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ORIGINAL ARTICLE

Planners, navigators, and pragmatists: collaborative wayfinding using a single mobile phone

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Abstract Shared use of mobile devices is increasingly prevalent in both research prototypes and in practice, however, little is known as to how to support best this interaction paradigm. In this paper, we present a study examining how pairs share a single mobile phone during a collaborative wayfinding activity. We provide a classification of strategies, role relationships and phone interactions employed to conduct the wayfinding activities in our study. While acknowledging that the factors determining how the phone was shared are nuanced and intertwined, our results illustrate how differences in the mobile application's interface influenced shared use, wayfinding strategy and outcome.

Keywords Group navigation · Collaborative wayfinding · Mobile maps

1 Introduction

The mobile phone is normally thought of as a personal device. Everything about its form factor, including screen size, handheld orientation and keypad, and its interface, including ringtones and wallpapers, are designed with the individual in mind. In practice, however, mobile phones are often shared during a phone conversation, or when viewing photos or text messages.

One class of mobile application that may lead to shared use is navigational support. In this paper, we present results from a qualitative study of shared mobile phone use while wayfinding (traveling between specific start and end-points) indoors. Our results indicate that when textual route descriptions are presented in isolation, the person with the phone tends to concentrate on communicating route information while their partner maintains an engagement with their surroundings, while a map-based route depiction promotes engagement with the phone and the environment by both partners. Our results also illustrate the impact of environment on how the phone is used during wayfinding.

The results of our study have implications for mobile spatial interaction in general. The activities supported by mobile spatial interaction are often conducted in groups. Such activities then become socially mediated, and our technologies will influence (and their use will be influenced by) the management of awareness, coordination, and control among members of the group.

We first present our experimental design, including a description of the interfaces evaluated. We follow with a description of our evaluation methodology, define a classification scheme used in our analysis, and then present the results. The paper concludes with a discussion of design implications followed by related work.

2 Experimental simulation

We conducted an experimental simulation that took 12 participant pairs through buildings in downtown Halifax, Canada in order to complete several wayfinding tasks. Tasks were presented as part of a single scenario: visitors to the city attending a conference, who also want to arrange some sightseeing with travel agents in the adjacent shopping malls. Details of the experimental design are provided in this section.

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2.1 Setting

The conference-related tasks were situated in a downtown convention centre. The convention center is a large, multi-level meeting complex, providing a range of large and small meeting rooms and supporting facilities. There is an integrated office tower and stadium, and a walkway to a nearby hotel. Signage is prevalent in the conference area proper, but less so in adjoining parts of the complex. There are no kiosk maps in the convention center.

The second part of the study was situated in two shopping centres. The first is a typical downtown mall, with a range of stores and a food court, integrated into an office and hotel complex. Kiosk maps are situated in the entrances and central areas of the mall, while signage locates services, streets and adjoining buildings. The second is a smaller, related boutique mall containing primarily specialty shops. The kiosk maps in the first mall also showed the stores in the second mall, while the second mall itself provided only floor directories and no maps.

All buildings used in the study are connected by an indoor pedestrian walkway (pedway). The pedway is heterogeneous in design (like many city pedway systems), connecting buildings above ground and below ground, for example. A high-level map of the pedway is provided in many of its sections; however, there is uneven support for locating adjoining sections of the pedway from within the linked buildings.

2.2 Mobile phone interfaces

Two interfaces were developed for the mobile device: the paged interface combines map segments and textual route descriptions on a single screen, and provides the ability to page through the steps along the route (see Fig. 1a). The textual interface displays the entire textual route description as numbered items in a single page (Fig. 1b). Both interfaces provide access to a scrollable map outlining the route to take (Fig. 1c). The map image is scrollable in two dimensions using the phone's jog dial. From the textual interface, this map view is accessed by first selecting a step in the textual description, which brings up the map view centered on the corresponding section. Pressing '2' in the paged interface brings up the corresponding section of the scrollable map. Both interfaces use the same text and map detail for each phase of the route, and provided a clear linear progression between phases. In addition, a continuous blue line indicates the route participants should take to their destination on the maps. In essence, the interfaces differ in the way map and directions are combined, with the paged interface emphasizing juxtaposed data (on the same screen) and the textual interface overview + detail, with the 'detail' being the map section corresponding to the text, presented on a separate screen.Note that participants managed the correspondence between route presentation and their environment themselves.

