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Piloting tourist guides in a mobile context

Bente Evjemo, Sigmund Akselsen and Anders Schürmann
*Telenor R&I
 Norway*

1. Introduction

The “self-made tourist” and the “active tourist” are trends within tourism today. He goes globally to see exotic sceneries and looks up small and less known attractions in his own neighbourhood - if they in some way stimulate his curiosity. He is skilled and demanding, and finds satisfaction in the process of composing the travelling route and program of events. Many decisions are made on the way – being the choice of visiting a museum or the time spent on specific items within the museum. The handy mobile phones seem promising as a tool mediating the dynamic updated information needed. The mobile context is complex and holds qualities relevant to the ongoing search for factors decisive to form attractive tourist guides and good user experience. This context is here explored through the analyses of how two digital tourist guides were welcomed by real users.

1.1 Digital tourist guides

Travel guides are to a large extent launched as glossy brochures and most tourist attractions appear as fixed products regulated by opening hours and guided tours. This is about to change. Cultural institutions exceed their physical borders to face their audience by making parts of their collections available on the Internet, and most important – they look for new audiences. Alternative media channels and mobile guides are put to use and multimedia shows are available on location. The storytelling power of multimedia technology accompanied by digitalisation trends and diffusion of handy mobile devices, support these changes.

The great number of digital tourist guides tells about a strong belief in the potential of digital guiding. One of the earliest digital guides, the Cyberguide, provided a positioning component that enabled questions of the kind “What am I looking at” to be answered (Abowd et al., 1997). This system developed from being an indoor guide to an extended outdoor guide. Subsequent guides vary according to several dimensions. Some guides store the content locally on the device (Aoki et al., 2002), while others transfer information on demand through wireless networks (Cheverst et al., 2000) or Bluetooth (Luyten & Coninx, 2004). Some are closely tied to one tourist attraction (Aoki et al., 2002; Laurillau & Paternò, 2004; Föckler et al., 2005; O’Hara et al., 2007) while others cover several attractions or points of interest (POIs) within a geographical area where automatic positioning and map based user interfaces are essential components (Cheverst et al., 2000; Schilling et al., 2005). The so

called route planners (e.g. Kray et al., 2003) and city visitor recommender systems (Modsching et al., 2007; Takeuchi & Sugimoto, 2009) benefit from automatic positioning as well.

A basic distinction is the use of stationary versus portable devices. The portable approach is regarded promising, but the procedures for lending out portable devices (e.g. PDAs) often turns out to be expensive. Thus the guide that runs on the visitor's own mobile phone becomes an interesting alternative. This approach is supported by the technological development that is about to transform the mobile phone into a multimedia device and also the overwhelming market penetration of mobile phones. Still mobile tourist guides are not widely used. The price structures of mobile Internet usage and/or the network coverage might hamper wide usage, but the explanation might as well be found in shortcomings of the understanding of the mobile phone context.

1.2 The mobile phone context

An attractive mobile guide is a mobile phone application with particular physical and networking capabilities. It is meant to be handled by a great variety of users. Further, the user and the device are parts of a changing and rather complex context that altogether decides the level of adoption and use, the user interaction style, and the overall user satisfaction. This mobile context can be specified as the physical context, the technological context, the mental context, and the social context (Kiljander, 2004; Biljon & Kotzé, 2007).

The physical context refers to the possibilities and constraints of the mobile phone device and the surrounding into which the use takes place. The possibilities refer to the multimodal aspects of the mobile phone and the dynamics that occur when digital content and guidance are received just-in-time, while the constraints refer to the specific and somewhat restricted user interaction mechanism of mobile phones (problems concerning small displays, keys, etc) and actual environmental factors like illumination, background noise, etc. Dim light or bright sun light might make the displays hard to read, and not all phones have the robustness needed for rain or snowy weather.

The technological context refers to the mobile infrastructure and the features and qualities of the mobile device utilising this infrastructure. Of course the network coverage and network bandwidth are salient factors as they put restrictions on service availability and quality. Most interesting are the location aware services that support discovery of POIs and also filter information based on the user's context to increase relevance and improve efficiency.

The mental context includes the user's understanding of how to use the mobile handset. The handset's multitasking or simultaneous interaction with the environment is part of the mental context. Obviously the user's technical skills and interests impact on the mental context.

