Ad hoc Communities on the Road: Serendipitous Social Encounters to Enhance Tourist Experiences

Sarah-Kristin Thiel [1, 2] **Marcus Foth** [1] **Ronald Schroeter** [1]
[1] Urban Informatics Research Lab, Queensland University of Technology, Brisbane, Australia
[2] Centre for Human-Computer Interaction, University of Salzburg, Austria
sarah.kristin.thiel@gmail.com m.foth@qut.edu.au r.schroeter@qut.edu.au

ABSTRACT
Driving can be a lonely activity. While there has been a lot of research and technical inventions concerning car-to-car communication and passenger entertainment, there is still little work concerning connecting drivers. Whereas tourism is very much a social activity, drive tourists and road trippers have few options to communicate with fellow travelers. Our study is placed at the intersection of tourism and driving. It aims to enhance the trip experience during driving through social interaction. This paper explores how a mobile application that allows instant messaging between travelers sharing similar context can establish a temporary, ad hoc community and enhance the road trip experience. A prototype was developed and evaluated in various user and field studies. The study's outcomes are relevant for the design of future mobile tourist guides that benefit from community design, social encounters and recommendations.

Author Keywords
Drive tourism; serendipity; recommendation; automotive user interfaces; connectedness; urban informatics; social encounters; social navigation

ACM Classification Keywords
H.5.2. Information interfaces and presentation (e.g., HCI): User-centered design.

INTRODUCTION
One of the most infamous sentences when driving is: "Are we there yet?" Especially children are likely to get bored when traveling even when the distance is not far. Yet, also to grown-ups a route can become rather dull especially when being alone in the car. The craving for an opportunity to communicate with others during a long, lonely drive has a long history. In the pre-mobile phone era, this desire was especially felt by truckers who sometimes spent weeks on the roads. Their only way of communicating with others were rest areas. For them the invention of the Citizens' Band-radio (CB-radio) provided an opportunity to connect with other drivers. The system allowed short-distance communication between individuals on 40 channels. Although still being used today by truckers, CB-radio has increasingly lost relevance with the rise of mobile devices. It has even been said that "it is dead" (Dvorak, 2009). One of the most interesting aspects about CB-radio is the inherent user motivation since truckers were not obliged to use it and contribute information to other drivers. There was no payoff except for the "feeling of connectedness" (Poniewozik, 2011). This paper explores through the evaluation of a prototype whether mobile applications can create or enhance this feeling and make drives a more social activity.

OzCHI '15 , December 07 - 10 2015, Melbourne, VIC, Australia
Copyright © 2015 ACM 978-1-4503-3673-4/15/12... $15.00
http://dx.doi.org/xx.xxxx/xxxxxxx.xxxxxxx.

Humans like to belong to a group (McKenzie, 1924). However, this belonging implies connectedness to a group. Whenever we are not connected, we feel alone. This explains one of the main reasons for the striking success of social networks such as Facebook (Weinschenk, 2009). But how do we use social networks on the road? Most communication tools were designed for text input. Various studies have shown that texting while driving is not safe (Basacik et al., 2012; Hosking et al., 2007; Sherzan, 2010). Furthermore, there has been evidence that also talking on the phone takes up a great amount of cognitive load (Fodness & Murray, 1998), making driving dangerous. The work we present in this paper explores design requirements for establishing ad-hoc communities among drive tourists.

Drive tourists are tourists who are on a road trips. As tourists we define people who come to an area unfamiliar to them during their leisure time with the objective to explore and learn about this particular area.

We begin this paper by providing some background information on recent developments to the ways tourists plan their holiday. Parallel to the emergence of social networks, there has been a clear shift of trust regarding the source of recommendations for holidays. Instead of relying on published sources or travel agencies, people nowadays tend to turn to friends and acquaintances for advice. A second trend that has been prevalent is the preference of content filtered according to relevance (i.e. context) and personal interests in favor to getting as much information as available. A third section addresses the influence social media and the Internet in general have on the way people perceive their holidays and how this also influences expectations and requirements for a satisfactory vacation. Consecutively, we report on the iterative process that led to the design of a mobile prototype. In order to validate our concept, we conducted a field trial. Despite some limitations in the study design, our results show that the concept is able to establish a

feeling of connectedness between participants. Moreover, the use of both audio and text-based messaging is appreciated. A relevant finding in this respect is further that participants noted that they are hesitant to communicate with strangers with audio as it reveals a lot about their personality and person in general. The paper concludes with a summary of our findings.

RELATED WORK

Recent literature covers trends in tourism and mobile tourist guides. First, we look at how tourists search for information by providing an overview of the most important data sources such as published means and online sources. Another section highlights the increasing importance of context-awareness and the benefit of location-aware applications. A third section discusses how audio can be used to minimize visual distraction for both tourism and in-car systems. Section four comments on how the Internet has changed our perception of holidays. As we claim that the application developed in the context of this study encourages "serendipitous road trips," the fifth section provides both a brief definition as well as an interpretation of the term serendipity.

Searching for information

The quest for a plan on how to make the most of one's holidays (e.g., seeing as many sights as possible) is commonly referred to as the Tourist Trip Design Problem (Vansteenwegen & Van Oudheusden, 2007). Finding automatically generated solutions for this problem has been the objective of various studies (Garcia et al., 2007; Souffriau et al., 2008).

Although information can be acquired from various channels, tourists usually have to rely on details that they can only assume to be accurate. Gursoy et al. (2004) noted that as the involvement of tourists increases, they are likely to make use of more than one source and combine these sources for their information search.