2.3 Environmental cues, maps and signage

With the exception of kiosk maps, the use of existing cues and navigational support in the environment such as signage was not controlled in this study. Pairs were explicitly told to use whatever tools they normally would for navigating unfamiliar locations, and to think of the phone as another tool. They were also told that they were not required to always use the phone, but that they should keep it held in hand throughout the tasks.

In order to avoid the impact of using different map presentations, we created our own version of the mall kiosk map using the same visual style as the electronic map. When participants approached a kiosk in the mall, they were asked to refer to our version instead. In an effort to balance the effect of using kiosks across all environments, we added kiosk maps to the convention center also, using a similar structure and design as the mall maps, and again reflected in the electronic maps. One factor in the experiment was whether the pairs were required to interact with the kiosk maps to retrieve route detail on their mobile device. More detail about the kiosk map design is available in [1].

2.4 Population and recruitment

Participants were recruited in pairs. Pairs were asked that they could conceivably visit another city on a business trip with their partner. Participants were also screened to have little or no knowledge of the setting used in the study. A call was sent by email through a campus-wide mailing list at Dalhousie University; however, participants were not required to be members of that community.

Our participants ranged in age from 18 to 35. Six of the pairs either knew each other as colleagues from work or school, while the remaining six pairs were friends with each other or related to one another. We did not control for gender, and recruited one female pair, six male pairs and five mixed pairs. We supplied the mobile phone.

2.5 Methodology and procedure

The experiment employed a within-subjects design with two factors (phone interface and the use of kiosk maps to retrieve route information), and two levels per factor (the paged or textual interface, use/do not use kiosk maps to retrieve routes).

Factors were fully crossed and balanced such that each pair conducted four tasks, each under one experimental

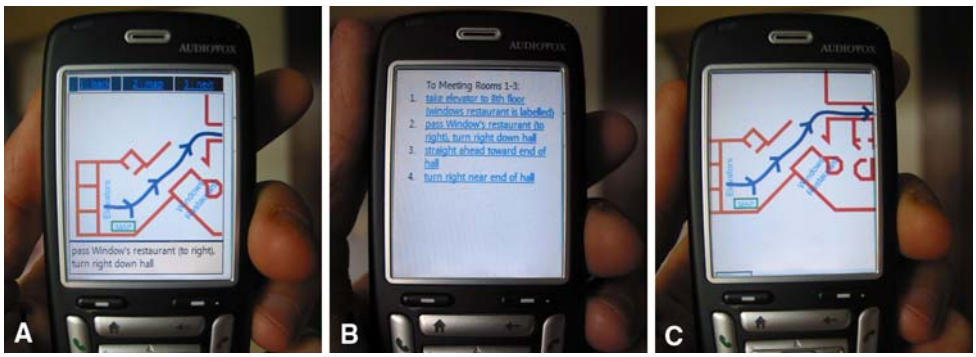

Fig. 1 The two route interfaces and the scroll map. **a** The paged interface, providing a map section and textual description for each phase in a route. **b** The textual interface, providing the entire route as a numbered list. **c** The scroll map, traversed using the jog dial. This was accessible from both (**a**) and (**b**), opening to the corresponding location on the map

condition. Condition ordering was counterbalanced between subjects. To avoid retracing steps and to maintain continuity in the scenario narrative, all pairs completed the tasks in the same order.

Before beginning the tasks, each pair was introduced to the overall scenario and walked through a sample task (conference check-in) to illustrate how each phone interface operated. Participant pairs then completed all four tasks in sequence. The first two tasks involved finding different meeting rooms within the convention centre. The last two tasks asked participants to locate travel agencies within the adjoining shopping centres.