The social context refers to the inter-human aspects of mobile phone use. Some might consider this approach as less relevant to this setting as tourist guides are made primarily for information retrieval. When recognising the tourist setting as a social setting (Brown & Chalmers, 2003) the importance of the social context is actualised.

1.3 Attractive services and user acceptance

Great effort has been invested to specify the factors that are decisive to service adoption and wide usage. The Technology Acceptance Model (TAM) was constructed to explain adoption

of utilitarian office systems (Davis 1989). The model has been extended and revised to better explain the determinants of user behaviour and also to address a wider specter of technology, mobile phone applications included (Kwon & Chidambaram, 2000; Bergvik et al., 2006; Biljon & Kotzé, 2007). Utilitarian factors are of course important but recent studies suggest hedonic factors and social influence to have significant impact (Nysveen et al., 2005; Chtourou et al., 2007). One might ask if these aspects are of special importance to the emerging self-made tourism. Thus the questionnaires used to evaluate the tourist guides of this chapter address the pleasure aspect as well as utilitarian factors.

Another fundamental question is how to gain reliable knowledge on technology acceptance and the effect of various user interfaces. You might simply ask people, or even better, you can offer them hands-on experience and then ask. This was the chosen strategy for the evaluation of the two tourist guides in this study, one addressing attractions within a wide region and one addressing a particular attraction.

2. RegionGuide – the traveller’s guide

The RegionGuide informed tourists about attractions, hotels, places to eat etc. within a region. Relevant multimedia information occurred on a map based user interface as POIs which was downloaded over the mobile phone network when needed. The following POI categories (based on a national classification scheme for tourist services) were used: accommodation, dining, attraction, activity, events, and tourist information. The overall design of RegionGuide reflected the results of a major tourist survey that was performed to better understand tourist behaviour, the tourist role, and the tourist’s particular interests and tasks.

As maps are frequently used and constitute an important source of information for people on the move, the main user interface was based upon a scaleable map (see figure 1). It was implemented as a Java ME Midlet.

To avoid information overload and too many overlapping icons, *attraction* was selected initially as the preferred and only category, but all categories could be shown simultaneously. When clicking an icon, the map screen was replaced by a short description of the POI limited to 255 characters to reduce download time and scrolling. There were links to contact information enabling phone calling and messaging and also WAP pages with multimedia content.

Fig. 1. Initial map is shown with POIs, including star-like icons that hide several specific icons (left), a simple POI description page (mid), and a WAP site with multimedia information (right).

A key based or a stylus based user interface was automatically selected when device capabilities were detected during installation of the software. In the key based interface the panning operation moved the map half a screen width in the desired direction (see figure 2). In the stylus version panning was achieved by dragging the map in the desired position. Zooming was done by drawing a rectangle around the area of interest. Icons at the top left of the screen (figure 2) provided additional functions and toggled between zoom-mode and pan-mode for the stylus.

Fig. 2. Key based interface (left) and stylus based interface (right).

2.1 Survey and field trial

The trial was performed in the archipelago of Lofoten in Northern Norway. Tourists waiting for the ferry were invited to a short demonstration of the RegionGuide, including some minutes hands-on and then answered a questionnaire. Those with capable phones were asked to install and use RegionGuide during their stay in the archipelago. A similar recruitment process was performed at the region's main tourist office.

The survey included 107 respondents, most of them middle aged. Less than half of them had phones that handled the necessary Java software, and practical problems occurred during installation of RegionGuide. Thus the field trial included about 30 participants from whom 13 were contacted after the trial period for a semi-structured interview. The duration of usage corresponded to the duration of their stay in the region which was typically 2-3 days.

2.2 Results

Most of the respondents seemed impressed by the detailed map on the small display and the possibilities to navigate and zoom, and finally recognize the link between the map section on the display and their physical location. However, this link was not obvious to everybody as the automatic positioning was not part of the solution and consequently no icon signalling "You are here" was shown. Comments related to automatic positioning was probably actualised by their knowledge of satellite positioning systems in vehicles.

They were surprised to find the phone capable of anything else but calling and messaging: *"This is great! The mobile is always there – and that makes it a handy service!"*. Doubtlessly they

found pleasure in using the guide, even though they moderated the suggested entertaining element: *"Well, not actual entertaining or fun, but nice"*.