Published information

The most important sources of information in the category of traditional means or published information are guidebooks and maps (Brown & Chalmers, 2003). A clear advantage of print-out guidebooks is their structured and standardized form that offers detailed descriptions at a glance (Brown & Chalmers, 2003). Bieger and Laesser found that information from professional (traditional) sources only play a significant role when making a definite decision or for non-standardized tours (Bieger & Laesser, 2004).

In general, tourists only seldom head for a specific location but more often for a general area or direction. Findings from our previous studies with tourists suggest that tourists are open to last-minute suggestions on where to go and are likely to amend their plans in favor of recommendations from fellow tourists.

Online information

Next to personal recommendations from friends and relatives, the Internet has grown to be the most used source for travel-related information in the pre-trip phase (Bieger & Laesser, 2004). In fact, the number of Europeans who use the Internet to plan their holidays (59%) outnumber those who do not (Poniewozik, 2011). By tailoring data based on interests, users are only presented relevant content (Newhagen & Rafaeli, 1996). However, if online services fail to offer such a tailoring, searching through the overwhelming amount of information the Internet offers can become frustrating (Radosevich, 1997; Stolz, 1999).

In contrast to published means, which are static and convey information through the lens of marketers, by supporting many different forms of communication (search engines, online travel booking sites, destination websites) the Internet enables users to assert their need for information and the way they search within a frame that is in line with their personal context (Pan et al., 2007). This advantage is arguably one of the reasons for the increasing importance of online sources including social networks and social media.

Word of mouth

More than 30 years ago, Brucks (1985) postulated that especially tourists unfamiliar with digital sources are more likely to rely on recommendations than on any other external source. Navigating socially by asking peers and people who have previously been to the destination in question, tourists can expect to be told relevant and key facts tailored to their circumstances (Bilandzic et al., 2008). Hence, those tourists save themselves the process of structuring data. A study conducted by Fodness and Muray (1998) found that recommendations from friends and relatives ranked most important, whereas travel agencies were used only by 8% of the respondents.

One of the biggest advantages of turning to personal information is that in contrast to data from suppliers and marketers the content here is provided by tourists whose interests overlap to a great extent (i.e. good service, low prices). In that sense, social media has gained overwhelming popularity as a source for vacation planning (Gretzel et al., 2006; Pan et al., 2007). Social media can offer collective intelligence that makes the content more valuable and relevant than generic content that has been written for the masses (Litvin et al., 2008).

Context-awareness: Relevant information when needed

Preferences of tourists are highly diverse. Even when expressing the same needs, for instance for a relaxing holiday, these needs may be interpreted entirely different. One might find crossing the Alps on foot relaxing as one gets the head clear. Someone else might find spending the days lying on the beach relaxing. Accordingly, each tourist has different information needs. In order to be able to filter data in a way that only relevant information remains, the first step is knowing what to look for. Using technology terms, context serves as a filter and the action of filtering is referred to as context-awareness, the outcome being the actual recommendation.

In the vast majority of systems users have to set filter parameters themselves. More recently, innovative recommendation systems use previous search heuristics to display only currently relevant content to the user (e.g. (Lamsfus et al., 2010)). As data used for filtering was

recorded in the past, this automatic filtering cannot reflect ad-hoc/dynamic changes in interests.

Apart from personal content, environmental context can also be used for filtering. This context summarizes information and data about the environment (e.g., weather condition, GPS coordinates of users or sights as well as opening hours).

Cheverst et al. (2002) aim at incorporating both types of context for the computation of tailored tours. The research framework *Deep Map* is an example of how different sorts of context and information are used to generate personalized tours (Malaka & Zipf, 2000). The framework's goal is to efficiently combine data from different sources (websites, reservation system, multimedia databases).

Most mobile tourist guide apps, which allow context-aware scheduling of activities neither support dynamic route generation nor re-configuring routes once they have been created. Supporting one of our findings from previous studies of this project, Yu and Chang (2009) pointed out that tourists have a high frequency of rescheduling their trips. Thus, a service is needed which does not only provide static context-aware information but updates information based on current situations, positions, and reacts to change of plans (Scherp & Boll, 2004).

Considering tourists' strong mobility needs, location-based services are useful for providing tourists with information about nearby sights based on the tourist's current position (Barnes, 2003). This information primarily includes localizing objects (such as accommodation, restaurants or shops). Little work has yet been done on finding and connecting people (here tourists) based on context. Some location-based services further provide information about traveling conditions (Yu & Chang, 2009) or allow routing between points of interest. According to Yu and Chang, an ideal location-based planning recommendation service should integrate information about (1) tourist's preferences, needs and constraints; (2) location and time; (3) destination and attraction.

Minimising visual distraction using audio

The great majority of mobile applications is based on visual representations. While also significant in mobile situations in general (Oulasvirta et al., 2005), the need to reduce the load of visual attention is crucial while driving.

In recent years the usage of audio has become more popular. For instance, in-car navigation systems use audio hints to inform users about upcoming navigation related actions. As it reduces the time the user has to look at the screen to obtain the sought information (Chittaro & Burigat, 2005), audio can help make usage of in-car systems safer. However, audio has limitations as well. When situations demand long and complex descriptions, the cognitive load required from the driver can become safety critical (Chittaro & Burigat, 2005).

