Development History of
Peace Gaming and Global University System

For the book;
"Transformative Learning and Online Education: Aesthetics, Dimensions and Concepts,"
IGI Global

September 7, 2008

Takeshi Utsumi, Ph.D.
Chairman, GLObal Systems Analysis and Simulation Association
in the U.S.A. (GLOSAS/USA)
Laureate of Lord Perry Award for Excellence in Distance Education
Founder and V.P. for Technology and Coordination of
Global University System (GUS)
43-23 Colden Street, Flushing, NY 11355-5913
Tel: 718-939-0928
utsumi@columbia.edu
http://www.friends-partners.org/GLOSAS/
http://www.itu.int/wsis/goldenbook/search/display.asp?Quest=8032562&lang=en
Tax Exempt ID: 11-29996

Abstract

As a computer simulationist, I conceived in 1972 an idea of establishing a Globally Collaborative Environmental Peace Gaming (GCEPG) with a globally distributed computer simulation system through a global grid computer network, with a focus on the issue of environment and sustainable development in developing countries. This 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. It can also be used to train would-be decision makers in crisis management, conflict resolution, and negotiation techniques. This gaming approach is to devise a way for conflict resolution with rational analysis and critical thinking basing on "facts and figures."

Over the past three decades I played a major pioneering role in extending U.S. data communication networks to other countries, particularly to Japan, and deregulating Japanese telecommunication policies for the use of Internet e-mail. I also contributed by conducting innovative distance teaching trials with "Global Lecture Hall (GLH)"[tm] videoconferences using hybrid delivery technologies, which spanned from Korea, Japan, New Zealand, Finland, Italy, France, Russia, Turkey, Brazil, etc.

Using this background, we are now creating a Global University System (GUS) with colleagues in major regions of the world, which will be interconnected with Global Broadband Internet (GBI). The GCEPG is one of the proposed ways to utilize the GUS and GBI in integrative fashion. A similar scheme with globally distributed computer simulation system can be applied to various subjects as creating a new paradigm of joint research and development on a global scale. 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.

This paper briefly describes the history of the GCEPG project since its inception in 1972 and its future direction.

1 Global Peace Gaming:

1.1 War and Peace Gaming:

After pioneered in computer simulation starting with the analysis of chemical reaction on absorption of air pollution gases in early 1960s with a slow-time analog computer which was used for gun-tracking on the battleship Missouri to bomb Hitachi-City in Japan during the World War II, I had an honor and privilege of organizing a large Summer Computer Simulation Conference (SCSC) with several hundred attendees in Boston in 1971 as the General Chairman. It was the first of its kind and hence proliferated in the US and developed countries ever since.

At its macro-system simulation session, a professor from the US Naval Post Graduate School in Monterey, California presented his work on war gaming. The professor's last words were: "War gaming cannot be perfect without having its models tied together with simulation models of civilian sectors" (Schram et al., 1971). I then responded, "Well, we may be able to help them, at least in the simulation of the civilian component," (Figure 1).

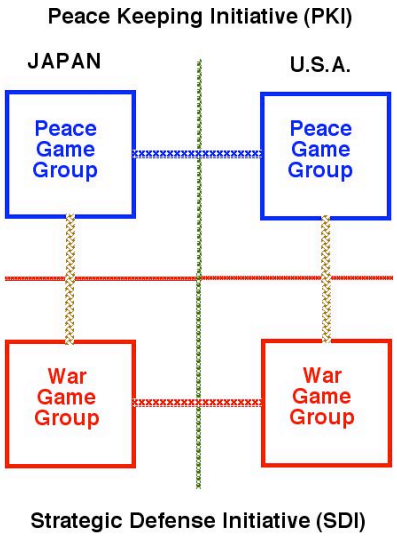

Figure 1: Peace and War Gaming

This motivated me to create a Globally Collaborative Environmental Peace Gaming (GCEPG), particularly on the issue of environment and sustainable development in developing countries, and the Global University System (Utsumi et al, 2003) that would supply the players of the game. The games were intended to train would-be decision makers in crisis management, conflict resolution, and negotiation techniques. This gaming approach aimed to devise rational methods for conflict resolution basing on "facts and figures."

After the 1971 SCSC mentioned above, I coined the word "Peace Gaming" (Utsumi, 1977) in contrast to the War Gaming that is now used extensively by the military. In both of these types of gaming, roles are assigned to players to represent important opponents in a real-life confrontation. But the objectives are as different as war and peace (Figure 2).