More than two thirds agreed upon the statement: *"I think this guide will be useful to me"*, and even more respondents claimed that they would install and use the system if their mobile terminal allowed them to do so. Some respondents asked for more POIs and extended POI information, and they were concerned about the comprehensiveness and quality of the information available.

The majority stated that the RegionGuide was easy to use, and this attitude remained positive throughout the field trial. However, the informants reported problems related to accurate navigation and to find back to a recognisable location on the map. Also lack of smooth panning seemed to reduce the overall user experience.

Technical problems reported were mainly related to the configuration procedure and had presumably limited impact on the test users' assessment of ease of use. Configuration problems occurred because the devices had various implementations of Java ME specifications and WAP and Internet settings.

3. MuseumGuide – visit without entering

MuseumGuide was developed to vitalise a museum located next to a monumental cathedral providing vivid teasers and complementary information about the museum attractions. The museum consists of four separate buildings that enclose a square courtyard. The thick stone walls and the rooms and artefacts inside hold parts of the city history and anecdotes about its inhabitants.

Fig. 3. User interface of the MuseumGuide. The silhouette of the cathedral was meant to support the user's orientation and identification of buildings (left), and the numbers on the building correspond to the entry options (left and mid). Different icons denote the type of media (right).

The design of the MuseumGuide reflected a pedagogical storytelling ambition, which is recommended within tourism and acculturation (Luyten & Coninx, 2004). The content was

held on hierarchical structured WAP pages on three levels. The welcome page directed the user towards historical events related to the buildings or alternatively to particular rooms and items within the buildings. The users were presented to a mix of short texts, images and graphical sketches, as well as video clips and audio tracks, both in Norwegian and English. Some of the audio tracks were supposed to be played close to statues of historical persons – placed outside – to support an intended conception of “talking heads”. They varied from 30 to 180 seconds in length, and the video clips from 24 to 150 seconds. Images with calm transitions were used throughout the videos to improve the viewability of the video on small screens, and the WAP pages were relatively short to minimize the need for scrolling. The MuseumGuide was implemented as a so-called location based service, utilizing advanced antenna technology¹ and WLAN for positioning. The 3G mobile phones² in use were equipped with WLANSIM³ cards. The system utilized WAP Push⁴ to load WAP pages related to the user’s current location.

3.1 The field trial

The guide was tested by 90 persons during three October days in 2005. The majority was college students, aged 17-18 years, and their attendance was arranged in advance. Additionally the museum staff and people crossing the yard during the day were asked to participate.

The test users were given mobile phones and a short introduction to the MuseumGuide. This briefing included an explanation of main features and navigation capabilities. They used the service for approximately half an hour. In case of technical problems, members of the project staff were present at the courtyard. When returning the handset they were asked to fill in a questionnaire. They received two lottery tickets with an approximate value of 6 € for the participation.

The 3G coverage happened to be weak during the pilot period. Consequently the handsets frequently switched between the 3G and 2G networks. This situation caused software deadlocks and reduced the user experience of video clips considerably. To avoid additional frustration it was decided to reduce complexity by deactivating the location aware functions of the guide.

3.2 Results

The MuseumGuide was welcomed by the test users and most of them supported the following expressions: *“If I get a chance, I will use a guide like this again”* and *“I will recommend others to use this kind of guide”*.

The aspect of usefulness was measured through several items, amongst them a rather provocative one: *“To what degree is MuseumGuide a substitute to entering the museum and visit it traditionally?”* Not surprisingly only a third agreed upon this latter statement (when considering those who had few technical problems the share rose to 50%), but their overall

¹ Cordis RadioEye

² 6630 and Sony Ericsson K600i

³ Wireless Local Area Network, Subscriber Identification Module

⁴ WAP Push Service Load (SL) was used

curiosity about this ancient palace was strengthened. This effect was not dependent of gender, age, profession or general historical or cultural interests.

However, more than half of the test users reported difficulties in linking the information given by the MuseumGuide to the actual buildings. One test user formulated his frustration like this: *"I'm here to see the court yard, not to watch a display"*. The leads given by the graphical design were obviously not good enough.

In periods of few network problems, the test users found the guide easy to use. The user interface was considered intuitive, and not surprisingly, those who had prior knowledge to the phone found the use of the keys more intuitive than others. The older informants seemed to be distracted by technical problems whereas the younger ones were thrilled by the multimedia approach and the guide's innovativeness.

