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Using Web-sources for Location Based Systems on Mobile Phones.

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ABSTRACT

The paper describes the implementation of a context aware location and time based system on a normal mobile phone, with a minimum of requirements (Bluetooth, Internet access, Java ME, and a simple webbrowser). We can answer the following queries based on data crawled from the web and enriched with location coordinates:

- Where are my friends?
- What movies are playing, right here, right now?
- I need to park my car. Where is the closest parking lot with free space?
- What is a good place to have dinner around here?
- What is the history of this building?
- What experiences have other people had at this location?

Similar systems have been built, but all in a limiting setting (specific hardware/software, specially built devices, limited areas). While many systems only use their own data, we use public sources from the Internet that can be coupled to location. This paper shows that it is possible and in fact rather easy to build useful location based systems on the kind of device which needs it most: your own mobile phone.

The challenge for location based services is thus located in obtaining valuable location and time based information from the web. We used 7 different web-sources, each with their own data format. These use-cases indicate system-bottlenecks and yield a useful set of requirements for emerging standards on location based data. A full version of this paper is available at `http://www.science.uva.nl/~marx/pub/nulaz.pdf`.

Keywords

Location Based Systems (LBS), Context aware computing, J2ME, Mobile phones, Web data extraction

1. INTRODUCTION

The abstract lists a number of information needs that we want our system to address. While these may be hard for a general purpose search engines, they are doable for our system because (1) we know *where* the user is *now*, and (2) we know that the user holds the interface in her hand.

We can answer these queries by combining the current time and location of the user (obtained from the mobile phone of the user) with data mined from the web. All content-data used is available on public sources on the web. We mine the content-data from the web and modify it in two ways:

1. The data is enriched with geo-data, and can be shown by geographic relevance, instead of other search methods.
2. The data is, if necessary, specially formatted for mobile interfaces with small screens.

We have mined 7 data-sources, each with its own pecularities. The technical demo will show how we obtain and transform the data, and how the data is used in a mobile phone in order to answer the listed information needs. The data-sources mined are:

Flickr: API While browsing pictures of other people in general can be interesting, knowing that the pictures have been taken in the current vicinity of the user, ads an extra dimension to them. It gives an impression of the experiences other people had in that area.

Google Maps: Own converter A map can give a good overview of the current location, and can be useful in finding places.

Wikipedia: SQL import Wikipedia contains much information about places, many of them contain a a geograpical reference.

Restaurants: conversion from HTML

Parking data: Live parsing Amsterdam provides information about it's parking garages, and the chance of getting a free place, on the Internet.

Movies: RSS feed

Cultural events: XML files In cooperation with the Amsterdam Uitbureau, an agency providing the agenda of all cultural events.

Main contributions of the paper. Our main contribution is that we show that it is possible to build a time and space aware information system based on data mined from the web which works on everyday mobile phones. The second main contribution is our list of web-data and the techniques used to fetch them. The list is representative of the data any mobile location based device would want to show. It shows that the bottleneck of a location based system is in obtaining and maintaining to obtain high-quality data from the web.

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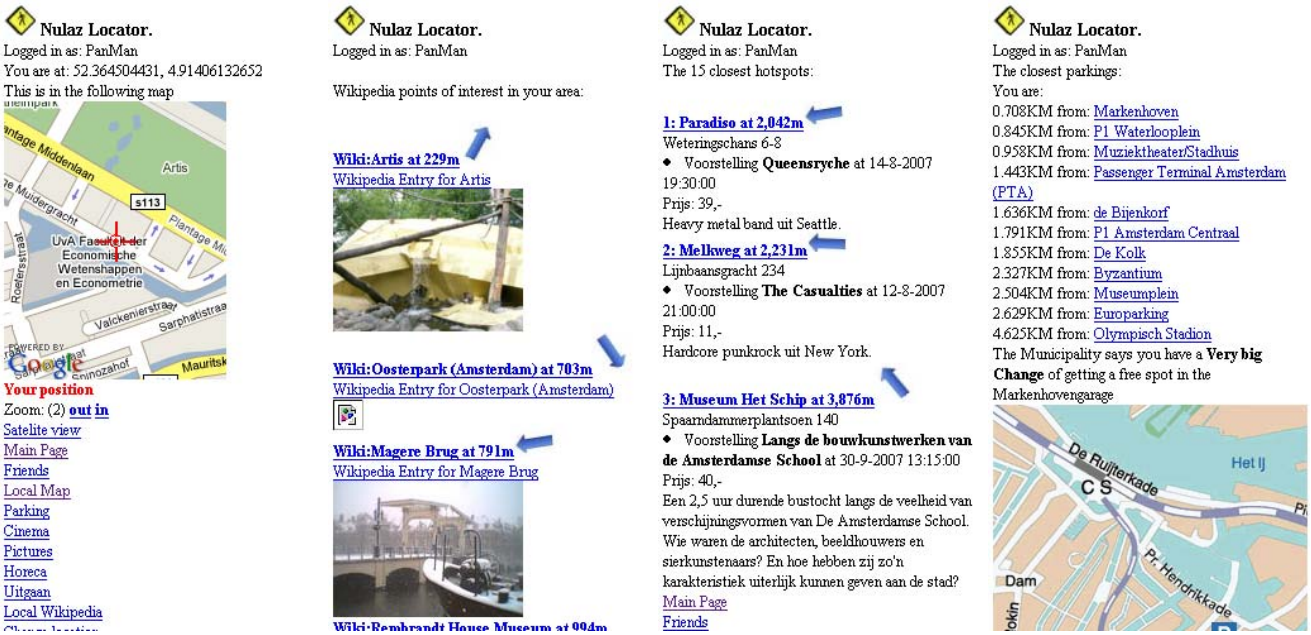