Figure 2

If education is based on suspicion, it generates fear. It then needs to conduct a war game, i.e., a zero-sum game to grab a piece of pie as much as possible out of the limited total size. The objective of war games is to win the war. However, because a nuclear war at this stage of technological advancements and military power would bring devastating effects to both sides, everyone would end up with lose-lose consequences.

On the other hand, if education is based on understanding, it will foster trust among people. They may conduct a peace game by charging players with the responsibility of reaching a peaceful resolution of a conflict of ideas or objectives, i.e., a plus-sum game that increases the total size of pie collaboratively with creative ideas of the participants. Each participant can have bigger size of the pie than the one from the limited size pie for zero-sum game. The objective of peace game is then to reach a peaceful resolution of a conflict in such a way that a nuclear war would never happen reflecting a win-win situation.

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 problems and the solutions we propose for them. The understanding gained with scientific and rational analysis and critical thinking would be the basis of world peace, and hence ought to provide the basic principle of global education for peace.

Then in 1981, I coined the phrase "Global Neural 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. Then the Vice President Al Gore used this term in a speech (as the result of one of his staffs at the White House received numerous e-mail messages from my list) and continued with the following words:

> *"The Department of Defense is investing well over $1 billion in the development and implementation of networked distributed interactive simulation. This technology, which*

allows dispersed learners to engage in collaborative problem solving activities in real time, is now ready for transfer to schools and workplaces outside of the defense sector." [Speaking to communications industry leaders, January 11, 1994, Washington, D.C.]

1.2 Encountering with ARPANET:

After the first presentation of our peace gaming project at the first International Conference on Computer Communication (ICCC) in Washington, D.C. in October 1972 (see more in below), I saw a demonstration of ARPANET (Advanced Research Project Agency Network of the U.S. Department of Defense), the first packet-switching data telecommunication network. I then decided to work on its extension to overseas countries, particularly to Japan, because such a network would be the most suitable for our global peace gaming. In a sense, it was the very first step of "closing digital divide" movement in the present day's terminology.

I heard that the ARPANET was extended to England and then thought, why not to Japan? My visits to many US governmental agencies failed, however. Later, the reason became clear. The connection of the ARPANET to England was actually through Norway via satellite and from Norway to England via undersea cable. The reason for the connection of the ARPANET through Norway was to detect the seismic wave of underground testing explosion of nuclear bombs in Soviet Union. Later I learned that because Japan is an island it could not detect seismic waves from Soviet Union, so Japanese governmental agency had to connect to ARPANET through a router in Seoul, Korea.

1.3 Extension of Telenet to Japan:

As soon as the Telenet, a commercial version of ARPANET, was opened in the summer of 1976, I visited their office, offering my assistance to extend their data telecommunication network to overseas countries, particularly to Japan. The nature of telecommunications business made it natural to expand globally.

In a sense, I pioneered the "closing digital divide" with substantial time, effort and private fund as extending U.S. data telecom networks to Asian countries, particularly to Japan, and deregulating Japanese telecom policies for the use of email. This triggered the de-monopolization and privatization of Japanese telecom industries. This movement has later been emulated in many other countries, as having more than 1.3 billion email users around the world nowadays. American and other countries' university courses now reach many developing countries.

This extension effort met with much opposition from the U.S. firms who previously encountered difficulties in extending their time-sharing computer services to Japan. My petition to the US Federal Communications Commission (FCC) for extension of Telenet to Japan was to demonstrate to Japanese how networking could increase intellectual capital, decrease the cost of communications, and increase overall efficiency. It would also reveal to Japanese society and businesses how ridiculous and un-empowering Japanese telecommunications policies were. The FCC finally allowed the extension of Telenet to Japan, as a demonstration of the urgency with which the FCC's determination considered my petition and contention seriously. The extended network of Telenet provided Japanese institutions with services of many U.S. data bank companies, compared to the exclusive time-sharing services that were previously available only from the host computers of opposing firms. Consequently, the extension of Telenet to Japan was an instant success.

1.4 First Global Peace Gaming in Normative (Qualitative) Mode:

After attending the 1972 SCSC in San Diego, California, I visited Professor Bob Noel of the Political Science Department of the University of California in Santa Barbara. I saw a conference room with a wall-size world map, and an American flag standing by. It was like a situation room of a governmental agency.