Most informants preferred audio over video even if some of the audio clips lasted for nearly three minutes. In particular the "talking heads" were appreciated. A young boy exclaimed: *"I don't like reading – I feel good about the story being told to me"*.

Nearly half of the test users would like to see co-visiting or content sharing facilities added to the guide, and among the museum staff these facilities were regarded most important.

4. Discussion

The discussion addresses tourist guide success criteria categorised according to the different qualities of the mobile context. Finally some considerations about piloting new services are given.

4.1 Physical context

A mobile phone is often described by a list of shortcomings. The display is small, the keys are hard to hit and the network bandwidth and battery capacity are among other resources denoted as limited. In other words; a mobile phone is a bad copy of another and more useful device, namely the personal computer. The assessment of ease of use is therefore influenced by expectations relevant to the computer or also other tools. Thus the map as it is displayed on a mobile screen is compared with a map on a computer or a paper based map, and likewise the navigational possibilities.

In both systems the users reported difficulties in navigating the map. They found it rather cumbersome to use keys and joystick (see figure 2) and it did not offer the qualities experienced when looking at an ordinary paper based map. This is in line with findings from other studies (Kjeldskov et al. (2005). Improvements might be gained through minimising navigation by adding automatic positioning and context based adaptation. The map displayed by RegionGuide should for instance be equipped with contour lines whenever the user is hiking off road, larger fonts when moving fast, and brighter display colours in dimmed environments.

Both services utilised the mobile phone's multimedia and visualisation features. When audio and video clips are produced by talented expertise, the results are appreciated by the users. However, the production is resource and time demanding. These conditions prevent large scale production of high quality multimedia content, which is probably a major reason why such guides are still not widely used.

4.2 Technological context

The mobile network infrastructure and the basic network services available constitute the so called technological aspects of the mobile context. In contrast to the fixed network and ditto services the mobile network is associated with scarce resources (e.g. bandwidth and coverage) as well as opportunities or strengths that make particular sense when the users stay elsewhere than their normal location or they are travelling. The positioning facilities and the camera and multimedia handling mechanisms are among these opportunities (c.f. the comments on multimedia content in chapter 4.1).

Multimedia content might as well be key elements in the request for information. The most obvious approach is to include images, taken by the phone's camera, directly into an information retrieval request. The success of such applications depends on the qualities of the image recognition module and also on the matching images available. So far these systems have achieved some success when usage presupposes a limited scope of possible outcomes (Föckler et al., 2005). It is obviously challenging to come up with a general image recognition module that meets the expected demands for precision.

Considering the positioning abilities we find systems that show promising results. Modsching and colleagues (2007) claim for instance that the use of tourist recommender systems implies an increased number of discovered attractions and prolonged stay at the attractions. They emphasize, however, that these impacts would not be achieved unless the system succeeded in choosing relevant information to push. Unfortunately the mobile network available when the MuseumGuide was tested turned out to be unstable. Hence the trial failed to test the solution's possible advantages with respect to push of information based on positioning.

Positioning is one among several possible context sources. According to Grün et al. (2008) a combined usage of many context factors might improve the perceived relevance of the retrieved information. Systems that utilise location combined with time, weekday or season might be appealing to tourists as this group is particular responsive to such parameters. Pushing information about a local guided sea safari tour in frozen winter hours will probably attract few tourists while the same information given in summer season is more likely to hit the target, in particular if also the weather conditions are taken into consideration.

The main concern of context aware systems is the inclination of being intrusive (Ramaprasad & Harmon, 2007). This threat might be counteracted by user consent requirements and user control (Tsang et al., 2004). Still some users want to remain anonymous while at the same time having the context sensitive information available. This contradiction is referred to as a "location paradox" (Bruner & Kumar, 2007). Future success depends on the ability to dynamically identify the user's intentions and balance the system's supportive and intrusive effects.

A more generic problem is the systems' lack of portability which is often linked to the use of proprietary interfaces to other systems, e.g. GPS, and the use of non-public content repositories (Grün, 2005). In addition there is an overall challenge related to production and maintenance of high quality content: it is time and resource demanding and presupposes skills related to the subject of interest as well as to the multimedia and content production for small displays. Recent automatic generation of narrative audio tracks based on public information sources is suggested as one mean to counteract this problem (Schöning et al., 2008).

