NatuLore

Know your place

CSIDC 2006

Interim Report

Team Country
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Introduction

Modern world does not pay proper attention to the nature. Its factories are producing air pollution; its cars are producing noise and emitting tons of smoke into the air and its hasting citizens are littering the streets.

There are many projects trying to look into these problems, but mostly to no avail. The problem itself lies in dealing with the outcome of those issues instead of coping with the root of the trouble. We believe the main reason is that people have very limited or no knowledge of their surroundings. Our consultations with some environmentalists lead us to the idea that "**only the one who knows the nature can effectively preserve and protect it**".

In the spirit of this idea we are designing a system called NatuLore that provides real-time online collaborative edited encyclopedia for multimedia and text information linked to geographical locations. We believe that occasional factual description of the ever changing nature is insufficient and the best way to make the encyclopedia alive is to give the possibility of managing the articles related to particular location to people, who live in the specific area. No doubt that the most valuable factor in world of today is information. We believe that we will be able to enhance environment providing information available anywhere while protecting it indirectly in the process. Moreover, our system calculates statistics useful for environmentalists to visualize the traffic in park or in the nature as a whole.

System overview

NatuLore uses a mobile device connected to a GPS module to obtain the actual position (see Figure 1). Contextual information is presented on the mobile device when the user approaches the particular place. He can read related information, add new records or modify existing ones. It is also possible to edit articles from home which gives more comfort to the user. Anyone with a web browser can view and edit the content online, so the data contained within the system should be accessible to various types of devices.

Client is represented by a mobile device carried by the user and its software. Server consists of database storage and communication layer providing standardized interface through web services.

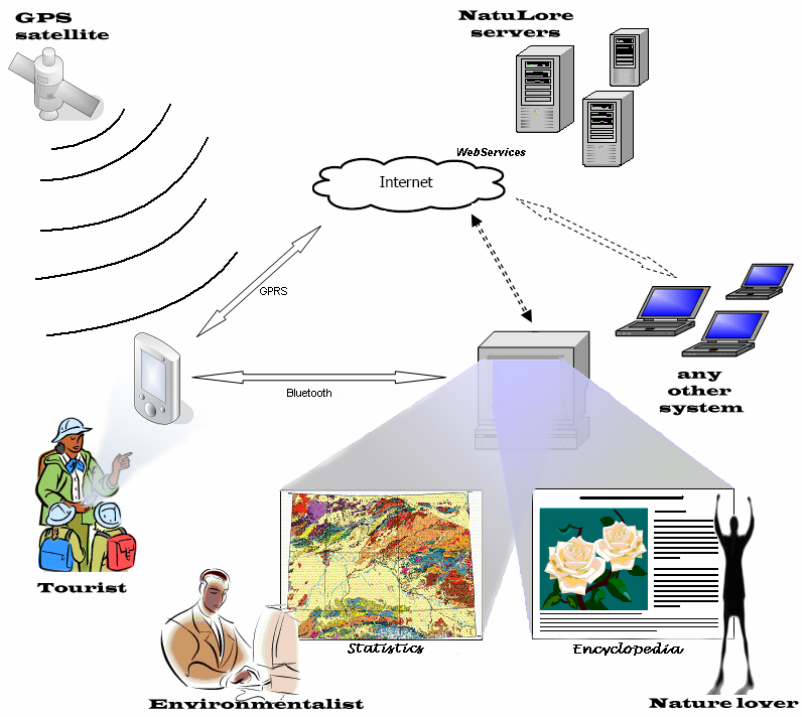

Figure 1. Overview of the NatuLore system.

Client devices are basically PDAs connected to GPS receiver. Since we can not assume that all PDAs have internet connection available anywhere, the client is designed to be able to work also in disconnected mode. Clients are able to synchronize each other directly in the nature using Bluetooth technology.

In order to get only the desired content delivered, a user can set his preferences by selecting from various filtering criteria. When the user approaches a place that satisfies specified filter conditions, he gets notified either by vibrations, predefined sound or text-to-speech feature and the information is then interactively presented by the mobile device.