With the goal to let tourists learn more about the places they visit, Schöning et al. developed a mobile application, which generates stories about places along a given route that are read out loud when in proximity (Schöning et al., 2008). Juhlin (2005, 2010) explored the possibilities of using audio for users who are driving. His system *RoadTalk* enabled car drivers to annotate the roadside with voice messages. The evaluation revealed that users preferred audio-based over text-based interactions. Audio is increasingly used in both in-car systems and tourism applications. While speech-recognition still has to overcome technical challenges, several advantages of using audio as an output modality have already been proven.

Using screen-based systems while travelling or driving shifts the focus away from the user's surroundings, which in the case of tourism (especially for road trips) defeats the point of travelling. Recently, the use of other in- and output modalities for mobile tourist guides is being explored (Szymczak et al., 2012). In the case of output modalities the most promising are currently audio and haptic / tactile. By conveying information in a way users do not need to avert their eyes from their prioritized tasks, these systems reduce the interference with travel experience.

The impact of Web 2.0 on travel experiences

User-generated content (UGC) is believed to be the earliest form of social media (Kaplan & Haenlein, 2010). In the domain of tourism, the most common form of UGC are reviews and ratings, which are often annotated with pictures. The majority of the reviewed research for this study concentrated on providing social network functionality both for tourism purposes and for in-car use.

Axup et al. explored the concept of a pairing system to support social contact and exchange of travel information between backpackers (Axup et al., 2006). Many of the tourist applications designed for socialising purposes also integrated features that use location-based information. *Trippple* for example can be described as a location-based social networking app (Marcialis et al., 2012). Similar to Trippple, *RoadTalk* was designed for in-car use (Juhlin, 2010). In an attempt to mitigate the risk of distraction the system relies on the audio modality for messages. Here the authors argued that in-car social interaction goes beyond negotiating the right of way and thus extended the system to allow sharing information about topics such as weather, road conditions, next stops, or simply exchanging impressions. A topic that has always been controversially discussed with regards to social networks is privacy. In most systems with social features, messages can be read by all users. As people do not want to share every topic with strangers, different privacy levels should be included in such applications. Moreover, some study participants of the RoadTalk system asked for a way to contact particular persons instead of addressing the whole group (Axup et al., 2005).

The application *CliqueTrip* aimed to explore experiences connected to relatedness in the domain of a car by providing a communication channel between cars that are on the same trip as part of a convoy (Knobel et al., 2012).

Their evaluation showed that the application fulfilled the need for relatedness as participants indeed felt as part of one group even though being in different cars. This concept has also been extended to motorcyclists by implementing the *Hocman* system (Esbjörnsson & Östergren, 2004). The application *SoundPryer* intended to provide a serendipitous shared experience (Juhlin, 2011; Östergren & Juhlin, 2006). Here, sharing music was meant to establish a link between people and giving them the feeling of being connected.

While systems designed for tourists traditionally focus on the provision of information, with the emergence of social networks more and more applications integrate social features such as sharing content or sending messages. This indicates that socializing is perceived as a key factor in our daily lives.

Serendipity

In his keynote for the international conference on Computer-Human-Interaction[1], Ethan Zuckermann's keynote provides a good description of the origins and meanings of the term "serendipity". He also makes an argument of how relying exclusively on filtered data (e.g. provided by Google or Facebook) inevitably makes us miss other information that would let us learn new things or view things from a different perspective. In that context he describes cities as "serendipity engines" where we can encounter the "unexpected". We agree with Zuckermann that continuously relying on the same information sources might lead to us missing things (which lie on the sideways) that may be equally or more interesting to us. Our study aims to establish a concept that is able to reveal those things. Following the argument about the importance of social encounters and the fact that activities are usually more fun when being able to share them, we are seeking for opportunities to bring people with similar interests and context together.

Research is prone to serendipity as sagacity is involved at most times. For instance, Fleming's discovery of penicillin is a very happy and indeed epoch-making accident in terms of healing. In context of our study, a serendipitous situation would for instance occur when a tourist changed their original route based on the recommendation from a fellow traveller and consequently discovers something (e.g., a place) that they were not in quest of but really liked.

RESEARCH APPROACH

This research is situated at the intersection of tourism, community design, and automotive user interfaces. The study's approach follows a user-centred design process. Alternating between user studies and incremental iterations of the prototype development throughout the project, we ensured that the end result would adhere to user requirements and display both good usability and user experience. The final product was then evaluated in a real-world setting to validate whether the tool helps to enhance the experience of drive tourists.

[1] http://www.ethanzuckerman.com/blog/2011/05/12/chi-keynote-desperately-seeking-serendipity/

The first study's objective was to gain insights on requirements of tourists in general and to identify general trends and preferences of tourists regarding mobile tourist applications. By employing the opportunity sampling approach, we recruited nine members of our lab, all experts in Human-Computer Interaction, for a one-afternoon ideation workshop. Having experts from this field allowed us to consider both recent advances in mobile technology and challenges of such. In a first round, we asked participants to brainstorm individually about what aspects they were seeking when on vacation. Afterwards, we discussed their findings in a group session. As already hinted at in the literature review, the concept that all participants felt strongly about was social interaction.

Figure 1. Photo taken during the field study.

With the objective to explore this concept in more detail, we conducted a field study. For this study we joined a group of participants on a road trip where we observed participants' behavior (Fig. 1). The researchers took notes for instance when participants were communicating with each other (i.e. topics, relations). Participants were instructed to use the mobile application Voxer. This chat application allows to both send audio and text-based messages. Prior to departure, a dedicated chat room was created within Voxer, which entailed adding the participants to a closed group. During the road trip all participants used the application to participate in the communication. Drivers were instructed to only use Voxer when the car was not in motion. Our analysis showed that the vast majority of messages served the purpose of conversation. Other topics included recommendations, reviews and general information. Overall, the road trip was valued as a "*fun experience*" as being able to connect with other participants made the trip more enjoyable.

