Globally Collaborative Environmental Peace Gaming with Global University System

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Globally Collaborative Environmental Peace Gaming (GCEPG) with a globally distributed computer simulation system, focusing on the issue of environment and sustainable development in developing countries, is to train would-be decision makers in crisis management, conflict resolution, and negotiation techniques basing on "facts and figures." To realize this, I worked on the proliferations of data telecom infrastructure and email to various countries, and demonstration and testing of hybrid technologies with "Global Lecture Hall (GLH)"TM videoconferencing spanning globe. We are now forging ahead to create Global University System (GUS), which will supply game players from around the world. With global GRID computer networking technology and Beowulf mini-super computers of cluster computing technology, we plan to develop a socio-economic-environmental simulation system and a climate simulation system in parallel fashion, both of which are to be interconnected in global scale. This paper briefly describes the history of the GCEPG project and its future direction.

Keywords: Peace Gaming, distributed computer simulation system, distributed decision-support system, Global University System (GUS), Global Broadband Internet (GBI), GRID computer networking technology, Beowulf mini-super computers

1. GLOBAL PEACE GAMING

When I organized as a General Chairman a large Summer Computer Simulation Conference (SCSC) in Boston in 1971, I conceived an idea of creating a Globally Collaborative Environmental Peace Gaming (GCEPG), particularly on the issue of environment and sustainable development in developing countries. The games were intended to train would-be decision makers in crisis management, conflict resolution, and negotiation techniques (Utsumi, 2003).

The GCEPG with a globally distributed computer simulation system is a computerized gaming/simulation to help decision makers construct a globally distributed decision-support system for positive sum/win-win alternatives to conflict and war. The idea involves interconnecting experts in many countries via global Internet to collaborate in the discovering of new solutions for world crises, such as the deteriorating ecology of our globe, and to explore new alternatives for a world order capable of addressing the problems and opportunities of an interdependent globe. Gaming/simulation is the best tool we have for understanding the world's interwoven problems and the solutions we propose for them. System analysis for systemic change at the global level is a precondition for any significant resolution to today's global-scale problems. The understanding gained with scientific and rational analysis and critical thinking basing on "facts and figures" would be the basis of conflict resolution for world peace, and hence ought to provide the basic principle of global education for peace.

Then in 1981, I coined the phrase "Global Neural (or GRID in today's terminology) Computer Network" in which each participating game player, with his/her own desktop computer, database and sub-model, would correspond to a neuron, router to synapses, with the Internet serving as nerves in a global brain.

Namely, each participant at appropriate locations should construct the sub-models of their individual sectors and countries and then connect all of their sub-models via telecommunications as if their total acts as a single model. The experts of those sectors and countries could bring credible data and model structure.

2. NEED

The Bush administration withdrew from the Kyoto Protocol on Climate Change Treaty on global environmental protection, lest the US should be impeded against favourable conditions to the economies of Japan and European Union. The U.S. administration then launched the [Climate Change Science Program](#) (CCSP) Strategic Plan. The CCSP with $1.7 billion/year budget of the US Commerce Department announced the administration's plan in the fall of 2002 which called for a vast array of work through the rest of the decade on goals like improving computer simulations for forecasting climate change, integrating measurements of global change and clarifying regional effects of warming, etc. ([The New York Times, 2003](#)). Trustworthy climate forecasts with the influence of human activities would be of great value for policymakers at all levels to help decision makers and the public determine how serious the problem is so that they can make clear choices about how to deal with it.

Thomas Graedel, professor of industrial ecology at Yale University and chairman of the panel of the National Research Council, said that research in the past tried to gauge how the climate was changing and its effects on nature. He also said, "*future science must also focus on more applied research that can directly support decision-making* (emphasis is mine). Research is especially needed to improve our understanding of the possible impacts of climate change on ecosystems and human society as well as options for responding to – and reducing – these effects."

