Imagine Cup 2006 Project Specification

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Problem Definition

We would like to interpret the notions of health and healthy lifestyle in a broad sense. That means that we would like to consider not only physical health and all its medical aspects but also to involve the concepts of social and emotional health that are not less important. So in this project we would like to take into account such health aspects as healthy labor and recreation, healthy activity in various spheres of life, healthy traveling, healthy communication, wild nature and fresh air, healthy and safety sports - all being supported and improved with computer technologies. And that is why we developed healthy *footstep* - as a walk, a pace, a step or as a way of living.

Footstep is an interactive system for active and healthy rest organizing, intelligent guide, adviser, a personal doctor and a system for communication of people interested in healthy lifestyle. The goal of this project is to use the power of modern technologies in order to help people interested in active and healthy life, traveling, going in for sports and looking for friends by interests. Whether you like extreme tours in out-of-the-way places or comfort and safety traveling, whether you prefer cycling with your family or friends or professional team games - anyway *Footstep* will encourage you and help you to find the team of people with the same interests, time, route and will give you necessary recommendations and warnings.

Hence, *Footstep* focuses on such main problems:

- encouraging users to follow healthy lifestyle regardless their occupation, interests, location and physical health;
- encouraging people, interested in healthy lifestyle, to communicate and to find friends by interests;
- active rest organizing - arranging trips and sports events for users
- helping user to optimize his time for making any healthy arrangement
- providing user with any necessary dynamic information on his future tour or sports event
- protecting user from possible danger during active rest with the help of warnings, recommendations and first aid expert system
- interactive providing user with full information and communication support during any healthy activity
- encouraging user to keep a healthy diary
- determination of the sequences of physical trainings on user's health

- analyzing and demonstrating user's health progress on the basis of his personal information, diary, contacts and events

Solution Approach

The purpose of *Footstep* project was not to create software which **helps** user in organizing his healthy activities, but to develop the one which **does** it for user and **encourages** him to live healthier life. Such a goal requires a great intellectuality from the system. And our idea was to use special software agents for executing operations which are usually done by users of such systems. That is why we created an intellectual *Smart Agents and Managers Architecture*. Smart manger is a special service for coordination of smart agents' work, located on server. And smart agents are special dynamic link libraries engaged in specific tasks. This technology provides *Footstep* system with high-leveled intelligence and allows users to dispense with such common operations as, for example, finding dynamical information on the Internet.

But smart agents do not only dynamically load the necessary information on the Web in order to keep all the databases in actual state, they also constantly analyze user's data, his health progress on the basis of his diary, contacts and events he involved, give necessary advices and demonstrate user the results of his active life. Thus, *Footstep* stimulates every user to live healthier life as an intellectual friend and a coach.

System also encourages users to communicate and to form teams – companies of the people with same interests. That is why we considered necessary to provide the system with all means of communication. Information on user's contacts is taken into account when analyzing user's health progress.

One more goal of *Footstep* project was to divert the user from his sedentary work, usual workplace and personal computer, which is quite paradoxically for software project. That is why our team did everything in our power to develop applications for portable (mobile) devices and to support it with maximum functionality.

Functionality

For each user his level of permissible load – so-called "health group" - is determined on the basis of mini-testing and a questionnaire, evaluating his state of health and physical training. User is suggested to keep a health diary. Except for user's notes, system registers in a diary all sports events and trips, which were made by user. On the basis of user's diary, his contacts, and events he participates, *Footstep* evaluates user's physical and social health. Their condition is demonstrated by special scales. Moreover, animated character, whose appearance depends on these scales, is developed in order to encourage user to live healthier life and to see the changes in his health rate. *Footstep* also gives personal recommendations on nutrition and healthy diet, and determines the sequences of physical training on the basis of user's heart rate.

After a user expresses his wishes concerning future active rest, the program identifies geographical names and other parameters in the text of the wish and smart agents find appropriate trips and sport events among the ones that were announced by users. If there are no such, the program helps user to organize his own event. The possibilities of Microsoft MapPoint Web Service are widely used in the project; which allows to automatize the process of trip organizing.