While Voxer proved to be a valid tool for people to communicate with each other while on the go, it is not suitable for tourists in our scenario. The main limitations include:

- Pre-defined list of contacts
- No profiles (e.g. stating interests)
- No context-awareness
- No sensing of people in proximity with similar context

- No opportunity to contact people based on their location

Various recommendation tools for tourists already exist (e.g., Yelp, TripAdvisor). Several of them even offer interactive features that allow to contact people. However, these platforms lack the dynamic that ad-hoc encounters like we propose can provide. For one, although being updated regularly most of the recommendations are outdated or do not apply to the current circumstances. For example, a tourist wants to cross a mountain pass but it is not sure whether his or her car will make it across as it has been snowing very heavily the last days. The tourist finds a review online mentioning that any car can cross the pass. However, that post had been posted a week ago when it had not started snowing yet. Likewise, it is often impossible to know the circumstances of when a recommendation was created. Judging whether this author's perception or preferences would match one's own is also hard to tell. Furthermore, even given the possibility to contact others, only in rare cases people would still be around the area and thus be able to relate to current circumstances.

Due to these limitations, we decided to develop our own system that by encompassing the stated functionalities would enhance the during-trip experience of drive tourists.

Based on the findings of the exploratory and the field study, we created a wire-frame based prototype of a mobile tourist guide. The core functionalities of this first version included being able to send and receive text as well as audio-based messages from tourists who share similar context (i.e. destination, interests). This initial concept was evaluated by experts in the field of (mobile) human-computer interaction. Their recommendations led to further refinements resulting in a second version of the prototype. With the intention to explore different approaches for the application, we created a third version, which concentrated on the core concept of sending and receiving messages from fellow travelers with a similar context.

Another user study was conducted to determine which aspects within those three prototypes would help accomplish the study's goal of establishing a feeling of relatedness and community between a group of drive tourists that do not know each other. The participants' assessment was used to create the final prototype. Overall, the idea of being able to communicate with fellow travellers was perceived as a nice way to "*socialize, make new friends, meet people, go somewhere else*."

TRAVELPAL – THE PROTOTYPE

The main goal of this research was to test how we can enhance the experience of drive tourists through social interaction (Jacucci et al., 2007). To accomplish this, the application allows users to communicate with fellow travelers who share a similar context. This communication can for example be beneficial when seeking recommendations for the trip or to arrange ad hoc meet-ups. Before starting a road trip, users would enter information regarding their context:

- set the trip's destination,
- enter their interests,
- create a user profile (i.e. demographics),
- set a range around their position and their destination (*discovery range*), defining the radius that ought to be considered as relevant for finding fellow travelers (**TravelPals**),
- configure the application's behavior in terms of privacy and receiving messages.

Hence, which travelers will be able to contact users is mainly dependent on their current position and their destination. TravelPals are displayed on a map and a list. Users can view the profiles of TravelPals, in order to help them determine whether this person is worthy of contacting for getting recommendations. The envisioned application allows sending both text and audio messages. Incoming text messages are read aloud. Users can determine whether incoming messages should be played automatically or after a self-defined delay.

IMPLEMENTATION

This section gives a brief overview of the overall system architecture. The system consists of two main parts being the server side and the mobile client side.

Mobile client

The client side was implemented as an iOS-based mobile application and represents the system's only input and output interface. Users can choose between three levels of privacy: (a) hide interests; (b) hide entire profile (includes a), and; (c) hide current position (includes b).

For the discovery range, users can choose between three pre-defined ranges: small, medium, and large. An optional feature is the ability to activate or deactivate the *exploreMode*. If turned off, users will not receive any messages that have been sent in the discovery range of their current position. Hence, they only get recommendations or posts in general about their destination. This might be desired by tourists who are either familiar with the route or have a tight schedule and thus do not have time to explore further surroundings.

The main interface of the application is a map that displays additional information (cf. Figure 3). After a user has entered his or her details (e.g. interests) as well as the travel destination, using the user's current position the server determines which other currently active users classify as this user's TravelPals (i.e. fulfill conditions listed in the following paragraph). This classification is

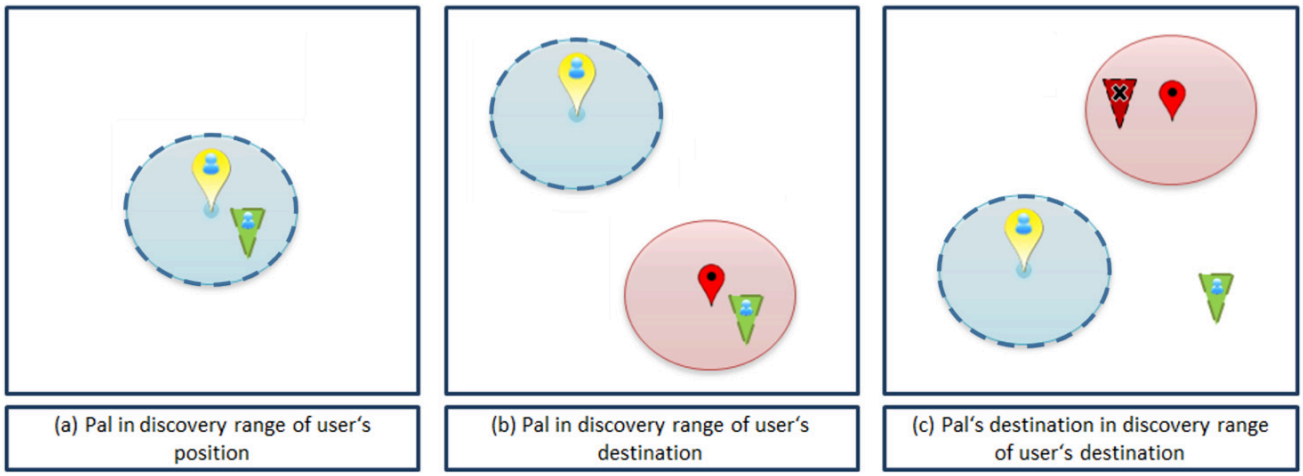

Figure 2: Illustration of the three cases determining whether two users are TravelPals.

