

プロジェクトマネジャー: David J. Farber PM

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## 1. プロジェクト全体の概要

The advent of high speed networks, both wired and wireless, has offered the possibility of fulfilling the notions of bringing the power of distributed computing and distributed data storage to the offices and homes of the users of computers and mobile devices. While to date, the applications have been focused largely on searching and media distribution, there are other directions to explore in particular directions which help develop human capabilities and to better utilize the capabilities of individuals and groups working together. For example, it has been proposed that "agents"/"avatars" to represent a user in gathering information etc would dramatically re-define the environment. Also ideas for applications, which allow interaction between groups of people and these computer based intelligence would radically change the nature of human/computer interaction.

We are about to enter the next phase in networking technology which will require dramatic changes in our approach to network software and protocols. End to end all optical networking in conjunction with a continuation of Moore's law in computer hardware will augmented by the increased use of "cloud computing" and other forms of distributed processing. I am especially interested in new approaches to how to use such changes to enhance the ability of people to fulfill their potential both individually and in society. The combination of these events combined with the future wireless technology will bring increased access to information and computer power everywhere and every time.

Based on this view I selected the following four projects.

## 1.1 Development of an Evolutionary Agent-based Network Simulator

Computer networks today are rapidly growing in size and complexity. As can be seen in emerging networks, for example peer-to-peer networks and sensor networks, networks today can potentially contain millions of nodes with different computing and networking capabilities that may dynamically leave and join such a network. Due to the large-scale, dynamic and heterogeneous nature, network applications and services need to address various issues such as scalability, adaptability and robustness, possibly autonomously without requiring human administration and intervention in order to minimize operational and maintenance costs.

A promising solution to designing scalable, adaptive, robust and autonomous networks is to use autonomous agents. In this project, the creator develops a network simulator by which one can practice the concept of the agent-based design methodology. The immediate impact of the proposed project is that it disseminates a user-friendly easy-to-use network simulator for testing agent-based networks; and in the long run, it is expected that various network services and products are developed based on the design methodology.

## 1.2 Audible Photo : Enhance the Digital Imaging Experience With Embedded Ambient Sound

This project proposes to create a new sense of rich emotional experience from digital imaging by enhancing the ability of the users to recreate atmosphere in which the photo was taken using attached environmental audio. Digital images with embedded ambient audio are constructed using extended Exchangeable Image File Format (EXIF).

The ambient sounds of the environment connected to the still pictures successfully reconstructs the atmosphere of the scenes being captured. It will also open many possibilities in digital imaging field through auditory scene based photo tagging and media-rich digital photo visualization.

The project will develop photo-audio capture application for the iPhone 3G and Android based smart phones. Furthermore, the project will develop auditory scene based photo tagging through the automated audio feature extraction and analysis for scene segmentation and classification. For the final representation of the photos, a web browser plug-in will be built to support the audio playback, and develop a standalone application to support auditory scene based photo grouping and indexing.

As a result, a new scenario of digital photography such as auditory scene based photo slideshows will be possible.

Other advancements include the use of geo-tags (GPS latitude and longitude data), and direction (compass) to add more viewing possibilities by overlaying the photos on Google Maps and similar services. Photo sharing sites such as Flickr and Picasa already supports EXIF tags. Thus EXIF provides to a strong fundamental platform for the project.

### 1.3 AJAX Platform for Image Based Rendering in Cloud Computing

With the recent ubiquity of AJAX (Asynchronous JavaScript and XML) technologies, web applications can provide the user experience end-users have demanded for a long time. That is to say, Rich Client and web applications are converging with regard to functionality and usability. Web applications are becoming "Rich" with respect to the capability of the User Interface, Rich Client applications are offering better deployment and management functionality.

The purpose of this project is to develop a software platform that enables users to view real-world objects interactively by changing viewpoints using AJAX technology. The rendering technique used is image-based; the virtual views of an object are synthesized by interpolating 2D images, and by leveraging the high quality of recent digital photographs. This approach alleviates the difficulty of modeling 3D geometry in existing approaches to

3D computer graphics. The software can run on various kinds of devices using a web browser without additional software installation, which makes it possible for users to experience photo-realistic 3D computer graphics in a cloud computing environment.

### 1.4 A Cloud Computing-based Information Sharing System for Mobiles

This project will create a powerful mobile-based information sharing system by adopting leading cloud-computing techniques.

Mobile devices are now widely used, but are limited to making phone calls, sending/receiving emails and SMS, and browsing websites. Our project is aims to make the mobile phone an information center and enable people to share messages, photos, GPS data, etc. on public internet in a much more secure and flexible way, where we will take advantage of the powerful computing available in cloud

computing servers and rich mobile email functions. By using this novel system, people with even low-end mobiles can for example easily share photos with friends, publish blogs, etc.