Conversation during the tasks was recorded using a digital voice recorder and the verbal communication between participants was carefully transcribed from audio at the end of the study. While video would have provided a visual context of the tasks, previous difficulties capturing video during high mobile activities led us to rely on audio and observational notes. Two observers accompanied the pairs at all times from about six feet away. One noted their behaviour on a coding sheet, looking at how the phone was shared, what environmental cues were used, and how the wayfinding task progressed in general. The other recorded more general observations, and also facilitated the experiment.

At the end of each task, each participant completed a questionnaire allowing them to reflect and comment on successes and failures during the task. After all tasks were completed, participants then completed a questionnaire asking them to compare interfaces, and were given an opportunity to elaborate in a short interview. The entire experiment lasted between 1–1.5 h per pair.

3 Results and analysis

In this section, we present results from a qualitative analysis of pair behaviour observed in the study. We first detail our analysis methodology, and then present a classification framework for collaborative wayfinding using mobile devices that emerged from our analysis. After this, we present results pertaining to how the device was shared, and in particular how the mobile phone interface impacted sharing and wayfinding strategy.

3.1 Methodology

3.1.1 Characterizations of pair behaviour

For each pair, we collected the transcribed conversation, source audio, questionnaire data and observer notes and built a narrative description of how the pair executed each task. This activity was conducted by two researchers, who continually challenged each other's extrapolations from the source data. We were able to reconstruct much of the participant interactions and behaviour with a high level of confidence by combining observer notes, source audio and transcriptions while reviewing the phone interface the pair was using.

Once all narrative descriptions were constructed, pair behaviour for each task was categorized according to a range of dimensions including how the phone was physically shared, how its data were communicated, what wayfinding strategies were employed, and what environmental cues were referenced. This allowed us to better identify commonalities and differences in the ways pairs conducted each task.

From these characterization activities, a classification of observed wayfinding approaches emerged. Approaches are categorized along two axes: wayfinding strategy and individual roles. This classification is presented in the next section.

3.1.2 Categorization of wayfinding approach by location

The final step in our analysis was to consider each task in terms of its constituent legs or stages. For example, regions that caused several groups to pause during wayfinding were identified as distinct stages in the corresponding routes. The navigation approach of each pair was then classified under our scheme for every stage in the route. When there was insufficient data to classify a pair's behavior for a

particular stage, the pair was not counted in analysis. This data provided a record of how a pair's behaviour remained consistent or changed in response to each stage in the route, and allowed us to assess the similarity of strategies across pairs for given stages in a route.

3.2 A classification of activities, strategies and roles

Because the focus of our analysis is on collaborative wayfinding, it was useful to devise a classification scheme that embodies aspects of both collaboration and wayfinding, rather than applying schemes developed for solo navigation or collaboration in static contexts. Our classification scheme is described in Table 1.

The basic building blocks in our scheme are "activities" of phone use. *Activities* are completely determined by the phone detail accessed, the location in which it is accessed relative to the location(s) referenced in the phone detail, and whether the detail is accessed while mobile or stationary. The concept of activity is kept distinct from the activity's intent. The intent of a given activity may differ, often depending on the strategy being employed. *Strategies* often rely mainly on one or two kinds of activities. A strategy is the process being followed in order to complete one or more stages in a route. Finally, within strategies there are different possible configurations of role between partners. *Role relationships* obviously affect the nature of strategies, but more specifically influence how phone detail is shared and communicated.

3.3 Results: roles and strategies employed

Table 2 summarizes the strategies and role relationships observed for all tasks. Plan and go, and sync and go strategies were largely collaborative, with both partners engaged in the same activities (planning, sync, and orienting). Navigator and scout was the strategy with the most recorded occurrences (55% of all recorded strategies), with just over half involving a clear division of responsibility between navigator and scout, and a considerable proportion involving the person with the phone by him/herself.