executed whenever the map view is loaded or a user sends a message. Broadcast messages will be sent to and saved in the server's database first, before being forwarding to all TravelPals of this particular user. For messages directed to a specific user (i.e. single cast) are also stored in the database and then forwarded via Push Notification to the receiver.

Server side

The server side is a self-implemented web service that comprises a database that stores all data and a backend system, which contains the system's functionality and core logic. The internal database of the server stores two

categories of data: (a) profile information about TravelPals, and; (b) sent messages.

The core application logic includes the evaluation of which users share a TravelPal-relationship (Fig. 2) and which user should receive what message. For this logic the concept of the discovery range is essential. In Figure 2, the range is indicated as a blue circle (dotted line) for the current position and a red circle for the destination.

(a) Pal in discovery range of user's position. In this situation both users reside in the same area. Being able to communicate, the two tourists could for example agree to spend time together or exchange information about places that the other might also want to see.

(b) *Pal in discovery range of user's destination.* One user is currently at the area where another user wants to go. Topics for conversation here could be sharing the current weather situation or relevant facts (e.g. whether a 4WD is needed to reach a certain point).

(c) *Pal's destination in discovery range of user's destination.* Both users want to visit approximately the same area. Given the ability to send messages to each other, those tourists might agree to travel together or share facts about the destination.

To understand the logic of who will receive a message and how the receivers are notified, "user" needs to be exchanged with "message" in the enumeration above. For singlecast messages the logic of who will receive the message is straightforward as the sender had to previously select the receiver. Receivers are informed of an incoming message by push notification. This notification contains the unique identifier for the particular message as well as the content of the message. In case of an audio message the file name is used.

FIELD STUDY

In order to evaluate to what extent our prototype implemented the requirements gathered in our previous studies, we conducted a field study. Our aim was to explore the general concept of the developed application in a real-world, in-the-wild setting. Hence, we were looking for participants who had either an expertise in human-computer interaction or belonged to the user group of tourists. Marcialis et al. (2012) pointed out that involving experts in field studies can help avoid lexical and methodological problems and simultaneously facilitate the accomplishment of the aim, even with a small group of research participants. We ensured that participants saw the trip as a leisure trip (e.g., by going on a Saturday) and not as an academic research project. That way we would be able to not only simulate, but indeed have a real tourist road trip. To offer a tourist like situation, we picked a destination that none of the participants were familiar with. Overall, this study setup resembles our previous field trip. Participants were again recruited from the lab and their close friends.

Study setup

Six people (5 male, 1 female) answered our call for study participants, what translated to having two cars on the road trip. Four were members of the lab. The other two were friends of those participants and could be counted as tourists. With none of the participants being older than thirty years, we again had a young cohort. After installing the software on two devices, we gave the participants a brief introduction on how to use the app. Almost all of the participants had been part of one of the previous studies and hence knew the basic concept of the project and its aims. To ensure that both groups would be TravelPals, participants were instructed to set their destination to the same given location.

The entire trip can be structured into three phases: 1) leaving Brisbane (driving as convoy); 2) mountains and coast (separate trips); 3) meeting in Byron Bay. Figure 3 shows a replicated screenshot of the application taken

shortly before phase 3. The route the participants took during the road trip is an important factor in this study as it affects the relevance of the messages being sent via the application.

As in the previous road study, all participants were using the application, while drivers only actively used it when the car was not in motion. Drivers still used the application passively while driving as both groups had mounted the mobile devices to the car's dashboard. This allowed all participants to hear messages. One of the driver commented on that in the post-interview by saying that he really appreciated the audio feature as it included him in the experience of using the system and the communication although he could not actively take part.

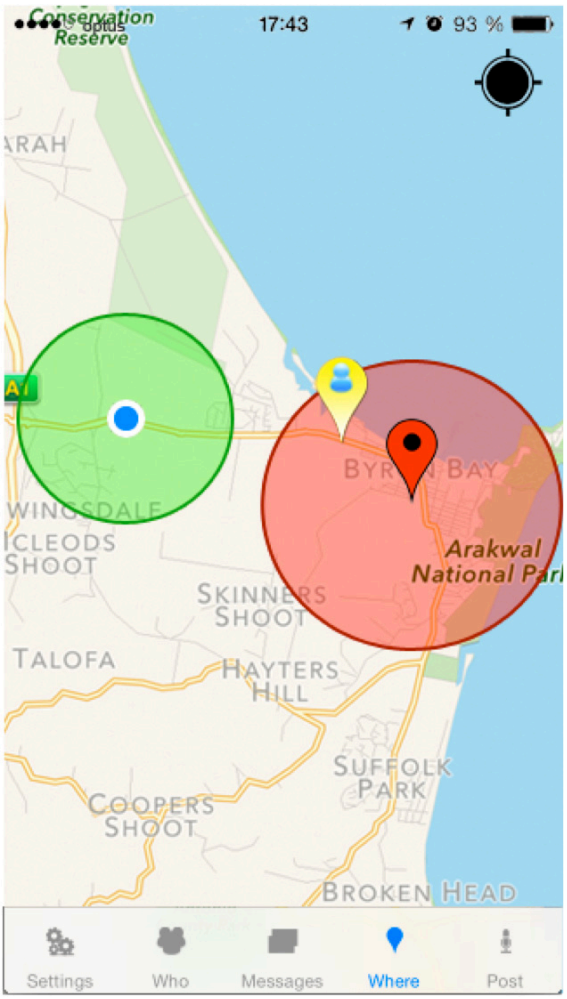

Figure 3. Replicated screenshot of the prototype during the evaluation study.