We believe that there are many people who fell in love with nature. These people, as well as the park employees and environmentalists are mostly proud of their surroundings and would like to share their knowledge about it. We designed our system in the form of an online collaborative encyclopedia that can be used to view and share the information contained within the system so that users can effectively browse encyclopedic content either directly in the nature or at home. We enable all of them to add new articles every time they see something interesting. Everyone can take part in enhancing the environment with text, pictures and videos virtually hanging above the plants.

Nature is changing quickly and humans often make mistakes. Hence all the articles can be edited and corrected. To prevent users from destroying relevant content, the revision history is being kept. We are also designing a module for automatic detection of vandalism by textual search and analysis using specific heuristics.

The main role of the server is to store information bound to geographical locations. Its responsibility is also providing an interface for interaction with clients and other systems. Other systems may include community portals, pages concerned with environmentalism or any other application.

We estimate that everyday use of the NatuLore system will generate huge number of requests as the users move. Therefore we decided to evenly distribute data and workload among several servers deployed in many places around the world to cover the most visited and popular tourist destinations and prevent one server from becoming a serious bottleneck.

Statistics available from the system are very important for the protection of the environment. Our system gives the ability to monitor traffic in a park by collecting anonymous statistics consisting of the geographical location and the timestamp. Various statistics could be made available based on this data. For now we have defined 3 basic statistic visualizations that we find suitable for use in environmentalism:

- *Density map* visualizes the amount of people that visited particular places in a park during the specified time period.
- *Movement map* shows the movement in a park. It is a graphical representation with colors chosen based on time when most people visited the individual displayed locations. When displaying a map generated from statistics, the direction most people were moving through the park can bee seen. With statistics that cover longer periods, it can be seen which parts of the park were gaining or loosing popularity over the time.
- *Density to time diagram* displays the changes in the amount of visitors of specified area over the time.

The system also provides users with the opportunity to inform the environmentalists about problems with littering by simply clicking a button on a device when they see a problem.

Originality of the project

The aim of the NatuLore project is improving knowledge of the modern man about the nature. This should lead to the increase of the environmental awareness and decreased rate of the pollution production as a result. The users of the system will also be able to send notifications about polluted areas and problems in parks that could be precisely specified.

The NatuLore project will bring the following benefits to the society:

- living natural encyclopedia of the particular geographical area,
- easier way to learn about the nature,
- a way to share interesting location-bound information,
- effective messaging notifications (e.g. about garbage) to the park administrator,
- monitoring of the traffic in parks,
- … and thanks to all of this, it will help to preserve the nature.

The main idea of the project is to enable access to contextual information directly in the nature and to create information collaboratively. Contrary to existing encyclopedia on the Web such as Wikipedia, our system basically gives its users the ability to create, receive, store and edit information bound to specific geographic locations while being physically present at the location together with the two dimensions of versioning – revisions related to the collaborative nature of information produced and variants related to the place and time characteristics.

Information present in the NatuLore system includes short annotations, articles, and multimedia (videos, pictures and sounds). This provides a common information base shared by all the users of the system and is giving them the ability to collaboratively process contextual information and effectively build interactive encyclopedia. It also gives the possibility to share any information in a small community, e.g. a group of nature scientists (biologists, geologists, botanists, etc), or a group just taking a trip.

The main purpose of the project is to enrich the environment by the most valuable thing we have – information. To provide this:

- we used GPS technology in combination with collaborative encyclopedia of the nature, the brand new way of use we find completely different from the existing solutions mostly used for navigation. It allows us to give people right data in right time without the need for any additional devices installed along the forests
- we enable people not just to read the articles from their mobile devices, we provide them hands-free walk without loosing any wanted information using the text-to-speech feature
- we allowed the use of many different types of devices by defining and designing web services for cross-platform compatibility
- we considered the distribution of data over several servers around the world to increase responsiveness
- we used the GPRS technology to provide Internet connection for mobile devices
- we enabled the use of system also in locations with lack of GPRS signal using the synchronization over Bluetooth. The synchronization can be done between desktop and PDA or between two PDAs.