There is therefore a clear need to help limited understanding of the underlying causes and impacts of climate change by human activities in order to set explicit prioritization and a management plan. American efforts to refine advanced computer models used to project the effects of rising greenhouse-gas concentrations have so far fallen behind those overseas, partly because of a lack of coordination. Because of the global nature of this matter, a unified approach is necessary with those other countries, and also because of the conflicting environmental issues in global scale, the GCEPG would be the best way to cope with the enormous planetary problems jointly by the people around the world.

3. THREE COMPONENTS NECESSARY FOR GCEPG

To achieve this goal, we need the following three components;

3.1   Data telecommunication infrastructure:
Over the past three decades I played a major pioneering role in extending U.S. packet-switching data communication networks to various overseas countries, particularly to Japan, albeit it was narrow-band -- which is now called "closing the digital divide." As the second round, we are now forging ahead to construct Global Broadband Internet (GBI) along with the establishment of Global University System (GUS) around the world, which is a network of higher educational institutions in various regions of the world – see below. Packet-switching technology facilitates the sharing of telecom media, bringing drastic cost reduction. We are extending this principle to sharing of information and knowledge in e-learning and e-healthcare fields.

3.2   Communication media:
For collaboration among game players, it is necessary to have convenient communication media on a global scale. In spite of fierce opposition from the Japanese government and commercial carriers, I devoted considerable effort, time and private fund to deregulate the Japanese telecommunication policies for the use of e-mail (thanks to help from the Late Commerce Secretary Malcolm Baldridge), albeit it was only text-oriented message exchange at that time. This triggered the de-monopolization and privatization of Japanese telecommunications industries. This liberalization of the telecommunication industry has been emulated and has now created a more enabling environment for economic and social development in many other countries. Over 180 countries have Internet access and more than 750 million people use e-mail around the world nowadays. American and other countries' university courses now reach many under-served developing countries.

I also contributed by conducting innovative distance teaching trials with "Global Lecture Hall (GLH)"™ multipoint-to-multipoint, interactive multimedia videoconferencing almost every year using hybrid delivery technologies, which spanned around the globe from Korea, Japan, New Zealand, Finland, Italy, France, Russia, Turkey, Venezuela,

Brazil, etc. After many successful demonstrations and systematic testing of various hybrid telecom infrastructure by way of the GLH, we are now forging ahead to implement multimedia through GBI — even in wireless mode.

The deployment of GBI for multimedia requires huge capital investment. I have prepared the availability of such funding (total US$17 billion) from the Official Development Assistance (ODA) Fund of the Japanese government – see the Chapter "Creating Global University System" in the book "Global Peace Through the Global University System."

3.3 Game players:
Basing on these backgrounds, we are now creating a Global University System (GUS) with colleagues in major regions of the world, which will be interconnected with GBI. The GCEPG is one of the proposed ways to utilize the GUS and GBI in integrative fashion.

GUS member institutions will have globally distributed and yet interconnected inexpensive mini-supercomputers through GBI to form massively parallel processing possible as if a single supercomputer in a global scale. This is, in a sense, to construct an advanced global neural computer network of a global brain for the proposed GCEPG with globally distributed computer simulation models.

We hope that GUS member institutions (which are also members of GUS/UNESCO/UNITWIN NETWORKING Chair Program) will construct databases and simulation models of their own fields and regions, and supply game players who will utilize the GCEPG for their study and analysis of environmental policies.

Along with the establishment of GUS with the GBI and E-Rate for K-12 schools, we will forge ahead to disseminate Systems Dynamics methodology in order to realize this GCEPG – particularly, we would hope, with the participation of K-12 youngsters around the world. They could collaboratively exercise systems analysis, policy-making, crisis management and negotiation skills for global socio-economic, energy and environmental issues via global Internet. Education of youngsters/adults on a global scale is the *best* future investment for world peace and progress. Senator Fulbright once said that *learning together and working together are the first steps toward world peace.*

4. GLOBAL UNIVERSITY SYSTEM

The Global University System (GUS) headquartered at the University of Tampere, Finland is a worldwide initiative to create satellite/wireless telecommunications infrastructure and educational programs for access to educational resources across national and cultural boundaries for global peace.

The GUS helps higher educational institutions in remote/rural areas of developing countries to deploy broadband Internet in order for them to close the digital divide and act as the knowledge centre of their community for the eradication of poverty and isolation.