The adjacent room was a control room with a short-wave radio that could receive world news instantaneously. The wall adjacent to the conference room had a glass window from which they could videotape the activities of the conference.

Professor Noel was conducting a political gaming on international affairs using ARPANET. He assigned several different schools to act as the governments of the United States, Soviet Union, Japan, China, etc. Students had to study about the assigned countries before the start of the game.

I inquired about the actor for Japan, and was told that it was the University of Southern California. I remarked that: "However hard Americans may study about Japan, they cannot think as Japanese, since they eat steak with knife and fork while Japanese eat noodles with chopsticks." So I proposed that Professor Noel invite the University of Tokyo to play the role of the Japanese government. Thus was born the original idea of Globally Collaborative Peace Gaming. This was to align with the Iron Rule #1 of simulation, i.e., "Make simulation close to SIMULAND as much as possible."

In the spring of 1973, I conducted the world-first global "Peace Gaming" with Professor Noel with the use of e-mail over computer networks. I invited the University of Tokyo, and he invited the University of Brussels, and the University of London in addition to several universities in the U.S. It was a "normative" gaming based on exchanging diplomatic e-mail messages without the use of quantitative computer simulation models. American universities sent their messages through ARPANET and overseas universities through GEISCO (a GE's time-sharing service firm).

Students acted as the heads of states and cabinet members of assigned countries. All messages were accumulated and re-distributed by a node at the University of California in Santa Barbara. The scenario designed by Professor Noel assumed an international crisis with a border incident between Iran and Iraq – which actually happened about half dozen years later. The Japanese team sent their messages to the United Nations team, asking to make the Straits of Malacca an international zone to secure oil flow from the Middle East to Japan. They also asked the U.S. and Soviet Union teams to withdraw their naval fleets from the Pacific and Indian Oceans, respectively. Professor Jonathan Wilkenfeld of the University of Maryland was a graduate student under Professor Noel at that time. He then continued this normative exercise into his International Communication of Negotiation with Simulation (ICONS) at the University of Maryland <http://www.icons.umd.edu/>.

1.5 De-regulation of Japanese Telecommunications Policies for the Use of E-mail:

Unfortunately, this exciting global gaming had to be terminated upon instructions from KDD (Kokusai Denshin Denwa, the Japanese overseas telecommunications authority). I then found fine prints in the KDD's user manual on the Telenet's extension line, prohibiting the use of e-mail. This was due to the Japanese telecommunications regulations, which strictly prohibited message exchange through a computer without changing its contents. However, a node in Santa Barbara, California, performed the message exchange, which was clearly outside of the Japanese jurisdiction. I thought this was absurd.

> Beforehand of this incidence, I asked Professor Jack Pugh of Massachusetts Institute of Technology (M.I.T.) to install his DYNAMO simulation language for System Dynamic simulation modeling into GE's GEISCO so that I could use it from Tokyo through a time-sharing terminal. After the KDD's instruction mentioned above, I received a message from GEISCO/Tokyo office requesting information how to use the DYNAMO in GEISCO. The message was sent from a fellow in Oslo, Norway, who worked on the "Limit to the Growth" project (Meadows, 1972) at the M.I.T.. Recalling the KDD's instruction, I asked them why such message exchange was possible. Their reply was because the message was sent from GEISCO/Oslo office to GEISCO/Tokyo office, i.e., within the same company. I therefore thought that this was patently unfair.

This KDD's prohibition of email negated my previous effort of extending Telenet to Japan, since e-mail would be the most convenient means of communication among game players. So, I chose to work through

the U.S. government on the de-regulation of the Japanese telecommunications policy for the use of e-mail. The late Commerce Secretary, Malcolm Baldridge, kindly took this issue as one of three items for discussion as Japan's "Non-tariff Barriers" when he visited Tokyo in October 1981 (Chunichi-Shimbun, Oct. 31 1981). This was the beginning of fierce US/Japan trade (including automobile) battles in the following years.