Software project lifecycle and schedule

After the first stage of problem identification and a quick feasibility study, we opted for an agile development approach, which was based on prototyping. The projects life cycle could be best described by means of an incremental and iterative model, which together with feature driven development allowed for easy incorporation of changing requirements represented as features, short iterations and early testing.

The schedule of the project including the work already done is summarized in Appendix A.

Team organization

Our team consists of four members:

- Marek Tomša has been selected as team leader. Besides the team management he works on desktop and mobile clients.
- Michal Dobiš is primary responsible for integration of statistics and text-to-speech module into the system. He also takes major part in project documentation.
- Dušan Kysel is occupied with encyclopedia web portal development.
- Richard Veselý is primarily responsible for the server-side of the application, web services and the database support.

Project status

The primary goal of the project is to design and evaluate innovative system that is supposed to enhance the nature with the additional information in hope to protect environment by getting users to know it better. In order to evaluate the practical feasibility of the design as well as for demonstrational and testing purposes we expect to have a final prototype of the system with all the proposed features working ready by the end of the project. This would include a mobile device equipped with GPS module and the respective software and all the server components necessary to run the NatuLore web services.

In the first stage of the project, we completed a number of tasks:

- we gathered initial project ideas and evaluated them,
- we decided on the systems functionality,
- we made a list of hardware and software requirements and designed the software architecture,
- we successfully implemented support for key technologies required to complete the project (GPS NMEA parser, Bluetooth communication module) and its use in PDA,
- we have implemented a working prototype and successfully tested its basic functionality,
- we have implemented the second stage of the prototype design by implementing additional features formerly defined as the second increment.

Thanks to precise design of the system made and some critical parts of it already implemented and tested, we assume the future implementation to be straightforward. Also all the needed hardware – Smartphones and PDAs with GPS module – is becoming common equipment of modern people in the near future, so we expect fast and easy expansion of the system with nearly no additional costs and benefit to everyone.

Appendix A - Project schedule

Due Date	Status	Task	Responsibility
15.11.2005	done	Project ideas and innovations evaluation	everyone
20.11.2005	done	System functionality specification	everyone
30.11.2005	done	Overall design and basic increments specification, its tests definition	everyone
05.12.2005	done	First prototype for mobile device with GPS test implementation	Richard Veselý
14.12.2005	done	First increment in the server-side of system	Richard Veselý
14.12.2005	done	First increment in desktop client design, implementation and testing	Marek Tomša
06.01.2006	done	Project title and a brief description writing	everyone
10.01.2006	done	Desktop client design, implementation and testing	Marek Tomša
20.01.2006	done	Statistic module design implementation and testing	Michal Dobiš
21.01.2006	done	Additional support for multimedia types in database implementation and testing	Richard Veselý
28.01.2006	done	Interim Report outline	Michal Dobiš
01.02.2006	done	Interim Report draft	everyone
10.02.2006	done	Interim Report completion	everyone
26.02.2006	Planned	First prototype of the Web portal	Dušan Kysel
28.02.2006	In progress	Statistics data store and access optimization	Michal Dobiš
01.03.2006	In progress	Markup language for article description definition and its parser implementation	Dušan Kysel
09.03.2006	Planned	Final Report outline	Michal Dobiš
20.03.2006	In progress	Distribution of data through more servers design, implementation	Richard Veselý
25.03.2006	In progress	Web-Service and desktop client testing, Web-Service benchmarks evaluation	Marek Tomša, Richard Veselý
25.03.2006	Planned	User profiles support and authentication design, implementation and testing	Dušan Kysel
28.03.2006	Planned	Text-to-speech engine interface design, implementation and testing	Michal Dobiš
30.03.2006	In progress	Overall synchronization specification and design	Michal Dobiš, Marek Tomša
01.04.2006	Planned	Web portal integration	Dušan Kysel
03.04.2006	Planned	PDA-desktop synchronization implementation and testing	Marek Tomša
05.04.2006	Planned	Final Report draft	everyone
08.04.2006	Planned	PDA-PDA synchronization implementation and testing	Marek Tomša
09.04.2006	Planned	Vandalism protection design, implementation and testing	Dušan Kysel
10.04.2006	Planned	System testing	everyone
14.04.2006	Planned	Final Report completion	everyone