## 2. プロジェクト採択時の評価(全体)

### 2.1 Development of an Evolutionary Agent-based Network Simulator

I had very mixed feelings towards this project proposal. While the idea of agent-based systems is very interesting (and has been since the 1970s in local environments) I had serious concerns about building a simulator. It is not that simulators are not good, but my concerns were that the effort would not lead to any productive place. It is just too easy to create a real environment on today's networks using today's large-scale distributed environments.

That being said, I did not want to veto the effort and accepted it as a project I wished to manage. The proposal was well thought out and would contribute to this area, however, I still remained very concerned what real contribution it will make as opposed to being just another "real" experiment.

### 2.2 Audible Photo: Enhance the Digital Imaging Experience With Embedded Ambient Sound

While some aspects of the proposal already existed in part already within camera and cell phone software, there was no integrated approach that I knew of. I believed that a well-implemented integration of view, sound and location could yield a very interesting application that also could become a commercially viable product. Success would all depend on the smoothness of the implementation and the care of design. I agreed that targeting a version to the iPhone in order to gain the maximum exposure.

### 2.3 AJAX Platform for Image Based Rendering in Cloud Computing

This project was complementary to several others I have managed or propose to manage and accepted it as a project to manage in this new round. The notion of the mobile phone as a part of a distributed computing environment, a "cloud" offers the opportunity to provide significant computing power to the limited mobile

environment. In particular, a two-way path between the phone and the rest of the cloud offers an interesting set of possibilities. The research appeared to be experienced and competent and thus should be able to achieve the project goals.

## 2.4 A Cloud Computing-based Information Sharing System for Mobiles

This project proposed to address themes common in a number of current proposals as well as past efforts and that suggested an opportunity for inter-project co-operation that would benefit each of the efforts as well as the overall effort. I accepted to manage this project and looked forward to its outcomes.

## 3. プロジェクト終了時の評価

### 3.1 Development of an Evolutionary Agent-based Network Simulator

Future directions in computer networks seem to indicate that they will evolve towards being agent-based with many of the functions proxied to modules which run independently and are coordinated over the network. One of the problems in designing agent-based systems is to understand their behavior prior to building a prototype. In general this calls for having a simulator available which can be used to try ideas out to get some notion of how the systems perform prior to prototype.

Such large-scale simulations often suffer from being extremely slow and limited in the size of the system they can simulate. To get realistic notions of the performance of these systems one would like to simulate the environment having thousands and even hundreds of thousands of nodes interacting. In addition there is often a need to enhance the simulator to allow simulation of new types of agent-based systems. This project was a direct attack on both of these objectives and succeeded quite well in achieving the ability to run large-scale simulations in modest areas of times and with the ability to modularly extend the simulator.

As I described when I accepted the project, I had mixed feelings towards the project proposal, that it would be difficult to make a real contribution beyond simply creating another experiment. However, the developer has produced a professional product which has been used by a number of independent researchers. I am very satisfied with the work done.

### 3.2 Audible Photo : Enhance the Digital Imaging Experience With Embedded Ambient Sound

The objective of this project was to extend the usefulness and impact of photographs especially taken in the iPhone environment. The proposal was to add an audible background sound to still photos thereby creating a two senses environment.

The project aims to integrate both sound and control information into the standard photographic format that is used by the iPhone. Given that it would have the maximum portability and utility. As I suggested when accepting the project, a well-implemented integration of view, sound and location could yield a very interesting application that also could become a commercially viable product. Overall the developer has achieved these goals and I am pleased with his work and to have been managing this effort.

### 3.3 AJAX Platform for Image Based Rendering in Cloud Computing

The purpose of this project was to allow users to both model and view real-time objects using a variety of web-based services potentially operating on a cloud-based computing environment. If we consider it to consist of two elements, the first is to take conventional photographs and recover the location and orientation of the cameras automatically. This will allow for the uses to manipulate the pictures and to obtain different views of the environment in a simple and flexible manner. The second element is software which allows a conventional web browser to be the vehicle by which users can manipulate the resultant images.

The work was completed very professionally, the results are extremely satisfactory and not only advance the state-of-the-art in this area but have strong commercial potential. Am pleased to have managed this project.

### 3.4 A Cloud Computing-based Information Sharing System for Mobiles

The idea behind this effort was to allow for the easy sharing of information, e-mail messages, photos, and video for the mobile user. The investigator uses the Google cloud-computing environment as a computing engine and storage engine to achieve these ends. This allows for the expansion of the number of users in a seamless environment sense the cloud environment allows the rapid and almost automatic expansion and contraction of computing resources. As I mentioned when accepting

the project, it was similar to other projects I have managed and was planning to manage. I am pleased with the outcome, the goals of the project had in essence been achieved.