My efforts, however, encountered severe opposition from the Japanese Ministry of Post and Telecommunications (MPT), and of course KDD, which was the semi-governmental monopoly at that time. This was due to the difficulty of "mind-change" from circuit-switching technology for analog telephony to packet-switching technology for digital data communications. Another reason was that almost 60% of KDD's revenue was from Telex, which worldwide networks were just about completed with huge investments around that time. Lo and behold, their financial status dropped into "red" a decade after I succeeded with the de-regulation effort! In a sense, I acted as the so-called "Creative Destruction," a famous word by Joseph Schumpeter. (Incidentally, ITT, RCA Globcom, Western Union, etc., large US telex companies also disappeared after proliferation of email, even though I was the one who suggested Telenet to utilize their worldwide telex network in 1976.)

My effort also triggered the privatization of Japanese telecommunications industries and de-monopolization of the Nippon Telegraph and Telephone (NTT), the world's largest corporation, and KDD. (Thanks to these privatization and de-monopolization, Japan now has the world most advanced broadband Internet. Incidentally, Japanese Ministry for Posts and Telecommunications (MPT) was the most formidable bureaucratic bastion at that time.) I would say that the greatest beneficiaries of my de-regulation efforts were large Japanese trade firms. This was because the firms till then had to have their own leased Telex lines all over the world with millions and millions of dollars in payments to KDD. All of them ceased the use of Telex in favor of e-mail, thus saving huge amounts of money.

After successful conduct of the global gaming with Professor Noel, I tried to solicit the participation of Japanese government officers for my second round. I visited an officer at the Japanese Economic Planning Agency, who was sent from the Japanese Ministry of Finance (MOF), the most powerful ministry, and who was a graduate from the Political Science Department of the University of Tokyo. I explained to him that the gaming players would act as echelons of governments, according to scenarios for the perspectives of policy analysis, training on negotiation techniques, etc. He replied, saying: "Are you suggesting that we, as Japanese government officers, act as KABUKI Players?" I learned how difficult to trigger a "mind-change," but I believe that tenacious persistence and patience will prevail and are the key ingredients of success.

In July, 1991, I attended the 22nd International Conference of the International Simulation and Gaming Association (ISAGA) in Kyoto, Japan (Utsumi, 1991), which was organized by the Political Science Department of Ritsumeikan University. I was surprised to learn that they were still using the World Game originated by Buckminster Fuller, which spreaded a large world map in a gymnastic hall, and let students standing on the assigned countries and shouting each other to convey diplomatic messages. I suggested them to use email as Professor Noel pioneered with the University of Tokyo almost two decades before as mentioned above. Incidentally, one of professors there wondered why the results of their World Gaming often completely contradicted each other even though the initial conditions of the games were set equal, which indicated serious flaw of "normative" gaming compared with "quantitative" gaming, as a scientific methodology.

> See more in Chapter 1: "Personal Recollections on the Inceptions of Peace Gaming and Global University System" in a book draft "Electronic Global University System and Services."

1.6 Idea of Distributed Computer Simulation System:

The well-publicized book, *The Limit to the Growth* (Meadows, 1972) (which was the outgrowth of the book *World Dynamics* by Prof. Jay W. Forrester of Massachusetts Institute of Technology (M.I.T.) and my professor) indicated interactions of population, industrialization, agriculture, resources, and pollution on a

global scale. Some said that the publication of this book triggered the first oil shock in the early 1970s and changed the world economy.

On the other hand, the book received severe criticisms that appeared in many journals and newspapers. The main contention was on the credibility of the data they used, i.e., how a group of only a few scientists could claim that they knew everything of the world. I thought at the time, why not take the motto of the Greyhound Bus Company, "*Leave the Driving to Us*." 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. Thus was born the idea of a distributed computer simulation system through a data telecommunication network similar to an analog computer configuration, as corresponding to each of sub-models to components of the analog computer, which would be processed in parallel fashion.

1.7 System Dynamics Methodology:

Incidentally, after contributing to the early development of digital computers and inventing magnetic-core memory, Prof. Jay W. Forrester pioneered "system dynamics," a computer simulation methodology for understanding complexity that extends far beyond servomechanisms and Cybernetics theory. He applied quantitative, system analysis and computer simulation technology to complex socio-economic, bio- and eco-systems to evaluate how alternative policies affect growth, stability, fluctuation, and changing behavior.

The system dynamics' cause-and-effect analysis (Figure 3) based on feedback theory, along with computer simulation modeling, is the best tool to understand the inter-relatedness and inter-dependency of various complex world phenomena.