The strategy employed was influenced by the stage in the route and other environmental factors. Perhaps unsurprisingly, plan and go was more prevalent in the early stages of a route, with navigator and scout most often employed during straightforward parts of a route, and sync and go used at more complex decision points. For example, the first task involved two phases. At the beginning of each phase, plan and go was observed in 8 of 12 and 7 of 12 groups, respectively. The convention centre's main lobby

Table 1 Classification of activities, strategies and role relationships for collaborative wayfinding

Activities
Typically mobile
Set up: view and/or communicate details prior to arriving at described location.
Sync: reference route detail (e.g. a landmark) in relation to current location.
Typically Stationary
Plan: similar to *set up*, but involves surveying a wider portion of a route.
Orient: similar to *sync*, but a more explicit re-orientation of location relative to route.
Review: access details about stages in a route prior to current location.
Strategies
Navigator and Scout: a predominately-mobile strategy, involving iterative *set up* and *sync*. The navigator communicates route to set up each route leg before reaching it. The scout matches environment to route detail and may prompt for more detail.
Synchronize and Go: a predominately-mobile strategy, involving *sync* and to lesser extent *orient*. Pairs match phone detail to environment as they encounter it, slowing or stopping at difficult spots. Usually involves some sharing of the phone interface.
Plan and Go: characterized by a stationary *plan* activity followed by minimal *sync* en route. Planning is often collaborative, using the phone and/or kiosk map. Typically phone use is minimal while mobile (e.g. to refresh memory).
Go and Validate: the pair embarks on a route with incomplete information (e.g. by using environmental cues not explicitly referenced in the interface) and then matches route and surroundings to phone detail in a combination of *review* and *orient* activity.
Role relationships
Leader and Follower: Partner without phone is not engaged in wayfinding, either voluntarily or due to a lack of communication by partner with phone. The leader may share route details, however this is not intended for collaboration.
Independent: Partners conduct the wayfinding task independently. The partner without the phone may look over the shoulder of the partner with the phone or ask for details, however this is not intended for collaboration.
Collaborative, Same Roles: The pair actively collaborate, such that roles are indistinct and decisions are made through discussion. Both partners (often simultaneously) look at the phone and engage with the environment.
Collaborative, Distinct Roles: The pair actively collaborate, making decisions together, but have distinct roles. Often the person with phone will concentrate on phone detail and communicate it to their partner, who will match this with environmental cues.

Table 2 Number of occurrences across all tasks of each strategy, by role relationship

	Leader and follower	Independent	Collab: same	Collab: different	Total
Plan and go	10	13	68	8	99
Sync and go	14	5	78	16	113
Go + validate	6	3	12	5	26
Nav. and scout	47	8	75	156	286
Total	77	29	233	185	524

A strategy was counted for each leg in a route, for all participant pairs

was a difficult stage of the route to navigate, and at this point 6 of 12 pairs employed the sync and go strategy. Most remaining route stages in this task involved traversing hallways; for these stages, the majority of pairs used navigator and scout.

Environmental details often had specific, direct impact on strategy and device use. The consistent signage in the main sections of the convention centre often reduced the amount of interaction with the phone. The final task began in the middle of one mall and required immediate orientation to locate the pedway to the second mall. At the outset of this task there was a marked absence of planning activity, with all 12 groups moving quickly into sync and go or navigator and scout strategies. Once the pedway was crossed, three groups then paused to plan the remainder of the route.

Different participant pairs demonstrated affinity to particular strategies. Three pairs were predominantly 'navigators', employing navigator and scout in more than 75% of all route stages (mean 55%), while another pair used sync and go in over half of all route stages (mean 20%). Plan and go was used in varying degrees across pairs, from 5 to over 30% of all route stages. Two pairs at the high end of this range (who we term 'planners'), tended to study phone detail carefully at the outset, and then use the mobile device very little when mobile, using environmental cues to bring them to their destination.