For example, after indicating places you want to visit (by title or location), you do not only get a map with a precise route by existing roads, photos and information on sights, but also an information about transport, nearby hotels, restaurants and hospitals. An agent, responsible for the terms of event, considers not only you wishes, but also a weather forecast together with a desirable way of transportation and your health group. Assistants, responsible for health and safety, do not only calculate necessary amount of calories per day taking into account your activity type and your data, but also tell you about required vaccinations, dangerous animals and poisonous insects in the region.

However, *Footstep's* help is not limited to organizing an event. Separate subsystem is developed for real-time work directly during active rest. It is supposed that during this stage user is away from his usual working place and personal computer. That is why clients for mobile platforms, laptops and web applications are provided in the system. This allows users to interact with the system with the help of portable (mobile) devices with Internet connection, such as smart phones, Pocket PCs, laptops, tablet PCs. Users are able to exchange information on-the-fly, to send voice and video messages, to observe their own and mutual location (with GPS receiver), to correct the route. With the help of Microsoft Text-to-speech technology the program reads text messages by voice, which is convenient for use on the journey. And for convenience of Personal PC user all the messages are duplicated on e-mail and ICQ.

In addition, special expert system provides recommendations in accidents and extreme situations. It is sufficient to describe symptoms of an injury or an appearance of a new fruit or an insect through mobile device, and user gets encyclopedic information about first help or about poisonousness of representative of local flora and fauna.

Advantages of *Footstep* Interface

The client application has intuitively comprehensible and convenient user interface. Using Microsoft Agent 2.0 technology allows reaching a new qualitative level of user interaction with the software. All recommendations and explanations are provided by nice animated assistant who plays the role of interactive guide to the system. The assistant allows controlling a program with the help of voice commands and is able to answer user's questions in the mode of voice conversations. This can be especially useful for users with limited physical possibilities and for users, willing to optimize their time. Voice recognition is provided by the means of Microsoft Speech Recognition Engine.

Besides, an interactive wizard, transforming a process of active rest organizing into a sequence of some simple steps, is provided. We hope it will help new-comers to master work with *Footstep* easily.

In order to divert user from constant sedentary work with computer, *Footstep's* timer gives regular notifications and warnings such as, for example, to have a rest every 40 min.

Architectural Design

The *Footstep* system is distributed system composed of one or several operational servers and different kinds of clients. The server is a complex composition of different components that are working together for supporting required functionality. They are: database, web services, web application and our original agents' management system. We used the latest technologies and innovative techniques for designing and implementing the system.

The information is stored in MS SQL Server 2005 database and it is divided into four main parts – media information (photos, sound, etc.), user's personal information (profile, statistics, and health rates), trips and teams information for supporting collaborative arrangements, and geographical data that is mainly supported by Microsoft Map Point Web Service.

For accessing all these information we have developed corresponding XML Web Services – **Media, Stat, Data**. We also use the functionality provided by MS Map Point on the server side for automated data base filling.
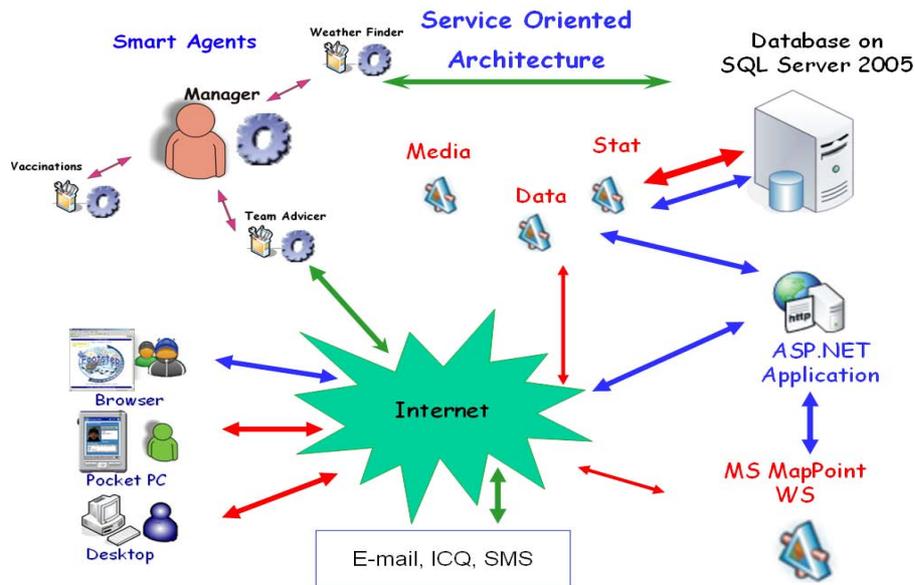
For work with *Footstep* different types of clients have been developed – thin web-based client, desktop application, and application for mobile platforms. Before accessing the system user has to register and to download the appropriate client. This operation may be performed through web application.