Findings

In total 35 messages were sent via the application. 30 of them were text-based, the rest were audio messages. Figure 4 shows some of those messages. The messages can be divided into four main categories: (a) bugs and errors; (b) location enquiries; (c) conversations, and; (d) recommendations. The first half of the road trip was clearly dominated by messages of category (a). Car one (which was not accompanied by a researcher) needed more time to fully understand the prototype. With the beginning of phase two the focus of the messages shifted to location enquiry and conversation. As the cars could no longer see each other, the participants wanted to know what the other was doing and where exactly they were. Moreover, both groups started to tell the others about their activities and experiences. The application was used once to send a recommendation.

Converting the content of messages into speech occasionally caused some problems. Words containing typos were in some cases skipped by the framework what made certain messages "*confusing*" and left the participants clueless of its meaning. Although sentences are read aloud almost fluently, most libraries that offer text-to-speech still have problems in recognizing colloquial language and typos. The latter was a big issue during this study. Even with features like auto-correction, when typing on a smartphone and sitting in a moving car, it is hard to spell each word correctly.

In the follow-up interviews, we encouraged the participants to reflect on their experience and compare it to previous road trips. Almost all participants stated that in most cases the main intention of sending messages had been to find out where the other group was and what they were doing. During phase 2 there had been multiple occasions where recommendations would have been helpful, as both groups were exploring unfamiliar terrain. However, at that time the two phones could not receive messages as they were too far apart. In this case condition C (see Figure 2) should have applied, but due to a mistake in the algorithm did not. In one of those situations group one wanted to ask for recommendations on where to go for lunch. But as participants in car two were too far away from the location of car one and had not passed it previously, they would not have been able to share insights about the area anyway. Hence, it can be said that the relevance and also usefulness of a message in the case of our application depends among other things on the distance as well as the location of the sender and receiver of that particular message.

Some of the participants stated that the road trip had been a good experience as the loose planning allowed them to discover new things. Discovering new things and serendipity in general were some of the concepts we aimed to achieve with the application. With users of the application posting recommendations, other users would in the best case be inspired to try (new) things they were not in quest of. One participant particularly praised the possibility of sending and receiving recommendations. In his opinion this was the "*best thing about it*."

Concerning the feeling of connectedness and community, participants had quite different impressions. One participant stated that he did not feel a huge connection between the groups, seeing that the cars were on "*separate journeys*." Another participant stated that she felt connected to the other group when she could see them on the map. One participant rated the trip as "*entertaining*" because of the "*sense of community*" and the "*shared experience*." A different participant told us that after hearing the stories from the other group he felt as if he had experienced it too, even though he had not been there in person. Participants of this study indicated that when on holidays, they would like to connect with

and meet people based on similar context (e.g. same destination). Establishing an active connection with those people was said to be clearly desirable. Meeting other people has been noted to be an integral part of many tourists experiences (Brown & Chalmers, 2003). Furthermore, when on holidays barriers for social contact are said to be lower, which supports our assumption that tourists would also be willing to meet up with total strangers in order to share recommendations or do activities together.

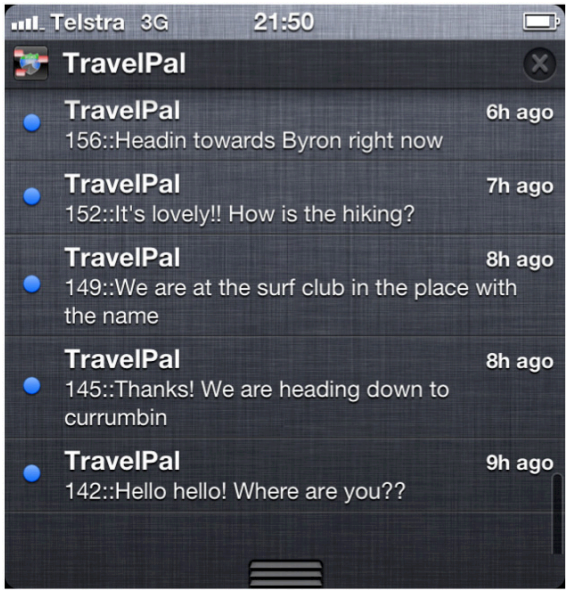

Figure 4. Screenshot displaying some of the messages sent during the evaluation study.

With regard to the preferred modality when sending or receiving messages, participants highlighted that text is more reliable in the sense that messages would not be subject to misunderstanding due to bad audio quality or accents. The latter is a very likely factor to be considered as tourists are often people from different nations speaking a foreign language. Moreover, participants clearly distinguished their preferences for modalities between when communicating with strangers and with friends. They stated that for strangers they would start the conversation by sending text-based messages. Later on, after having gotten to know the person, they would switch to audio. Participants stressed that the voice itself and the way they speak (e.g., choice of words) or form sentences reveals a lot about their character. Yet, for that reason users liked having the audio feature because they could "*imagine what the person is like by hearing [their] voice*." The participants further elaborated on the advantages of audio. For example in contrast to typing being "*really slow*," audio would be the easier and faster input modality.