3.4 Results: using the phone

3.4.1 Sharing the phone

There was a wide variation in how the phone was shared as a resource for navigation, and this was closely related to the strategies and role relationships employed by participants. One important aspect of sharing was who held the phone, and so who (mostly or entirely) directly interacted with the interface. Participants were told that they were free to share the phone in this way and we did not control who first took the phone for a given task. No dominant pattern of this kind of sharing emerged in our study. Five pairs chose to have one participant to hold the phone throughout a given task, and seven pairs passed the phone between partners at least once, while tasks were in progress.

Passing the phone is just one form of sharing. More often, pairs would come together around the phone to discuss details, or the participant without the phone would glance over the shoulder of the participant holding the phone. Concerted sharing of the interface, often involving a pause in the route, was prevalent in our study, with this kind of sharing occurring during 43% of all recorded route stages across pairs. This includes over 70% of all occurrences of both plan and go and sync and go strategies, 46% of go and validate, and 26% of nav/scout. This concerted sharing was also important when lost, occurring in 20 of the 31 recorded instances of lostness. There were differences between pairs in this kind of sharing also. Three pairs made an effort to look at the phone together throughout the tasks, while two pairs never looked at the interface together, except fleetingly at the outset of each task. Most "over the shoulder", glancing was not captured and so is not included in this analysis, however observer notes record glancing for most but not all pairs, and for three pairs quite frequent glancing was noted.

3.4.2 Communicating phone detail

The most prevalent means of sharing phone detail was through conversation, occurring in 78% of all recorded route stages.[1] The nature of this communication was impacted by the role relationship between partners, their wayfinding strategy, and the interface used.

Role relationship The partner with the phone often required a sense that their partner was actively engaged in the task to continue to devote effort to relaying phone route detail. Conversation is a direct way to signal engagement, establish and maintain roles. For example, the partner without the phone could query for detail to signal engagement:

(walking)	(18 s silence)
P11	what does it say?
P12	down the escalator

[1] This proportion is likely higher: there were a number of cases where conversation was inaudible or garbled.

Wayfinding strategy The strategy used influences the nature of the conversation about phone detail. Below is a typical navigator and scout conversation. P5 presents route detail while P6 relates it to the environment:

P5 turn right at the phones
P6 phones are here
P5 alright, turn left
P6 so, right at the phones, and then
P5 then left
P6 turn left—oh highland suites! Number 10?

Contrast this with the following sync and go conversation, in which both partners are looking at the phone, interpreting detail and engaging with the environment:

P18 go there?
P17 that's it
P18 go up escalator.. straight ahead.. turn right.. straight ahead.. ok?
P17 yeah
P18 it's that way
P17 11… 9, 10, 11. … Bingo!

Phone interface When textual directions were provided, participants often spoke part or all of the text aloud to communicate the next step in the route, while other participants tended to paraphrase the instructions. The person with the phone did not arbitrarily choose when and where to communicate route detail. The text was often spoken to sync the phone detail with the environment, to bring focus back to the wayfinding task, and in response to questions from their partner:

P13 Windows restaurant is labeled—ah
P14 then you said turn right?
P13 past Windows to right…turn right down hall

Participants who relied mainly or solely on graphical route presentations needed to actively interpret and then describe route detail, or required their partner to also view the device to communicate:

((leave elevator))

P24 we're going that way
P23 um… (inaudible)
P24 back
P23 nnn-nn…
P24 oh. Are we going up the stairs? No we're going there

3.5 Results: interface impacts on collaboration and wayfinding

The way people collaborated around the single device was determined in part by the presentation of route detail. Text directions need to be interpreted and translated into the environment, while a spatial representation of the area can show relative position and distance of landmarks directly along with the route itself. Conversely, text is straightforward to communicate, while spatial representations need to be converted into verbal route descriptions on the fly or shared visually.

Both interfaces used in our study provided textual and graphical route data (see Fig. 1). The difference lay in the way this data were presented on the phone screen. As might be expected, participants reviewed the entire route prior to embarking more often when using the textual interface (20/45) than with the paged interface (6/48).