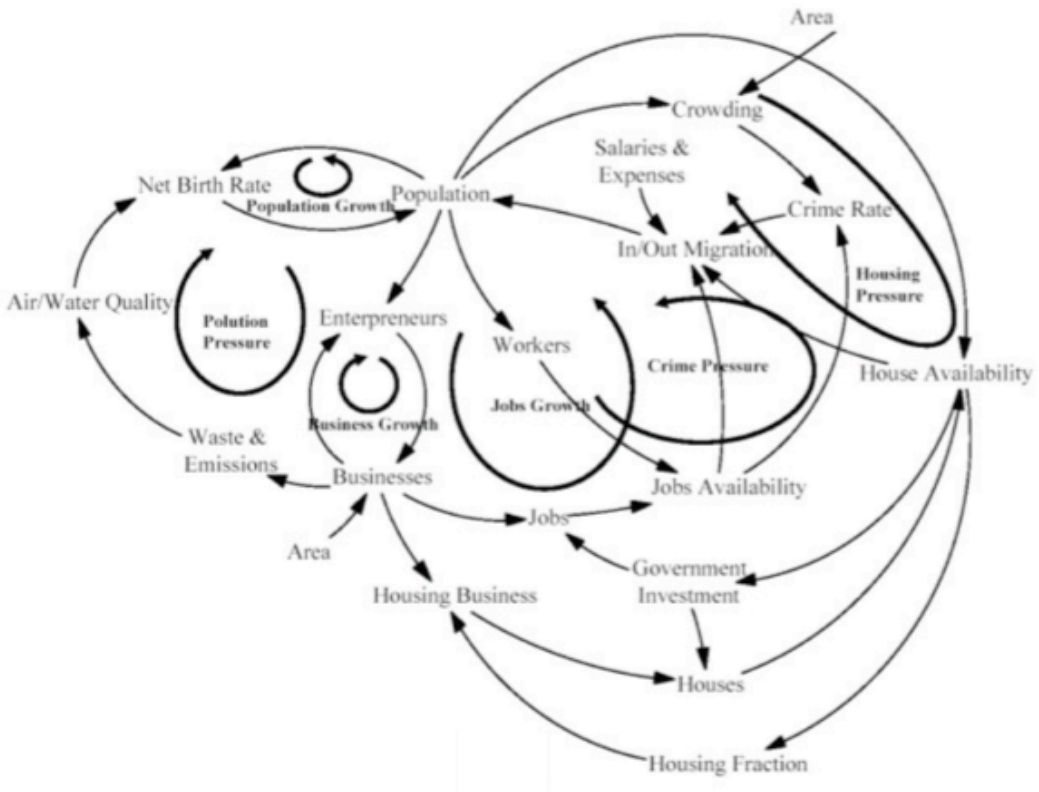

Figure 3: Example of cause-and-effect diagram "Population Growth in City Development" (Barlas, Y., System Dynamics: Systemic Feedback Modeling for Policy Analysis)

Under Forrester's leadership (Forrester, 1996), pioneering schools are creating a new kind of pre-college education, starting in kindergarten that is built on a system dynamics foundation. Such education becomes inter-disciplinary with the same computer simulation concepts applied to the environment, biology, history, literature, and economics. We can expect future leaders with expanded abilities for crisis management, policy-making, and negotiation skills for corporate, national, and global issues. The resulting deeper understanding of social and economic complexity, arising from this new kind of education, will enhance mutual understanding among people of different countries and cultures, and facilitate world peace and a sustainable development of humankind in the 21st century.

1.8 Demonstration of Global Peace Gaming in Quantitative Mode:

Later, I conducted a demonstration of global-scale peace gaming at the conference on "Crisis Management and Conflict Resolution" that was organized by the World Future Society (WFS) in New York City, in July of 1986. It was one of the largest and perhaps the most successful demonstration of global gaming/simulation so far. The event was a global gaming simulation session on a crisis scenario involving the U.S.-Japan trade, and economic issues. Nearly 1,500 people took part in New York, Tokyo, Honolulu, and at the World's Fair in Vancouver, B.C. An officer of the United Nations wrote a game scenario, and Prof. Akira Onishi of Soka University in Tokyo supplied FUGI Global Modeling System, which is the world largest econometric model (Onishi, 2003).