4.3 Mental context

The mental dimension of mobile phone context deals with the user's understanding and actual use of the handset and service at hand. It is likely that technological skills and general attitudes towards technology impact considerably on the user's mental models and further on how the service is utilised. This is most important when the actual service is seldom used and within non-familiar environments as is the typical tourist guide usage situation. Thus, the requirements regarding ease of use and ease of learning should be strengthened compared to applications used regularly.

The informants using RegionGuide were mainly middle-aged. They found the content interesting but were not familiar with advanced mobile phones and mobile services. This finding indicates a mismatch between the target group and the technological platform used. This is further illustrated by an informant's utterance: *"This is great - this is the future, but perhaps it suits the younger ones even better."*

In the RegionGuide case the installation of Java-based software and configuration of communication settings were problematic and cumbersome. As you never get a second chance to make a first impression, the first try should be a positive experience. Consequently access and eventual installation of software should be flexible and free from hassle (Grün, 2005; Kaasinen, 2005). The maturing field of automatic detection and configuration (ADD/ADC) of mobile device and installation of software over the air (OTA) will probably reduce these problems.

Later on a WAP based version of RegionGuide was developed which reduced the problems related to installing Java programs. There is a risk however, that technical simplifications imply a less appealing service to be launched.

The shifting of attention between the physical surroundings, the content presented by the digital guide, and finally, the social context including other persons, is another problem, also suggested by others (Brown & Chalmers, 2003). Aoki et al. (2002) claim that in particular the visual user interfaces take attention away from the physical object, whilst listening to audio clips seem to balance the attention much better. One might further speculate in the impact of authenticity: an image is dramatically reduced in size compared to the real world, while a voice from an audio device is rather equal to a voice from a person next to you. This might make the audio approach preferable.

Those who tested the MuseumGuide reported that the link between the stone walls located in front of them and the information given by the MuseumGuide was not clearly depicted. Similar problems were raised by Kjeldskov et al. (2005) when the influence of location according to perceived relevance was evaluated. These problems might have been reduced by some kind of linkage between the relative direction of the user and the actual content provided by the guide. Tourist navigational guides utilise automatic positioning to assure the user of his/her immediate position. Services that combine the use of position, direction and images have recently been demonstrated by Google⁵ and by Nokia⁶.

Some years ago Kray et al. (2003) provided 2D maps to show the user's location and destination, and also a 3D navigational aid. The users found the 3D model amusing and attractive even if it did not add significant value. To gain overview of the situation a flying perspective was preferred to a pedestrian view.

⁵ HTC G1 Android phone and Google Mobile Maps with StreetViews

⁶ Image Space service

Another less hardware demanding approach to the recognition problem is to identify what's in front of the user by image recognition. Such a system should utilise standard features of the mobile phone like the mobile phone's camera and multimedia messaging abilities. Here the main problem is to achieve image recognition of needed precision within reasonable time, - a claim that encourages client based image computation solutions to occur (Föckler et al., 2005). Capturing 2D bar codes by the camera (see for instance O'Hara et al. (2007)) or utilising NFC technologies reduce the impact of imperfect image recognition, but on the other hand, presuppose physical tags to be placed on every item of interest. Cheverst et al. (2008) combine the photo and 2D map approaches when they suggest a system providing navigational aids upon physical public maps which are found on location. They are supposed to have the wanted detail level and an appealing design.

4.4 Social context

A mobile phone is made for connecting people, but when the phone is used for information retrieval the support for social connections might be reduced. To understand this apparent built-in conflict, let us have a closer look on the tourist role and the tourist setting. Tourists interact and collaborate with fellow travellers, personnel in shops, local residents and other tourists, and the barriers to get new acquaintances seem to be lower than usual (Brown & Chalmers, 2003). The sharing of events seems essential, not least when visiting a museum. From this point of view an attention demanding tourist guide might cause a kind of social isolation (Woodruff et al., 2001). Not surprisingly this aspect was pinpointed by those who used the MuseumGuide. They should like to co-listen and simultaneously follow the same path through the digital content. These challenges have been recognized and partly met in other projects (Aoki et al., 2002; Laurillau & Paternò, 2004). In a study of visitors using the Collect system at London Zoo, O'Hara and his colleagues (2007) give examples of selective sharing of content snippets for particular social effects, such as humour. They also found that visitors created shared experiences by watching content together but on separate phones in approximately synch, and that audio content sharing to a small group was achieved by simply turning the mobile phone speaker volume up. Another issue, raised by the same study, was the interesting tension between cooperative and sharing attitudes on one side and competitive attitudes on the other, as both moods were encouraged by the application.