When pairs used the textual interface partners found it less necessary to share the phone presentation. This was particularly beneficial in the navigator and scout strategy, allowing the distinct roles to persist over longer stretches of the routes. Tasks were performed in less time overall with the textual interface than with the paged interface [$F(1.47) = 7.891$, $P < 0.01$]. We tallied the number of distinct pauses in navigation to share the interface, and found 43 instances of sharing map detail versus 26 of sharing text.

A spatial representation may have been particularly beneficial in confusing stages of a route, (where sync and go was the most prevalent strategy), to help orient route details to the environment. Sync and go was employed as a strategy in almost 70% of the 38 recorded cases where the scrollable map was used in isolation. By contrast, sync and go was used in just 10% of the 128 recorded cases in which the textual interface was used without referring to the scroll map.

Results pertaining to the impact of the prototypes on spatial awareness, and the integration of existing environmental support for navigation, including interaction with kiosk maps to retrieve routes, are available in detail elsewhere [1].

4 Discussion

The textual display of route information was in some respects the most effective presentation for collaboration in our study. It promotes communication while mobile, and although two participants complained that text was difficult to read when mobile, allowed quick reference to the route in its entirety. Simply having the entire route on a single page also seemed to promote planning behaviour, especially when there was no kiosk map to refer to. Text did not facilitate all wayfinding activities, however. It was used far less by participants when orienting themselves with the environment. An MSI application might provide orientation support by automatically rotating a map view; however, our results suggest that this might not be the optimal default display for group navigation.

The paged interface could accommodate a variety of strategies by combining map and text onto the same screen. However, a drawback of the paged interface was the need to manually sync the page with the environment. Several participants who actively used the scrollable map with the textual interface had similar complaints about that interface also. Location sensing technology can be effective in facilitating this syncing task.

In our study, it was clear that while interface impacts strategy, it doesn't dictate it—it is important to recognize and accommodate the variety of strategies used. Of textual, paged, and scrollable there was no clear interface preference expressed across participants, but in 10 of the 12 pairs, both participants chose the same interface as most preferred. Interfaces were judged in large part by how well they fit their style of collaboration.

As discussed, the interfaces used in this study were basic. Ubiquitous computing technologies such as location sensing, tagging, and augmented views can drastically change the information available and how it is presented. However, applications using such technologies must still reflect the importance of existing environmental support, navigation strategies and collaboration styles in their design.

The tasks in our study involved navigating unfamiliar, indoor environments. Familiarity and setting both can have a profound impact on how a device is used. It is also unclear how ownership of a mobile device would affect sharing. Finally, the activities of twelve pairs were repeatedly sampled along the various stages of our tasks. As indicated, some pairs heavily favoured specific navigation strategies or sharing styles. While this emphasizes the importance of group dynamic on the use of spatial applications, it prohibits a quantitative statistical analysis.

5 Related work

5.1 Sharing mobile phones and navigating in groups

In the Sotto Voce project, Aoki and Woodruff [2] iteratively designed an electronic guidebook for an historic mansion that explicitly addresses the social nature of such visits. They illustrated how shared audio promotes shared experience of the exhibits, both by drawing visitors together around a particular exhibit, and by providing tie-ins for off-topic conversation. By contrast, our participants sparked off-topic conversation based mainly on the environment and the task scenarios, and not the phone detail per se. In [3], Luff and Heath distinguish between two kinds of artifact mobility: macro mobility, including physically transferring the device, and micro mobility, which includes changes in device orientation relative to the person such as rotating a map. They argue that it is necessary to pay attention to both kinds of mobility to support mobile collaboration. Weilenmann and Larsson [6] conducted an ethnographic study of mobile phone use among teenagers in Sweden. They identified shared use as an important phenomenon neglected in design. They similarly distinguish *minimal* forms of sharing as involving sharing the screen or communicating detail by reading aloud, and *hands-on* sharing in which the phone is passed back and forth. Both types of sharing were observed in our study, however the minimal (or micro) forms were far more prevalent.

