Natural Language Processing

MOBILE SEARCH AND ADVERTISING

Vladimir Lovitskii, Colin McCaffery, Michael Thrasher, David Traynor, Peter Wright

Abstract: Mobile advertising is a rapidly growing sector providing brands and marketing agencies the opportunity to connect with consumers beyond traditional and digital media and instead communicate directly on their mobile phones. Mobile advertising will be intrinsically linked with mobile search, which has transported from the internet to the mobile and is identified as an area of potential growth. The result of mobile searching show that as a general rule such search result exceed 160 characters; the dialog is required to deliver the relevant portion of a response to the mobile user. In this paper we focus initially on mobile search and mobile advert creation, and later the mechanism of interaction between the user's request, the result of searching, advertising and dialog.

Keywords: mobile text messages, mobile search, mobile advertising, question-answering system

ACM Classification Keywords: I.2 Artificial intelligence: I.2.7 Natural Language Processing: Text analysis.

Conference: The paper is selected from Second International Conference "Intelligent Information and Engineering Systems" INFOS 2009, Varna, Bulgaria, June-July 2009

Introduction

This paper considers the results of our recent research in the areas of text data mining and the natural language processing [1-7] when restricted by mobile phone text-based SMS messaging. In our previous papers [6,7] the Question-Answering Mobile ENgine (QAMEN) has been discussed. During internet searching QAMEN converts web pages to a simplified format that is compatible with handheld devices. Moreover, QAMEN frees users to have an expensive mobile phone with a web browser. Internet connections from mobile devices continue to remain expensive and there is little prospect to an immediate decrease in pricing structure. QAMEN is based on industry-standard SMS messaging technology and thus works with any mobile in any GSM network. Hence QAMEN is useful for people on the move and probably unable to access a PC.

Worldwide Mobile Search Advertising Spending, by Region, 2007-2012 (millions)

	2007	2008	2009	2010	2011	2012
US	$34.5	$107.4	$241.8	$530.5	$910.2	$1,484.2
Asia-Pacific	$26.0	$72.0	$189.9	$372.8	$732.4	$1,160.0
Western Europe	$18.4	$52.0	$140.5	$339.7	$614.1	$968.2
Rest of World	$4.4	$12.4	$24.4	$47.0	$88.6	$160.9
Worldwide	**$83.3**	**$243.7**	**$596.6**	**$1,289.9**	**$2,345.2**	**$3,773.2**

The growth of mobile-search-related advertising is strong across many regions [8] (see the Table). Mobile search will eventually move away from the generic style of searches seen on the fixed internet to more personal services. In these circumstances local search will become increasingly important. Through these local searches location-based services and advertising will be able to gain vital revenues as mobile subscribers using search will reveal both their geographical location and the items being searched for.

Mobile search and mobile advertising should grow significantly because mobile phones have several advantages over PCs when accessing the Internet [9]:

- Mobile phones are always on, always available, and always "connected". Subscribers can gain access to information anywhere; at home, in the office, at a restaurant, or from the car.
- There are currently 3 billion mobile phones worldwide compared with less than 1 billion PCs.
- Ability to immediately connect people to phone numbers, since they already have a device in hand.
- When conducting mobile search, users are in an atmosphere, situation and environment more likely to result in a purchase. Most of the time they are out of the home.

But mobile phones have some limitations when compared to PCs:

- PCs have relatively large screens that can show more detailed information and numerous search results. By contrast, mobile phones have smaller screens with limited real estate.
- PCs have large, comfortable keyboards with easy-to-use pointing tools including mouse, trackball, or touchpad. Mobile phones have compact number pads, commonly with arrow keys limiting user-navigation to up, down, left and right.
- PCs and the Internet are relatively homogenous, using consistent colour displays, screen sizes, browsers, and open programming standards. Mobile phones are heterogeneous, employing varying input methods, display screens, browsers, operating systems, and user interfaces. Mobile devices do not conform to any standards.
- Mobile search usability issues include smaller screens, typing limitations of phone keypads and the cost of spending time scrolling through mobile search results.
- Mobile devices are currently less likely to be used for general browsing but more for retrieving specific information.

These limitations describe the problems that need to be taken into account when developing an acceptable mobile search and advertising procedure. In addition to these immediate differences, future mobile search applications may be able to capitalize on user specific information [7]. Mobile phones are increasingly associated with each individual's personal style, representative of their owner's personality, with specific demographics, behaviour patterns, and personal interests etc. This information offers the opportunity for more relevant search results to be determined. Mobile phones may also be able to leverage location as an additional search parameter, allowing for greater specificity for search results.