Noted U.S. economists (Prof. Lester C. Thurow of M.I.T., Provost William Nordhaus of Yale University, Mr. Keith Johnson of Townsend and Greenspan Company) were panelists of this event and electronically interconnected with Japanese counterparts for three days of computer-assisted negotiations. Several hypothetical policies were examined. One issue raised by President Emeritus of American Arbitration Association was the effect of raising military expenditures in Japan to the American level while lowering those of the U.S. to the present Japanese level. Simulation that ran overnight predicted that the balance of trade would thus be even by the year 2000, with necessity of cooperation, rather than competition, by both countries in the future. This clearly indicated the cost and dilemma of American's nuclear umbrella protecting Japan's economic prosperity, thus threatening American's economic prosperity (Nikkei, Shimbun (1986, Aug. 8), in Japanese).

This event, combined with the use of inexpensive delivery systems, afforded an opportunity to contemplate how academic departments might become linked across national boundaries for the purpose of joint study, research and planetary problem-solving without expending high cost for satellite video. After this successful sessions, several former high ranking officers of the U.S. and Japanese governmental agencies expressed strong interest in a similar multi-media teleconferencing on a more regular basis to establish an early warning system for both countries' ever-closely interwoven, interdependent economic and trade relationships. System analysis for systemic change at the global level is a precondition for any significant resolution to today's global-scale problems.

1.9 "Global Lecture Hall (GLH)" Videoconferencing:

Since the initial success of our global peace gaming on the US/Japan trade issues in 1986 mentioned above, I realized the necessity of accompanying graphics, diagrams, images and audio/video in addition to text-only e-mail communications via data telecom networks, particularly for e-learning courses of engineering and for continuing medical education (CME). However, around that time and up to the early 1990s when advanced data compression technology enabled inexpensive videoconferencing and World Wide Web via Internet, graphics could only be transmitted with the combined use of fax via Plain Old Telephone Service (POTS) and analog satellite, both of which were expensive, particularly, for overseas connections.

Since mid 1980s, I made another major contribution towards fostering global dialogue and creating learning environments with the innovative distance teaching trials. These were a series of "Global Lecture Hall (GLH) ™" multipoint-to-multipoint multimedia interactive videoconferencing, using affordable hybrid delivery technologies. They were conducted, once or twice every year for over a dozen years, as promoting

global e-learning and e-healthcare/telemedicine, including demonstrations of telemedicine from Finland and Amazon to the US. Some of them utilized 11 channels on 9 transponders, all at free of charge, as connecting many universities in many countries around the world, from Korea and New Zealand to Finland, Ukraine, Russia, Poland, Italy, Turkey and Brazil, etc.

> See more in Chapter 2: "Global Lecture Hall (GLH)" in a book draft "Electronic Global University System and Services."

1.10 Lord Perry Award for the Excellence in Distance Education:

Thanks to these efforts and also for initiating the movement of global e-learning since early 1980s, I received the prestigious Lord Perry Award for the Excellence in Distance Education in the fall of 1994 from Lord Perry, the founder of the U.K. Open University. The two-year senior recipient of the same award was Sir Arthur C. Clark, the inventor of satellite.

1.11 Three Components Necessary for Global Peace Gaming:

Envisioning a significant future on the use of information and communication technologies (ICTs) in educational and healthcare fields, I established the GLObal Systems Analysis and Simulation Association in the U.S.A. (GLOSAS/USA) in October of 1988 in the State of New York. It is a publicly supported, non-profit, educational service organization – in fact, a consortium of organizations – that is dedicated to the use of evolving ICTs to further advance world peace through global communications. GLOSAS fosters science- and technology-based economic development to improve the quality of life. The ultimate goal of GLOSAS/USA is to establish Globally Collaborative Environmental Peace Gaming (GCEPG). To achieve this goal, we need the following three components;

1.11.1 Data telecommunication infrastructure:

As described above, GLOSAS helped to initiate the extension of packetswitching data telecommunication networks from the US to various overseas countries, particularly to Japan, albeit it was narrow-band, almost three decades ago. As the second round, we are now forging ahead to construct Global Broadband Internet (GBI) (Figure 4) along with the establishment of Global University System (GUS) around the world – see below.