In [4], Brown and Chalmers discuss an ethnographic study considering how tourists work together in groups, and in particular collaborate around maps. They emphasize the importance of large maps and other artefacts accessible to the entire group in facilitating coordination. Cole and Stanton [5] discuss three studies involving the collaborative use of mobile devices by children. They emphasize the potential of mobile devices to integrate with their surrounding environment and other tools. In this sense, their form-factor is a boon, as they do not take over the attention of the user: in one study, PDAs allowed children to switch smoothly between individual, paired and whole group activity.

In another study involving sharing a single PDA, pair work was impeded by the need to stand still so partners could both see the screen. In performing our tasks, participants found creative ways to communicate detail without requiring the screen to be shared.

5.2 Presenting route information on mobile devices

Borchers et al. [7] argue that maps on mobile devices can be viewed as a mobile kiosk that provides useful information at major decision points, however considerable differences in interaction and display challenge this comparison [7–9].

Additionally, while kiosk maps support a range of purposes, mobile maps often address an immediate information need (such as the route to a restaurant) [10, 11]. There are many contextual factors that must be taken into account in mobile map design, including the user population [12], the number of users [9], their task [8], their location [13], and the available technical resources [10].

The influence of signage and environmental variables other than landmarks (as traditionally defined) on navigation is well established. In 1981, Weismen [14] reported an analysis of wayfinding in buildings. Considering that the spatial relationships amongst building locations must be stored in a person's head, he defined 4 broad categories of environmental variables that can impact wayfinding:

1. the presence of signage,
2. the ability to see familiar cues or landmarks from a novel location,

3. the extent to which one location looks different from another, and
4. the overall plan or layout of a setting.

In another study, O'Neil [15] emphasized the need to examine multiple environmental variables at once to understand how they affect wayfinding. He considered the relationship between floor plan complexity and various signage conditions, finding that signage was only a moderate countermeasure to complex layouts.

While little work has explicitly considered how pairs communicate while navigating together, a significant amount of research has explored how route information is best communicated. In [16], Allen presents evidence that route information is best conveyed by following three guidelines: presenting directions in the correct order, concentrating on decision points, and referencing landmarks in terms that are understood by both parties.

Daniel and Denis [17] provide additional support for (2) and (3) in their work on how concise route descriptions are generated. Denis et al. [18] provide evidence that familiarity with an environment has little impact on a person's ability to determine an effective skeletal route description.

Effective route maps must provide information that is necessary and sufficient to make the right choice at each decision point [17]. Agrawala and Stolte [19] argue that for maps on mobile devices it is particularly important that the routes are simplified and extra information is removed. There are different techniques to help generalize route information for mobile devices [10, 19], such as applying the principle of readability (draw important objects larger and in a different scale), removing clutter, summarizing, distortion, simplification, and abstraction. Designers of mobile maps need to consider that their users may assume spatial accuracy, however. In [20], Tversky shows how route maps and textual route descriptions are similar from the perspective of individual cognition, but that maps can present additional spatial information in their layout. Our study illustrates that the two formats affect collaborative wayfinding differently.

6 Conclusion

We have presented results from a qualitative analysis of wayfinding behaviour of pairs in a scenario-based experimental simulation involving the use of a single mobile phone. Our analysis is structured around a classification scheme of wayfinding strategies and role relationships. The wayfinding strategies employed were influenced by environment and the stage in a route. In addition, some pairs seemed predisposed toward specific strategies, while others applied strategies in a more pragmatic way.

The way route information was presented on the phone affected how the phone detail was shared. Textual descriptions were more often relayed verbally, while spatial presentations were often shared visually. Less initial planning was observed when the phone presented route detail in a stepwise fashion instead of on a single screen. Possibly due to both of these factors, the textual interface led to shorter task times overall.

Sharing resources such as maps and guidebooks are common during wayfinding, and so it is reasonable to expect that other tools such as mobile phones or other MSI technology would be shared as well. In evaluative comments, only two of our participants remarked that sharing was awkward, and in both cases, it was in relation to one of the interfaces, and not the phone itself. Our study illustrates that a single phone can be effectively used by pairs in wayfinding tasks, but in ways that are influenced by interface, environment, and collaborative predisposition.

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