Reading this paper will tell you the following:

- The difference between mobile web search and PCs web search.
- Why mobile dialog is needed?
- What is mobile advertising?
- How mobile search and mobile advertising will work together.

QAMEN versus Mobile Web Search

The mobile web consists of web pages that are designed specifically for display on mobile devices. Due to their limited capabilities (relative to standard computers) mobile devices access and render web content using the specialized Wireless Application Protocol (WAP). WAP is separate and distinct from the Hyper-Text Transfer Protocol (HTTP) that computers use to access HTML pages. As such, WAP browsers can only access pages that are written in xHTML (eXtensible Hyper-Text Markup Language) or WML (Wireless Markup Language). WAP 1.x

browsers access only WML pages, while WAP 2.0 browsers access both xHTML pages and WML pages. The mobile web is determined by the universe of content that is written in WML or xHTML.

Searching the mobile web returns only WAP pages. The world is short of quality WAP sites in general. Most WAP sites are poorly designed, under-used, unstable and limited in content and service. There are WAP search engines that index the mobile web but many do not work well due to the volatile nature of the current mobile web – there are many outdated and redundant links. Furthermore, most WAP site crawling technologies are underdeveloped [10].

QAMEN is an HTML compatible search engine. It works almost the same as computer browsers and can access HTML search pages from the huge internet webpage databases in the same way that computer browsers do. In providing the result of internet searching QAMEN converts web pages to a simplified format compatible with handheld devices. Search technologies of QAMEN are evolving to provide users with appropriate results despite the often unstructured web content.

QAMEN's Basic Commands

By default any request is considered by QAMEN as a request for searching in the local knowledge base, and/or in the Internet. Mobile question answering differs from standard information retrieval methods in some important respect. Firstly, it needs to retrieve specific fact information rather than whole documents. Secondly, it should select among the found facts the shortest and appropriate fact to meet the requirement of 160 characters. In short what a user normally requires is a precise answer to a question. But the concept "precise answer" is very fuzzy because of its reflects potential ambiguities in a user's request. For example, QAMEN even theoretically cannot define what is the precise answer to a user's request: *"I'm looking for Hilton address in London"* (see Fig. 1).