Footstep users may communicate using common services such as e-mail, ICQ and SMS messages. This functionality is provided by Media web service. By means of these service users may also receive the information on changes in system that allows keeping informed about events even when staying far away from a workplace. Web application also allows the user to work in system, having any device connected to Internet and being able to process html. The mobile client to *Footstep* is developed in order to support user with information during the trip.

But the main difference between other common systems and *Footstep* is the use of agents' management system for solving intellectual tasks. This technology makes the system more scalable, efficient, and suitable for user's needs. The use of agents' technologies allowed us to create flexible, convenient in administration and effective system of the intellectual services concerned with smart search and analysis of the information. We have developed and optimized algorithms of agents' management for achieving performance and high efficiency. For
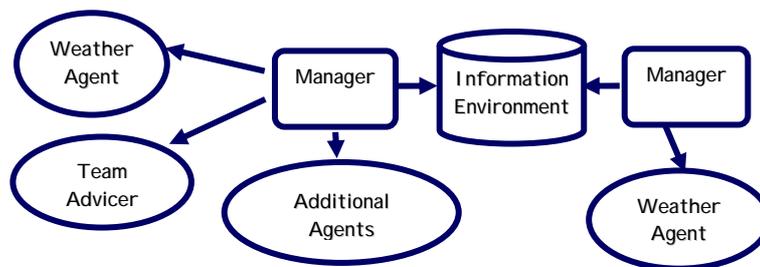
implementation of our agents' management system we used the latest achievements in the domain.

Our agents are able to process user's wishes expressed in natural English, automatically search the Internet for filling database with information about weather, necessary vaccinations, and other facts about certain region. The system contains the agent that analyzes user's data and gathers statistics about his interests according to user's behavior in the system and then generates useful advices.

Developed agent management system is a complex and innovative system by itself. It is composed of manager, operational information environment and mobile smart agents. The manager is able to analyze data in information environment for selecting tasks and then to make a decision for running a certain agent to solve this task. The system may contain several managers on different computers in the network. The purpose of manager is to identify the appearing tasks, to find agents that are able to solve them, to compose the schedule and to run agents according to the schedule.

The agent is a special type of MS.Net Framework assembly. It may be shared between managers and a new agent may be added to the system without stopping it. The purpose of an agent is to solve an entire or a piece of an intellectual task.

To develop *Footstep* system the following technologies and tools were used: MS.NET Framework 2.0, MS SQL Server 2005, MS.NET Compact Framework, MS Agent Engine, MS Speech Engine (Text-To-Speech,

Recognition), MS Map Point WS, ASP.NET, MS Web Services. Thus, the architecture of the *Footstep* satisfies all Imagine Cup 2006 requirements.

Social impact

The *Footstep* system will be useful for everyone who wishes to follow a healthy lifestyle, to travel at least once, to go in for sports and to find friends for active rest. System can also find special application in sportsmen's environment, among professional tourists, organizers of sports events and the workers of tourist's industry. The abilities of the system in organizing active rest and trips and in finding and distribution of the appropriate information are useful not only for separate users but for the entire organizations such as tourist's and sport clubs or tourist's agencies.

Thus, *Footstep* target audience includes:
- everyone, willing to live an active and healthy life
- professionals in health and recreation sphere such as:
  - sportsmen;
  - professional tourists;
  - sports events organizers;
  - tourist industry employees;
- not only individuals, but also for entire organizations such as:
  - tourist's and sports clubs
  - travel companies
  - organizations interested in attracting healthy lifestyle users.

Hence, we supposed *Footstep* system to cover the entire business process of active and healthy rest and life organizing, including:
- interested individuals,
- organizations, for which these individuals become clients,
- intermediaries between these two groups.

Prospects of development

We would like to outline such future trends in Footstep development:
- using sensor devices to provide real-time monitoring of user parameters
- the automatic notification of hospitals, rescue services, etc. about emergency situations with automatic providing of coordinates and user information
- upgrading of intelligent services: new program agents will extend the system functionality