The GUS has task forces working in the major regions of the globe with partnerships of higher education and healthcare institutions. Learners in these regions will be able to take their courses, via advanced broadband Internet, from member institutions around the world to receive a GUS degree. These learners and their professors from participating institutions will form a global forum for exchange of ideas and information and for conducting collaborative research and development.

The aim of GUS is then to achieve education and healthcare for all, anywhere, anytime and at any pace, for global peace.

5. USE OF GLOBAL GAMING

The purpose of an interactive gaming mechanism is to help find appropriate alternative policies by establishing consensus among participating parties. It is suggested here that globally distributed computer simulation should be tested interactively with the game player inserting pseudo-policy parameters into the models whenever necessary, during the execution of simulation. This is called peace gaming/simulation (Utsumi, 1977) similar to war games practiced by military strategists (Schram et al., 1971). With the advent of global broadband Internet and standard interface protocols for interconnecting various dispersed, dissimilar host computers, the potential exists for ensuring the coordination of international efforts by providing more frequent communications and an environment for shared development, enabling more credible simulation study than was previously possible for playing peace games on the scale of Pentagon war games (McLeod, 1987).

About two decades ago, I proposed the development of global decision support system with globally distributed interactive gaming simulation for global socio-energy-economic system with the use of global data telecommunication network (e.g., Internet nowadays). Interconnection of dissimilar computers and models for peace gaming on energy, resources and environmental (ERE) systems, architectures for linking heterogeneous computers were outlined. The reference also described communication procedures through multi-party gaming simulation (Utsumi and DeVita, 1982).

I then examined the application of the new development in the area of distributed systems and Computer Aided Communication (CAC) to the analysis of the global sociological and economical issues. Based on the review of the past attempts and experiences with model acceptance and validation, meaningful and credible simulation has to be implemented as a modelling network composed of a large number of locally developed and verified models. No single model, developed by a local group of experts has a chance for universal acceptance when it deals with controversial and confrontation-prone area such as global resource allocation and economical policies.

Yet, a comprehensive model of global resources, ecology, and economy is needed for the rational management of ecosystems and for economic cooperation between nations and economic blocks. As a solution to the dilemma between the need for a unified model and a diversity of views and the special interests of diverse groups, a public Open Modelling Network (OMN) was proposed which would consist of models developed by local experts interconnected by global Internet (Utsumi, et al., 1986).

The problem of managing the variety of heterogeneous models, each operating locally, yet affected from time to time by the results of similar runs at other locations, was compared to Scheduling Algorithm problem which is required by all asynchronous distributed systems consisting of the distributed communicating processors, in particular the application of Time Warp algorithm (Jefferson, 1984) and the Virtual Time concept that allows organization of the information exchange among dispersed, dissimilar computational resources with asynchronous and parallel executions.

The GCEPG Project proposes to utilize the semantic benefits of gaming simulation on a global scale to aid decision makers in appreciating the impact of their decisions on interwoven global problems, i.e., the construction of Globally Distributed Decision Support System (GDDSS) with Distributed Computer Simulation Systems (DCSS), which deals with coordination of the distributed sub-models and their experts via the global Internet for global crisis and ecology management for *plus sum, peace game*.

6. GLOBAL GRID COMPUTING NETWORK FOR GCEPG PROJECT

We face, however, a basic dilemma on the conduct of GCEPG Project. Namely, decision-makers must concern with the issues and matters of their constituents within their jurisdictional boundaries. Even though distributed simulation models we advocate may represent their concerns, they will be confined within their boundaries and borders. On the other hand, climate simulation cannot, by nature, regard the boundaries and borders, i.e., they have to be continuous phenomena. Problems are now too intertwined to be well resolved in a system consisting of nation-states, in which citizens give their primary, and near exclusive, loyalty to their own nation-state, rather than to the largely global community.