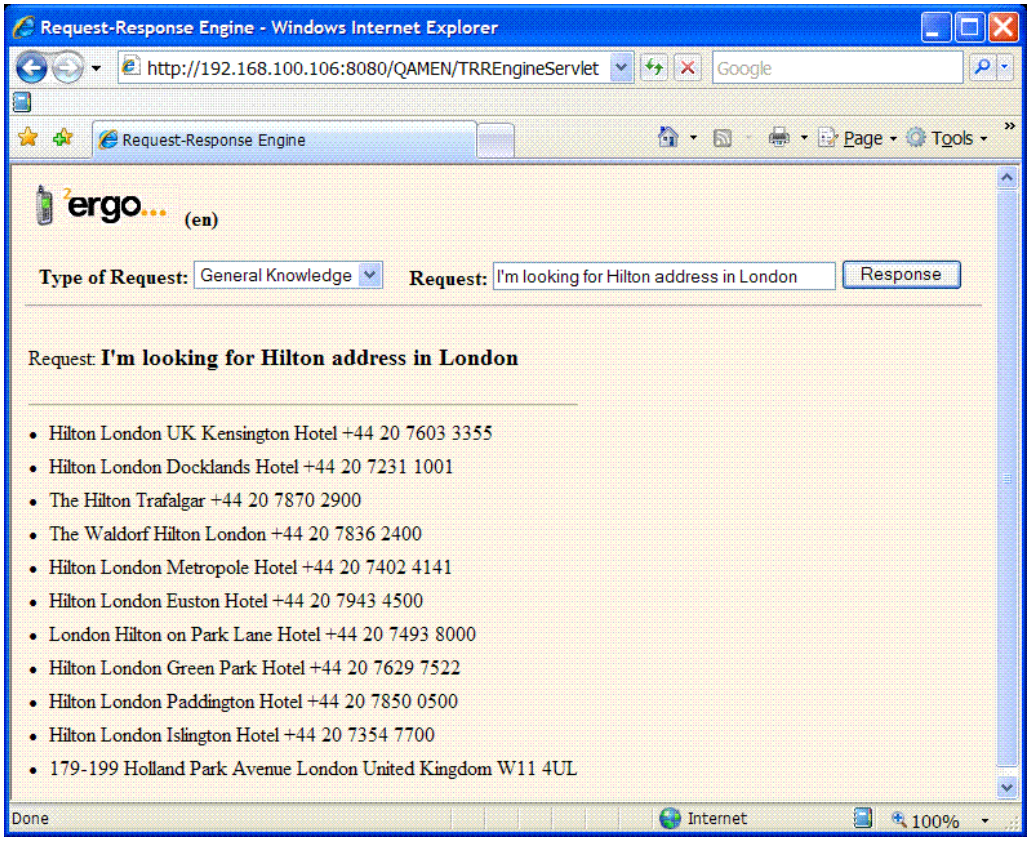

Figure 1. List of locations and phone numbers of Hilton hotels in London

On the one hand, the most important, the result must be relevant to the user;s search, on the other hand, there is no guarantee that the displayed response: *"The Hilton Trafalgar +44 20 7870 2900"* exactly meets the user's expectation. Enhancing the user profile, of course, could significantly improve the selection of appropriate answer. Even an unexpected advert along with the correct response might improve user satisfaction.

The mobile search industry is still in its infancy and the primary barriers, cited by subscribers as affecting potential uptake, are not knowing how to use the search engine (23%) and not thinking about using mobile search on their phone (19%). Just 20% of UK subscribers actually search content on the mobile internet, despite an industry perception that 89% do [11]. This gap between reality and perception suggests that the industry needs to promote the benefits of mobile search more actively as well as educating consumers on how mobile search may be used to find relevant content.

Taking into account such a situation QAMEN provides users with the maximum flexibility for selection of the desirable combination of options. Mobile users seek quick and convenient access to information and services. The following basic commands, for example, allow a user to select any combination of options online:

- Type in *Advert ON* to activate advertising (or *Advert OFF* to quit).
- Type in *Dialog ON* to activate dialog (or *Dialog OFF* to quit).
- Type in *Person ON* to activate personalization (or *Person OFF* to quit).
- Type in *Language BG* to allow user to use Bulgarian language (or *Language EN* to back to English).
- Type in *Election ON* to select an application domain with data regarding the UK General Election 1997, 2001 and 2005 (or *Election OFF* to quit).

For example, in the result of Dialog activation when QAMEN provides interactions between itself and the user the response to the same request: *"I'm looking for Hilton address in London"* will be represented differently (see Figure 2). Space on the mobile phone screen is at a premium, and users have limited input mechanisms, so any result of mobile searching needs to be easy to navigate using only the mobile phone's own keypad.

Each user can have multiple active mobile dialogs. QAMEN holds continually the personal profile of each user as well as the current state of dialogue for each search activity.

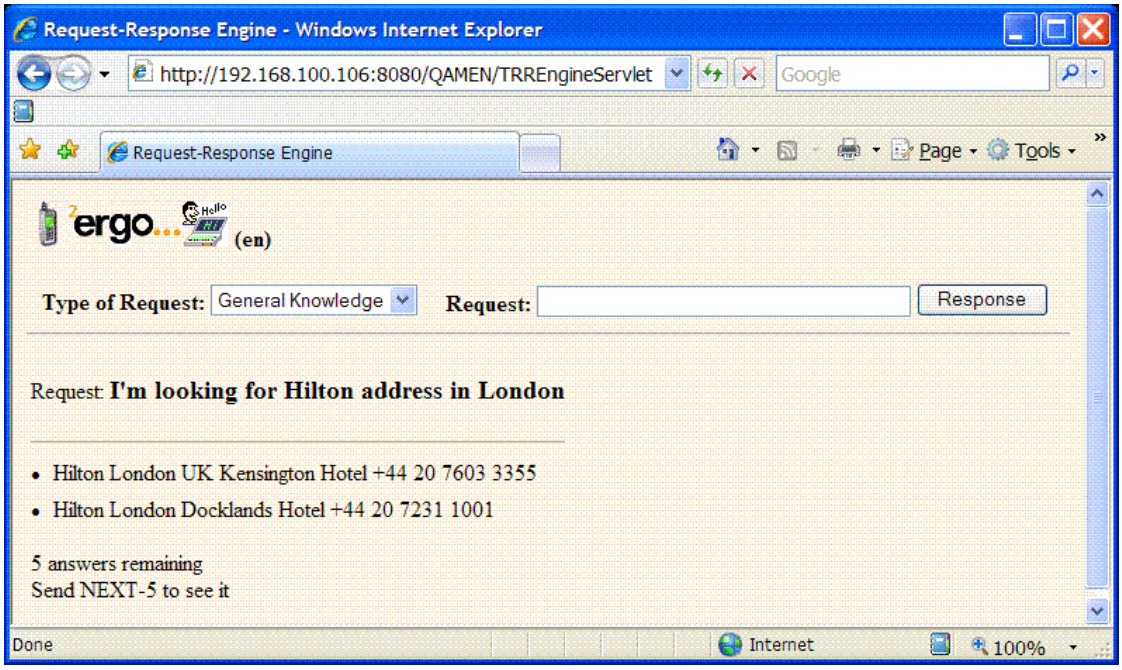

Figure 2. List of locations and phone numbers of Hilton hotels in London with dialog