Dealing with social needs might create other challenges, for instance privacy and discretion concerns which are non-ignorable parts of a mobile social context. The co-located other person, not included in the actual social context, might feel embarrassed and disrupted. Häkkinen (2007) argues that designers of mobile context-aware applications should consider possible effects of social context in relation to the application. In some social context, certain device or user behaviour may be considered awkward or even unacceptable. Social context has also an effect on interruptability. For example, a volume alert may be considered as inappropriate. In a tourist setting the problem of social disturbance is a combined result of individual, situational, and technological factors (Bergvik, 2004), and thus no straight forward solving procedure is given.

The RegionGuide was built to support tour planning - another communication aspect of tourism. The results indicate that the guide supported and even encouraged the social aspects of planning and coordination amongst fellow travellers.

Interacting with other people is found to be a source for tourists to seek information. People tend in general to rely more on informal sources such as family and friends and general “word of mouth” than on official channels. Recently mobile services are developed to seek travel related information through social interaction with other people and to share experiences with each other anytime and anywhere (Carlsson et al., 2008) and a variety of social web services are suggested to enhance the experience of tourists (Coppola et al., 2008).

4.5 Field trials

The need of field trials is an ongoing discussion (Kjeldskov et al., 2004; Nielsen et al., 2006). Our claim is that challenges related to supportive links between physical objects and digital content, demand for co-visiting mechanisms and configuration problems would not have been uncovered without studies in the field. Field studies involving avant-garde technologies are highly desirable but also risky as new technology is more unstable and unpredictable than mature technological platforms. The RegionGuide was adapted to the GSM network only, which has sufficient capacity to transmit text and images. To download videos was time consuming, but did not provoke technical problems. The problems occurred however in the software installation phase, as the devices vary according to implementation of Java ME specifications and WAP and Internet settings. Presumable ongoing efforts related to mobile device management might reduce these problems.

5. Conclusion

There were great differences between the tourist guide services, the devices involved, the measuring instruments, and the degree of hands-on experience that the users actually were offered. Still the piloting enlightened aspects related to user acceptance of mobile services and the multi-faceted mobile context, not easily uncovered in laboratories.

Both the MuseumGuide and the RegionGuide were welcomed by the test users, and the multimedia and storytelling approach seemed appealing to groups beyond the traditional museum visitors. The appearance of multimedia content was considered a surprising and positive add-on to a mobile phone still recognised as a talking and messaging device.

The possibility of establishing an immediate and accurate link between physical objects and digital information is fascinating. However, small screens and bandwidth limitations accentuated the competition of the user’s attention. These studies prove that it is challenging to design a service that enriches the experience without introducing a filter that actually reduces the experience in situ. Perhaps the coming generations of multimedia consumers will more easily benefit from the alternating real and virtual impressions and also better cope with installation and configuration procedures needed to use such services.

The social dimension of tourist guides has so far been underestimated. There is an obvious demand for co-visiting mechanisms addressing the interaction between co-visitors, and the rapid developing mobile infrastructure, handsets included, calls for exploration of mechanisms that support interaction between the tourist and people located elsewhere.

The technological dimension of the mobile context is not fully explored and the time and resource demanding content production seem to decelerate the diffusion of high quality and attractive tourist guides. However, as the demand for dynamic content and multimodal links between the real world and digital content is generally growing, the efforts invested

will indirectly be increased and eventually fed back to the benefit of the active information seeking tourist.

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University Campus STeP Ri
Slavka Krautzeka 83/A
51000 Rijeka, Croatia
Phone: +385 (51) 770 447
Fax: +385 (51) 686 166
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Unit 405, Office Block, Hotel Equatorial Shanghai
No.65, Yan An Road (West), Shanghai, 200040, China
中国上海市延安西路65号上海国际贵都大饭店办公楼405单元
Phone: +86-21-62489820
Fax: +86-21-62489821

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