CONCLUSION

This study explored ways of enhancing the experience of drive tourism and road trips while keeping in mind safety requirements. While there has been plenty of work researching the planning phase of travel, this research project aimed to fill a gap by focusing on the *during* trip experience. The user acceptance and benefits of adding a social aspect to road trips was investigated in more detail. In the context of this project, a prototype application was designed and developed based on the results of a literature review and two exploratory studies. The design process followed a user-centred approach comprising several user studies that formed the basis of multiple iterations of the prototype. The final application was then evaluated in an actual road trip.

The user studies not only helped improve the prototype but also offered an extensive insight to drive tourism and how tourists interact with mobile technology during their holiday. Participants noted that recommendations were their preferred source of travel-related information and getting those from locals or experienced travellers made them even more valuable. While some participants claimed that they would be hesitant to contact strangers, they did see the benefit of getting highly relevant and up-to-date information. Judging from the participants' actions and feedback, the application proved valuable for drive tourists. It was noted that enabling communication and an exchange of recommendations with strangers establishes a sense of connectedness and community, which did enhance the overall experience of the road trip. Participants especially endorsed the application's potential to meet new people and discover new things.

Moreover, by offering the option of composing either text or audio-based messages, the results of this project can also be consulted to explore which input and output modalities users prefer in what kind of driving situations.

It is important to be aware of the study's limitations when interpreting its results. For one, the sample size for the evaluation was quite small, considering that we only had two cars travelling on the route. Furthermore, the participants did not quite belong to our target group. First, because almost half of them were not actually tourists and secondly because almost all participants knew each other from being either colleagues or friends. Those two aspects definitely influenced the communication (e.g. more conversation) happening during the road trip and therefore also the results of this study. In our case, participants were mostly using the system to have a conversation instead of sharing insights about places such as recommendations as where to go for lunch. The participants arguably appropriated the system in the way they did because they knew each other, but also because they both were in different areas that were unfamiliar to both groups. The fact that they did ask for recommendations (once explicitly and other times through inquiring the other's location), leaves us to believe that the system serves the purpose of being valuable as source for both information and social encounters. In order to validate the found tendencies more evaluation studies have to be conducted.

Future work should include a more broad and extensive evaluation of the presented system. While a field study (here road trip) is the appropriate method, it should involve more participants that are actual tourists that do not know each other. This will allow a more valid analysis of types of communication and addressed topics. Another aspect that could be explored in future work is

the difference of effects and usage of the system of lone drivers versus groups.

ACKNOWLEDGEMENTS

This work is part of the main author's master thesis which was conducted at the Urban Informatics Lab at Queensland University of Technology, Brisbane, Australia.