Let us distinguish Answers Quantity (AQ) and SMS-Responses Quantity (RQ). For considered request AQ=11 (see Figure 1). RQ represents number of SMS, which need to be sent to cover AQ. As a rule the length of one response less the size of a SMS. That is why one SMS may include several answers i.e. RQ ≤ AQ. QAMEN shows how many RQ left (see Figure 2).

Mobile Advertising

Mobile advertising can basically be defined as the business that using the wireless channel as a medium to deliver the advertisement message or slogan encourages people to buy products and services. Mobile advertising is not simply linking users to websites by clicking on banners or pop-up windows through their mobile phone browser. It offers the ability to go beyond the mainstream of electronic advertising, which mainly targets the mass market predominantly over the Internet, to allow businesses to deliver their particular messages to specific individuals at specific locations.

QAMEN is an ideal way for advertisers to reach target markets and establish a one-to-one relationship with the consumer, a significant objective for all advertisers. For example, weather application is defined as personalized, localized weather prediction according to user location and personal profile. Weather related advertisement system knows how to match the right advertisement to the right weather in the most effective manner. For example, implementing a decision to start a soft drink campaign when the temperature approaches, 32°C / 90°F according to user location (if the user is close to the beach and experiencing higher levels of effective temp he will experience a different ad in different temperatures). Such approaches would help the advertiser to optimise its advertising campaign.

The following key characteristics drive the success of messaging as a source of mobile advertising inventory [12]:

- Ubiquitous SMS access – Virtually all mobile phones can receive SMS, and the majority of users use SMS on a regular basis. Today, SMS is the most widely used mobile phone service after voice.
- High attention level – Users almost never delete mobile message without opening them and reading at least part of content.
- Engaging – Once displayed, an effective advert can engage users directly in various ways, such as interactive message reply, click to transfer to the Web, or click to call.
- Compatibility – Messaging usually works between different networks and between different countries.
- Response collection is easier – It also may be achieved immediately. Brands may have access to real time response information and may modify the campaign according to the results, long before a campaign terminates.
- Direct and personal way of communication – Customer has the sense of feeling that the advert addresses only him/her.

Mobile Advertisement Creation

In this paper we consider adverts that are text only. Mobile messaging represents an opportunity for advertising placement. Advertisement can be inserted in SMS content that subscribers request and receive by using the free (non-used) space, up to the message size limit. The main task of advert creation is to establish an advert structure. There are, as yet, no standards for representing these, because there is no general agreement on what an advert should contain. That is why we were free to offer our vision of advert structure. First, let us describe the general requirements, restrictions and conditions to advert creation:

- A poor mobile advertising conveys a bad impression of any company, potentially turning away customers.
- An advert must be related to the original message content i.e. text adverts have to be shown in response to keywords entered on user queries.
- Mobile advertising is moving more towards dialogue type of advertising. Limiting user input to numeric or short sequence of text due to the limitation of the keypad on most mobile phones.
- Adverts should provide click-to-call links that allows the users to make a phone call directly from the displayed advert.
- Analysis of advert "activities" is a crucial feature in their future development in order to automate an improved process of advertising. The correctly specified metrics for an advert should include:
  - Total adverts sent.
  - Total adverts delivered.
  - Unique deliveries (distinct mobile phones).
  - Content of advert served.
  - Type of advert (independent or request dependent).
  - Location of served advert.
  - Date and Time when advert has been displayed.
  - Season of advert displaying.
- SMS advertising is appended to the bottom of the content message to be sent to the user. The available space for each advert is therefore dependent on how much space is left after subtracting the characters used in the main content body of the message.
- To optimize an advert placement:
  - The advertiser should develop several versions of adverts to be used, with the optimum length directly dependent on the length of sender's message.
  - Use punctuation only if required for clarity or emphasis.
  - Try to avoid a carriage return because it may count as two characters.

Let us distinguish between two types of advert: 1) independent if there is no any link with areas, season or location, and 2) dependent otherwise. For both types of adverts link with user request is required. Advert can be easily created and updated via the web-based interface (see Figure 3).

