational locative games for their users in the near future.

Summary

According to our findings, combining RouteMate location based platform with game based learning elements and gamified motivational route scenarios was a success since the majority of the piloting sites were confident enough to integrate it in their piloting sessions, while users regardless of the different range in age, abilities and culture, were more than keen to immerse themselves in the gaming scenario.

All piloting sites were willing to use educational locative games for their users in the near future, while the integrated game with photographs blended successfully with the game scenarios and mini games that supported the session. From these initial findings, it is proposed that a blending of digital with non digital locative games is beneficial for users with disabilities trying to learn a new route. However, further research and development of Routemate with integrated gaming scenarios is on our forthcoming plans in order to enhance a location aware travel training tool as a framework of motivational and independent route learning for users with a different range of disabilities.



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