REFERENCES

1. Axup, J., Viller, S., and Bidwell, N. J. Usability of a mobile, group communication prototype while rendezvousing. In Proceedings of CTS'05, IEEE Computer Society (2005), 24–31.
2. Axup, J., Viller, S., MacColl, I., and Cooper, R. Lo-fi matchmaking: A study of social pairing for backpackers. In UbiComp 2006, P. Dourish and A. Friday, Eds., vol. 4206 of Lecture Notes in Computer Science. Springer Berlin Heidelberg (2006), 351–368.
3. Barnes, S. Location-based services: the state of the art. e-service Journal 2, 3 (2003), 59–70.
4. Basacik, D., Reed, N., and Robbins, N. Smartphone use while driving - a simulator study. Tech. rep., Institute of Advanced Motorists, 03 (2012).
5. Bieger, T., and Laesser, C. Information sources for travel decisions: Toward a source process model. Journal of Travel Research 42, 4 (2004), 357–371.
6. Bilandzic, M., Foth, M., & De Luca, A. CityFlocks: designing social navigation for urban mobile information systems. In Proceedings of DIS'08. ACM (2008), 174- 183
7. Brown, B., and Chalmers, M. Tourism and mobile technology. In Proceedings of ECSCW 2003, Springer (2003), 335–354.
8. Brucks, M. The effects of product class knowledge on information search behavior. Journal of consumer research (1985), 1–16.
9. Cheverst, K., Mitchell, K., and Davies, N. The role of adaptive hypermedia in a context-aware tourist guide. Commun. ACM 45, 5 (2002), 47–51.
10. Chittaro, L., and Burigat, S. Augmenting audio messages with visual directions in mobile guides: an evaluation of three approaches. In Proceedings of MobileCHI'05, ACM (2005), 107–114.
11. Dvorak, J. C. Twitter is the new CB radio. http://search.proquest.com/docview/213774240?accountid=13380, August 2009. visited 2013-06-20.
12. Esbjörnsson, M., Juhlin, O., & Östergren, M. Traffic encounters and Hocman: Associating motorcycle ethnography with design. Personal and Ubiquitous Computing, 8(2), (2004), 92-99.
13. Fodness, D., and Murray, B. A typology of tourist information search strategies. Journal of Travel Research 37, 2 (1998), 108–119.
14. Garcia, A., Arbelaitz, O., Linaza, M. T., Vansteenwegen, P., and Souffriau,W. Personalized tourist route generation. In Current Trends in Web Engineering. Springer, 2010, 486–497.
15. Gretzel, U., et al. Consumer generated content–trends and implications for branding. E-review of Tourism Research 4, 3 (2006), 9–11.
16. Gursoy, D., and McCleary, K. W. An integrative model of tourists' information search behavior. Annals of tourism research 31, 2 (2004), 353–373.
17. Hosking, S., Young, K., and Regan, M. The effects of text messaging on young novice driver performance. In International conference on the distractions in driving, 2005, Sydney, New South Wales, Australia (2007).
18. Jacucci, G., Oulasvirta, A., & Salovaara, A. Active construction of experience through mobile media: a field study with implications for recording and sharing. Personal and Ubiquitous Computing, 11(4), (2007), 215-234.
19. Juhlin, O. Road Talk: A Public Roadside Location-dependent Audio Message System. In Social Media on the Road - The Future of Car Based Computing, vol. 50 of Computer Supported Cooperative Work. Springer London, (2010), ch. 7, 99–109.
20. Juhlin, O. Social media on the road: Mobile technologies and future traffic research. MultiMedia, IEEE 18, 1 (2011), 8–10.
21. Kaplan, A. M., and Haenlein, M. Users of the world, unite! The challenges and opportunities of social media. Business horizons 53, 1 (2010), 59–68.
22. Knobel, M., Hassenzahl, M., Lamara, M., Sattler, T., Schumann, J., Eckoldt, K., and Butz, A. Clique trip: feeling related in different cars. In Proceedings of the Designing Interactive Systems Conference, DIS '12, ACM (2012), 29–37.
23. Lamsfus, C., Grün, C., Alzua-Sorzabal, A., and Werthner, H. Context-based matchmaking to enhance tourists' experiences. Novatica 11 (2010), 17–23.
24. Litvin, S. W., Goldsmith, R. E., and Pan, B. Electronic word-of-mouth in hospitality and tourism management. Tourism management 29, 3 (2008), 458–468.
25. Malaka, R., and Zipf, A. Deep map: Challenging it research in the framework of a tourist information system. In Information and communication technologies in tourism 2000. Springer (2000), 15–27.
26. Marcialis, I., Uras, S., Ardu, D., Soro, A., De Vita, E., and Paddeu, G. Evaluation of trippple: a multimedia mobile travel. MoMM, ACM (2012).
27. McKenzie, R. D. The ecological approach to the study of the human community. American Journal of Sociology (1924), 287–301.
28. Newhagen, J. E., and Rafaeli, S. Why communication researchers should study the Internet: A dialogue. Journal of Computer-Mediated Communication 1, 4 (1996).
29. Östergren, M., & Juhlin, O. Car drivers using sound pryer-joint music listening in traffic encounters. In Consuming Music Together. Springer Netherlands (2006), 173-190.

30. Östergren, M., & Juhlin, O. Road Talk: a Roadside Location-Dependent Audio Message System for Car Drivers. J. Mobile Multimedia, 1(1), (2005), 47-61.

31. Oulasvirta, A., Tamminen, S., Roto, V., and Kuorelahti, J. Interaction in 4-second bursts: the fragmented nature of attentional resources in mobile hci. In *Proceedings of the SIGCHI conference on Human factors in computing systems*, ACM (2005), 919–928.

32. Pan, B., MacLaurin, T., and Crotts, J. C. Travel blogs and the implications for destination marketing. Journal of Travel Research 46, 1 (2007), 35–45.

33. Poniewozik, J. Social media as high-tech CB radio. Time 177, 2 (January 2011), 1. http://search.proquest.com/docview/847464258?accountid=13380.

34. Radosevich, L. Fixing web-site usability. InfoWorld 19, 50 (1997), 81–82.

35. Scherp, A., and Boll, S. Generic support for personalized mobile multimedia tourist applications. In *Proceedings of the 12th annual ACM international conference on Multimedia*, ACM (2004), 178–179.

36. Schöning, J., Hecht, B., and Starosielski, N. Evaluating automatically generated location-based stories for tourists. In Proceedings of CHI '08 Extended Abstracts on Human Factors in Computing Systems, CHI EA '08, ACM (2008), 2937–2942.

37. Sherzan, T. E. Talk 2 u l8r-why cell phones and driving have g2g: An analysis of the dangers of cell phone use while driving. Drake L. Rev. 59 (2010), 217.

38. Souffriau, W., Vansteenwegen, P., Vertommen, J., Berghe, G. V., and Oudheusden, D. V. A personal tourist trip design algorithm for mobile tourist guides. Applied Artificial Intelligence 22, 10 (2008), 964–985.

39. Stoltz, C. Each year, a bit less ugly; and other notes form the annual online travel suitfest. Washington Post 11 (1999). http://www.highbeam.com/doc/1P2-626395.html visited 12-16-2013.

40. Szymczak, D., Rassmus-Gröhn, K., Magnusson, C., and Hedvall, P.-O. A real-world study of an audio-tactile tourist guide. In Proceedings of MobileHCI '12, ACM (2012), 335–344.

41. Vansteenwegen, P., and Van Oudheusden, D. The mobile tourist guide: an or opportunity. OR Insight 20, 3 (2007), 21–27.

42. Weinschenk, S. Neuro Web Design: What Makes Them Click? Voices That Matter. Pearson Education, (2009).

43. Yu, C.-C., and Chang, H.-p. Personalized location-based recommendation services for tour planning in mobile tourism applications. In E-Commerce and Web Technologies, T. Noia and F. Buccafurri, Eds., vol. 5692 of Lecture Notes in Computer Science. Springer Berlin Heidelberg (2009), 38–49.