The advert structure consists of the following items:

- Areas: *game, music, video, product, weather, sport, health, finance, holiday, transport, omit*. For advert several areas might be selected e.g. *sport* and *weather*.
- Seasons: *all seasons, winter, spring, summer, autumn, omit*. If *spring* is selected the months *March*, *April* and *May* will be added to advert pattern automatically.
- Location: *country, county, city, omit*.
- Slogan is a short (< 100 characters) memorable text advert.
- Advert's Key Words (AKW) include not only synonyms of slogan's keywords but also describes the conditions for use of the advertised product. For example, if "ice cream" is advertised the words: *hot* and *heat* should be added to keywords.
- Advertiser and its contacts*: country, city, address, web site, email, telephone*.

- Priority depends on payment and its value lie within 1-10 range.
- Quantity shows how many times advertiser wants advert to be displayed and (in brackets) how many times advert has been displayed.

Before storing the advert description in the Adverts DataBase (ADB) which is the main part of advert – (the Advert Pattern (AP)) – is created. The general form of AP is the following:

AP=<SKW+AKW><Areas><Seasons><Location><Priority><Quantity>, where:

- SKW means Slogan's Key Words. SKW are extracted from the Slogan and together with AKW are saved in the advert dictionary;
- Meaningful selection (i.e. when the selected value is no equal *omit*) of Areas, Seasons and/or Location are saved in the advert dictionary as well. The selection of *All Seasons* means that all twelve months and four season names will be included in the dictionary.