Figure 1: Four screenshots of the mobile webinterface.

2. SYSTEM OVERVIEW

This section describes our mobile phone information system called Nulaz. Nulaz works with a small J2ME program on a mobile phone that connects to a GPS device. It receives its current location coordinates from the GPS, and transmits them (over GPRS or other data carriers and the Internet), together with a user ID, to a central webserver, that stores them in a database. This is repeated every few seconds. The components of the system and the data flow between them are presented in Figure 2.

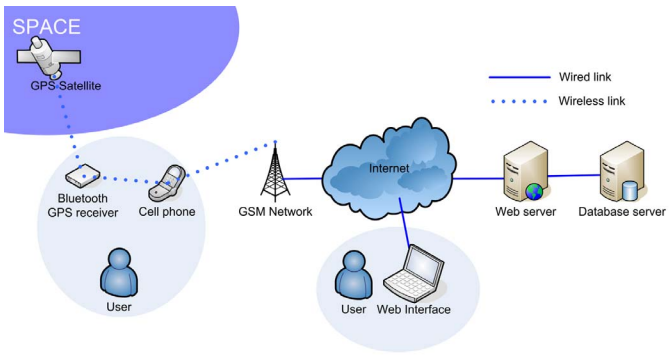

Figure 2: Overview of the Nulaz system.

Nulaz consists of several parts that communicate with each other as shown in Figure 3. All communication between handset and servers, and all three interfaces, use the HTTP protocol.

The Nulaz software can open a browser on the phone, to display relevant local information. The same webserver is then called with the ID and location of the user, and a mobile interface is shown. This mobile interface combines several datasources to show relevant information in or about the vicinity of the user. Currently the system can show: friends who are in the surroundings, photographs taken in the vicinity, a map or aerial picture of the surroundings, highlights from Wikipedia about the vicinity, restaurants and parking places in the surroundings, cultural events and movies in the surroundings which are happening now or starting soon. Screenshots of this interface can be seen in Figure 1. The webserver also has a webinterface for normal browsers running on a PC.

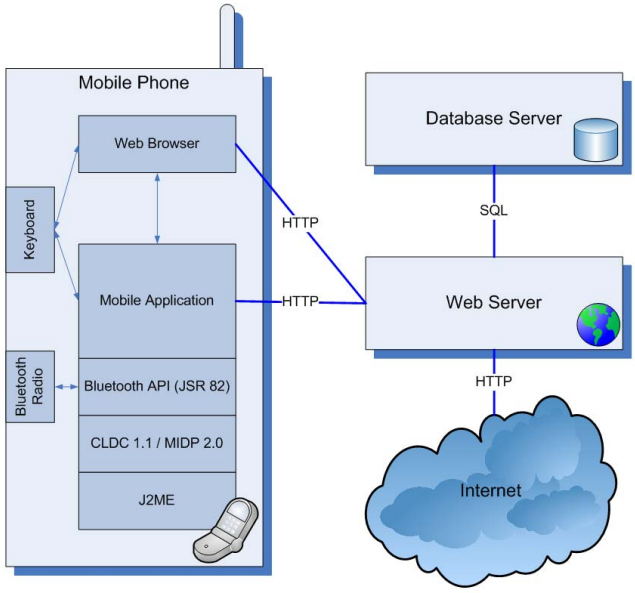

Figure 3: Overview of the Nulaz architecture, with it parts.