The best remedy and hope to cope with this modelling difficulties stemming on the basic difference between discrete, boundary-oriented socio-economic-environmental simulation and continuous climate simulation would be to accomplish distributed computer simulation networks of both of them with dispersed, inexpensive Beowulf mini-super computers of cluster computing technology in parallel fashion and both networks to be interlinked at appropriate locations. The network of dispersed mini-supercomputers (each of them with socio-economic-environmental model of their localities) will work as a single simulation of global economy. In a similar fashion, another network of dispersed mini-supercomputers (each of them with climate model of their region) will work as a single simulation of global climate. Both networks can be linked in such a way that global socio-economic-environmental simulation will work closely together with global climate simulation. The decision-making parameters can directly be fed into nearby mini-supercomputers for its regional socio-economic-environmental simulation model, yet having effects on both global simulation networks. This will be a perfect democratic participatory of global simulation.

7. POSSIBLE COOPERATION WITH ELEGI PROJECT

European Learning GRID Infrastructure Project (ELeGI), which is now funded by the European Commission, aims to design and implement advanced service-oriented Grid-based software architecture for learning. This project will

develop a new paradigm focused on knowledge construction using experiential based and collaborative learning approaches in a contextualized, personalized and ubiquitous way. This will replace the current information transfer paradigm, which is based on content, and on the key authoritative figure of the teacher who provides information.

GCEPG project could be a complete and powerful demonstrator of ELeGI Project to show (1) the advantages coming from using advanced technologies (i.e., GRID for accessing to computing resources and collaboration environments) for supporting simulations execution, data analysis, etc., and (2) simulations for learning through the definition of innovative pedagogical models (i.e., socio-constructivist contextualized learning approach), and (3) to show all the benefits coming from the harmonized and synergistic use of advanced technologies together with innovative pedagogical models for learning (i.e., ELeGI).

8. SPIN-OFF BENEFITS

With rapid advancement of computer simulation with GRID computing network technology, such a network of mini-supercomputers around the world can also be used by researchers, even in developing countries to perform with their counterparts in developed countries for joint collaborative researches with virtual reality and virtual laboratory of various academic and engineering subjects. They can also be used in micro-biology, meteorology, chemical molecular study, DNA analysis, medicine/bioscience, 3D animation of human anatomy, agriculture, commerce, finance, nanotechnology, joint advanced engineering design, astronomy, etc. (Sterling, 2001).

In a sense, our GUS/UNESCO/UNITWIN Networking Chair project aims to construct global scale knowledge forum with advanced Information and Communication Technology (ICT), i.e., with the use of massive parallel processors of globally distributed and yet interconnected mini-supercomputers through global neural computer network. This will be a paradigm shift of research and development in global scale, out of the so-called "Ivory Tower" approach.

This will also become a core of a global knowledge forum for the exchange of ideas, information, knowledge and joint research and development. This in turn brings forth the possibility of creating new knowledge and wisdom by global collaboration, and hence global peace. This will foster not only wisdom by collaborative interaction on knowledge but also true friendship among people around the world with mutual understanding and lasting peace.

9. CONCLUSIONS

Clearly, our GCEPG Project is ambitious due to its scope and nature. Any one group, university, or national government cannot achieve it. The program will however need substantial collaborative contribution of ideas, expertise, technology resources, and money from multiple sources. We invite those who value the vision of this Globally Collaborative Environmental Peace Gaming to join us in this urgently necessary project for human survival.

The Chinese proverb says, "I hear and I forget, I see and I remember, I do and I understand!" Another Chinese proverb says, "Knowledge gained with interaction becomes wisdom." E-mail and multimedia World Wide Web of Internet so far contributed significantly to the world society on the dissemination of information. The next phase of the Internet development with global neural (or GRID) computer network should be the globally collaborative experiential learning and constructive creation of wisdom with interactive actions on virtual reality simulation models of joint global research and development projects on various subjects mentioned above. This will promote trustful friendship among youngsters around the world to realize the Knowledge Society of the 21st century, and their collective creativity will enlarge the size of pie for stakeholders to reach peaceful win-win consequences. Another Chinese proverb says, "Acquiring knowledge is a joy, and sharing knowledge is an ultimate joy." I sincerely hope to foster such friendship among the people of the world with our GUS and GCEPG projects for inevitable emergence of a global civilization.

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