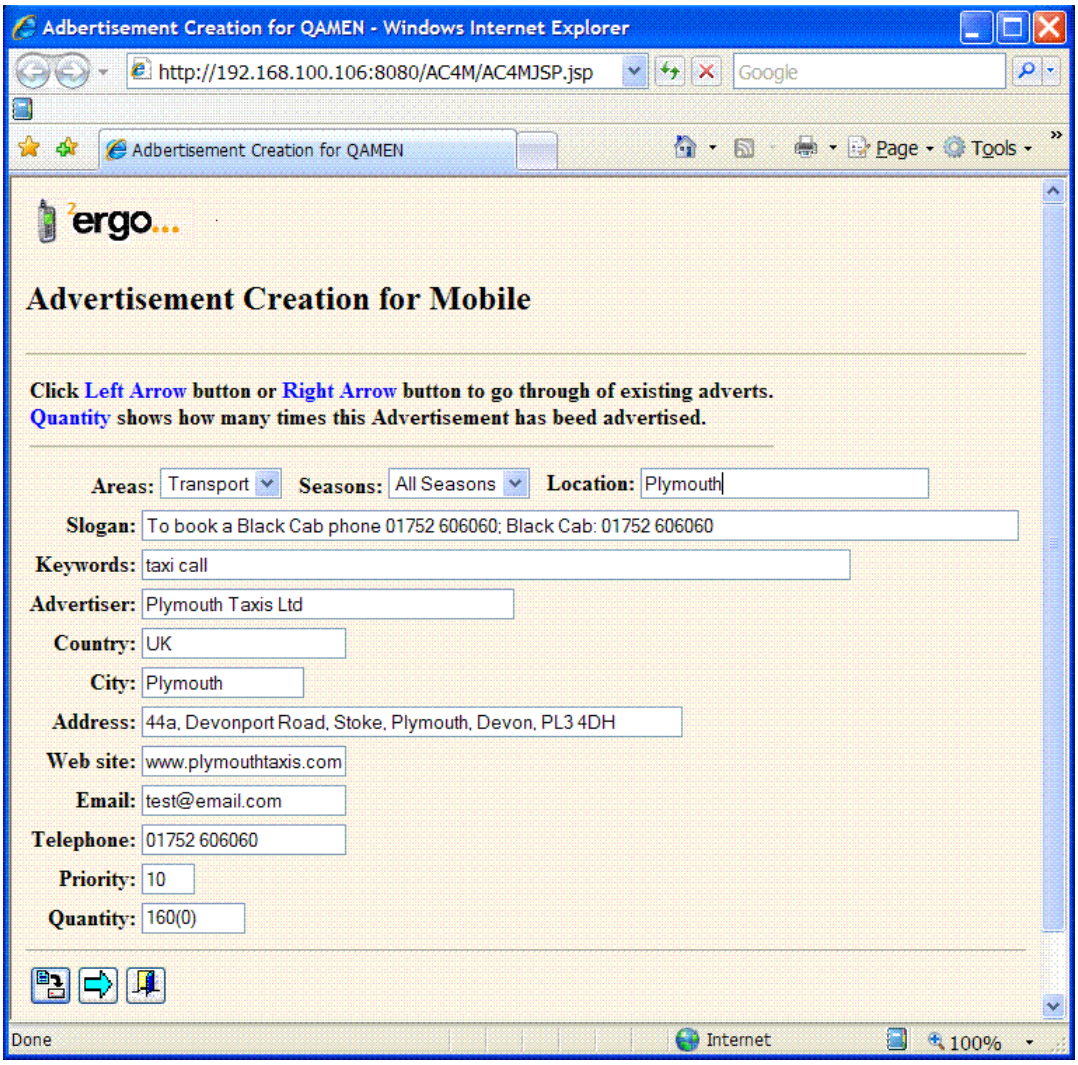

Figure 3. Web-based interface for Advert creation and editing

It is important to emphasise that any words are inserted in the advert dictionary just once but that the link chain related to any word will be extended, and will consist of the information of all adverts from ADB where this word has been involved. For example, word *May* has a link to the set of adverts *Seasons* that have been described as

All Seasons, or *Spring*. An example of advert, which is extracted from the ADB in accordance with user's request is shown in Figure 4.

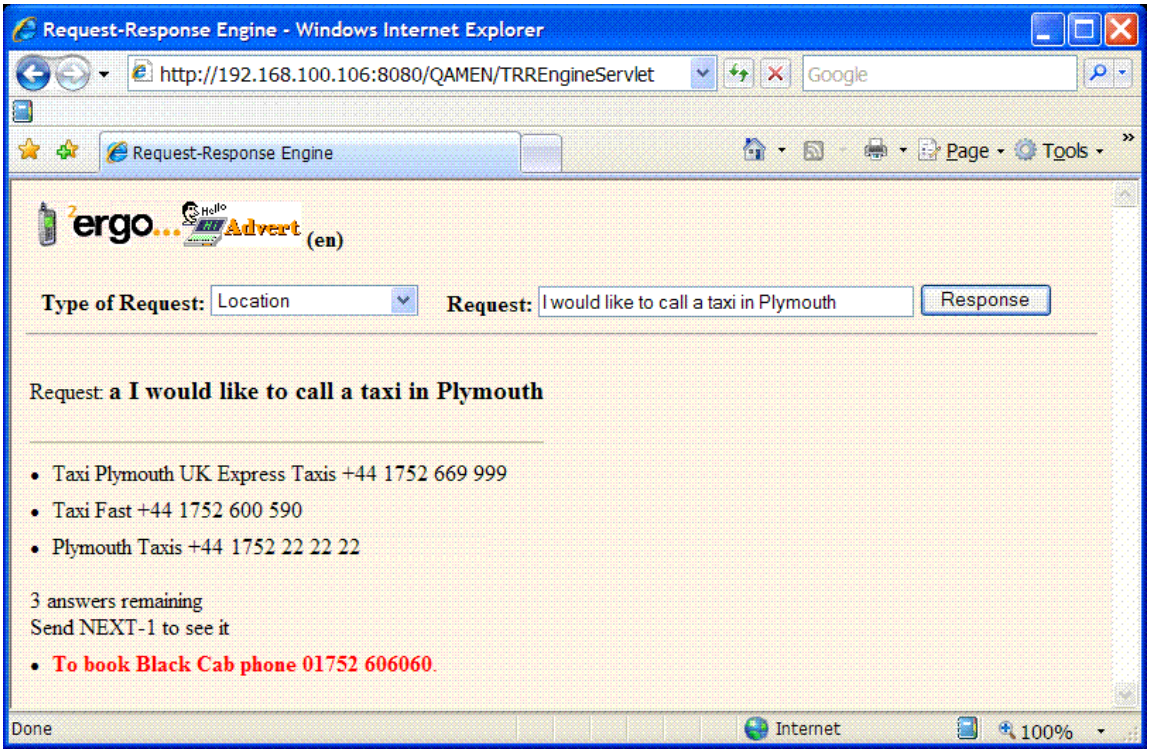

Figure 4. Example of Advert

Algorithm of Advert Selection

Let us consider the algorithm of advert selection:

1. QAMEN should be ready for advert i.e. command ***Advert ON*** should be sent from the mobile phone.
2. User type in and send the request e.g. *I would like to call a taxi in Plymouth* (see Figure 4).
3. QAMEN extracts KW from the request (RKW) i.e. *call*, *taxi* and *Plymouth*.
4. Using advert dictionary QAMEN extracts from ADB the list of advert patterns and calculates their "weights" i.e. APW. For APW calculation it is just enough to find intersection RKW with AP from ADB. If RKW belongs to SKW then 2 points is added to APW. In all other cases i.e. when RKW represents ***Areas***, ***Seasons***, ***Location*** explicitly, or belong to AKW just 1 point is added to APW. For the request in the example APW=3 but for request: "*I'm looking for phone No to book a taxi in Plymouth*" APW=6.
5. QAMEN makes descending sort of AP in accordance with their APW. If two AP have the same APW the ***Priority*** of AP defines the order. If ***Priority*** is equal the ***Quantity*** of AP and ***Date*** and ***Time*** when adverts have been displayed the last time define their order.
6. QAMEN calculates the free space for advert and in the result of calculation select an appropriate version of advert (see Figure 4).
7. If Web searching produces no response then just the advert can be displayed (see Figure 5).

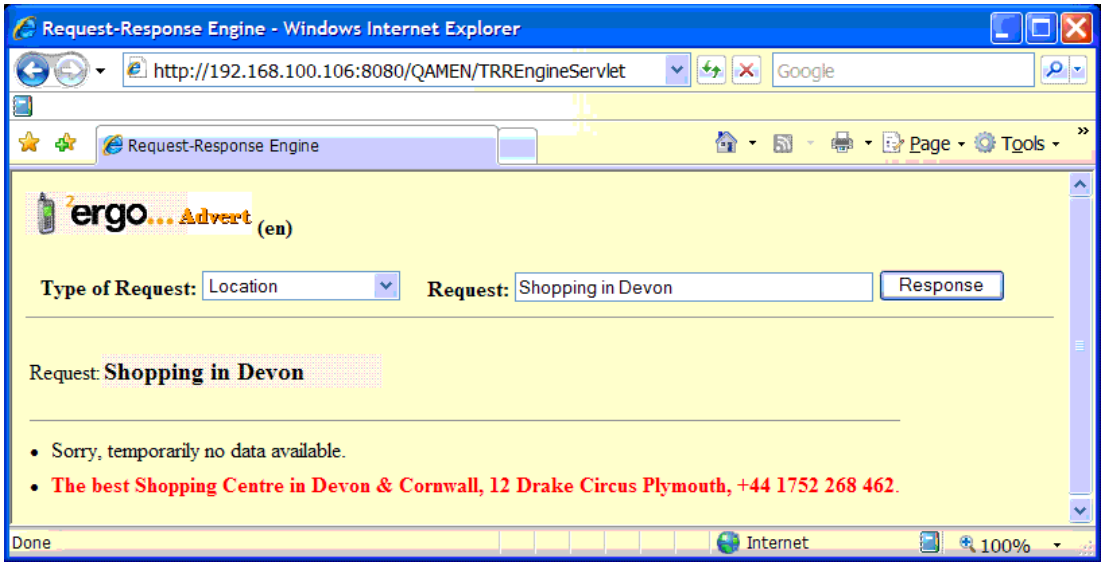

Figure 5. Web searching was not a success

Conclusion

We believe that mobile search and mobile advertising offers a significant opportunity for many players in the wireless industry. While consumers across the world use Internet search applications as their primary access point to information and web sites, mobile users are just starting to experiment with the potential of mobile search and advertising applications. In this paper we describe our vision of mobile search and advertising to improve the efficiency of SMS. We turned our particular attention towards mobile advertising and its possible application in a mobile environment. The object of our research is to improve query response by adding adverts. It is important to offer and realize some ideas (not necessarily the best) when there are as yet no standards for representing mobile adverts. Of course, the ultimate criterion of "good" mobile search and advertising is that a user should be satisfied with search results and subscribe to the content of adverts. Future studies into this aspect of mobile phone use could be conducted as a series of further case studies in other countries in order to facilitate comparison: we have already started to create the Cyrillic version of QAMEN. The first step has been made in the creation of a Bulgarian version of QAMEN (see Figure 6).

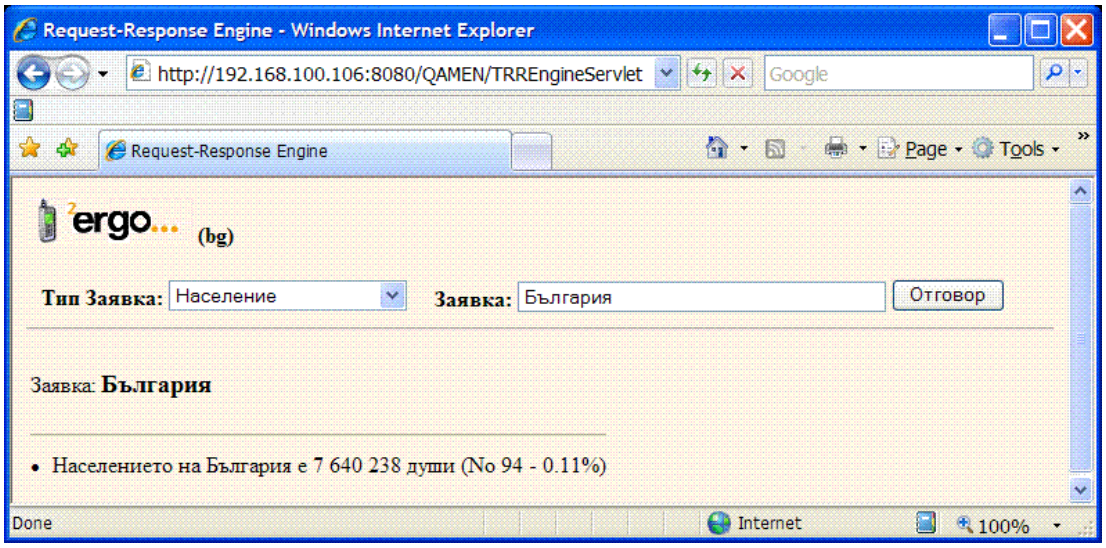

Figure 6. Bulgarian version of QAMEN

Bibliography

[1] G.Coles, T.Coles, V.A.Lovitskii, "Natural Interface Language", *Proc. of the VIII-th International Conference on Knowledge-Dialogue-Solution: KDS-99*, Kacivelli (Ukraine), 104 -109, 1999.

[2] T.Coles, V.A.Lovitskii, "Text Searching and Mining", *Journal of Artificial Intelligence, National Academy of Sciences of Ukraine, Vol 3,* 488-496, 2000.

[3] D.Burns, R.Fallon, P.Lewis, V.Lovitskii, S.Owen, "Verbal Dialogue Versus Written Dialogue*", International Journal "Information Theories & Applications", Vol 12(4)*, 369-377, 2005.

[4] Ken Braithwaite, Mark Lishman, Vladimir Lovitskii, David Traynor, "Distinctive Features of Mobile Messages Processing",*International Journal "Information Theories & Applications", Vol 14(2)*, 154-160, 2007.

[5] Guy Francis, Mark Lishman, Vladimir Lovitskii, Michael Thrasher, David Traynor, "Instantaneous Database Access", *International Journal "Information Theories & Applications", Vol 14(2)*, 161-168, 2007.

[6] Vladimir Lovitskii, Michael Thrasher, David Traynor, "Automated Response To Query System", *International Journal "Information Theories & Applications", Vol 15(2)*, 143-152, 2008.

[7] Lee Johnston, Vladimir Lovitskii, Ian Price, Michael Thrasher, David Traynor, "Personalized Question-Answering Mobile System", International Book Series: "*Information Science and Computing"*, book 2: "Advanced Research in Artificial Intelligence", 123-132, 2008.

[8] Loren Baker, "Mobile Search Advertising", *Search Engine Journal*, February 2008 http://www.searchenginejournal.com/mobile-search-advertising-to-hit-38-billion-by-2012-14-billion-in-us/6382/

[9] http://www.mmaglobal.com/uploads/MMAMobileSearchIntro.pdf.

[10] "Mobile Search and its Implications for Search Engine Marketing" provided by http://www.oneupweb.com

[11] Eden Zoller, Ovum, http://www.ovum.com/go/content/c,432,35105

[12] http://www.iabmexico.com/downLoads/mobileadoverview.pdf.

Authors information

Vladimir Lovitskii – 2 Ergo Limited, 4th Floor, Digital World Centre, 1 Lowry Plaza, The Quays, Salford, Manchester, M50 3UB, UK, e-mail: vladimir.lovitskii@fsmail.net

Colin McCaffery – 2 Ergo Limited, 4th Floor, Digital World Centre, 1 Lowry Plaza, The Quays, Salford, Manchester, M50 3UB, UK, e-mail: colin.mccaffery@2ergo.com

Michael Thrasher – University of Plymouth, Plymouth, Devon, PL4 6DX, UK, e-mail: mthrasher@plymouth.ac.uk

David Traynor – 2 Ergo Limited, 4th Floor, Digital World Centre, 1 Lowry Plaza, The Quays, Salford, Manchester, M50 3UB, UK, e-mail: david.traynor@2ergo.com

Peter Wright – 2 Ergo Limited, 4th Floor, Digital World Centre, 1 Lowry Plaza, The Quays, Salford, Manchester, M50 3UB, UK, e-mail: peter.wright@2ergo.com