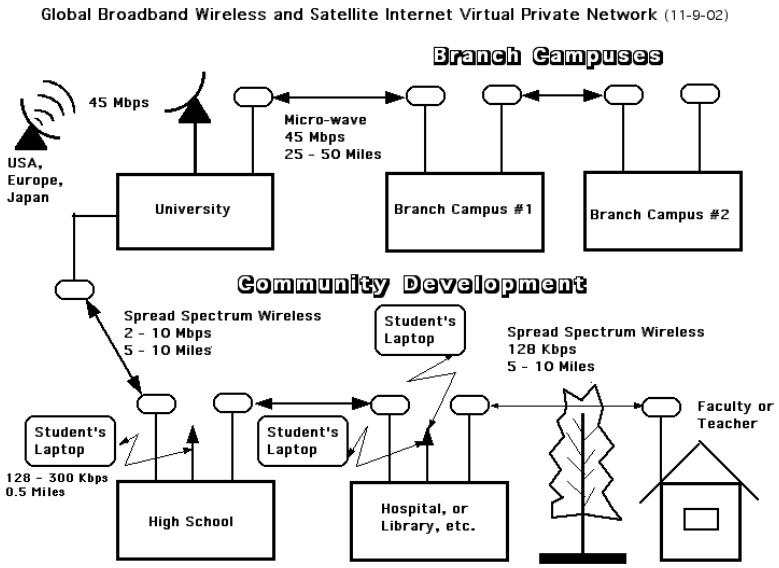

Figure 4

1.11.2 Communication media:

For collaboration among game players, it is necessary to have convenient communication media on a global scale. As described above, in spite of fierce opposition from the Japanese government and commercial carriers, we pressed for the de-regulations of the Japanese telecommunications policies for the use of e-mail, albeit it was only text-oriented message exchange at that time. After many demonstrations and testing of various videoconferencing technologies during GLHs, we are now forging ahead to implement multimedia through GBI — even in wireless mode.

1.11.3 Game players:

Packet-switching technology (Baran, no date) facilitates the sharing of telecom media, bringing drastic cost reduction. Grid technology (see below) makes people collaborate even in global scale. We are extending these principles to sharing and collaborating on the creation of new information and knowledge in e-learning and e-healthcare fields, by creating a Global University System (GUS).

GUS member institutions will have globally distributed and yet interconnected inexpensive mini-supercomputers through Global Broadband Internet (GBI) to form massively parallel processing possible as if a single supercomputer in global scale. This is, in a sense, to construct an advanced global neural computer network of a global brain for the proposed Globally Collaborative Environmental Peace Gaming (GCEPG) project with globally distributed computer simulation mode – see below.

This will also become a core of a global knowledge forum for the exchange of ideas, information, knowledge and joint research and development, such as 3D animation of human body, DNA, high polymer, pharmacological molecule analysis, joint engineering design, etc., which may lead to the creation of Globally Collaborative Innovation Network (Utsumi, 2006).

We hope that GUS member institutions (which are also members of GUS/UNESCO/UNITWIN Chair Program) will provide experts who will construct their databases and simulation models of their own fields and regions, and game players who will utilize the GCEPG for their study and analysis of environmental policies (Figure 5).

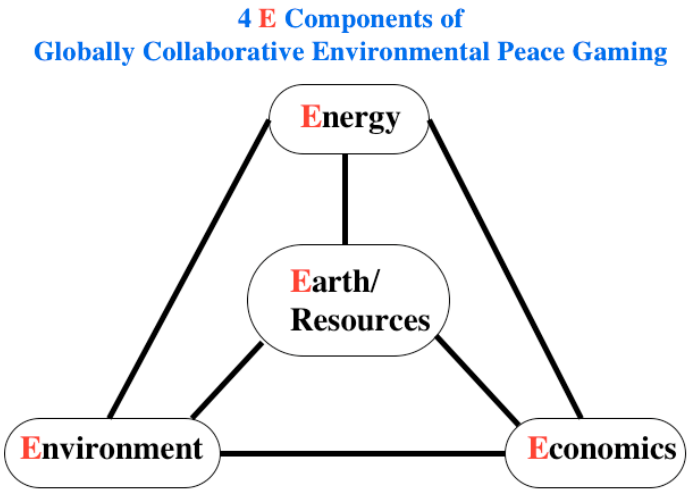

Figure 5

Along with the establishment of GUS with the GBI, we will forge ahead to disseminate Systems Dynamics methodology in order to realize this GCEPG through a Global Neural Computer Network – particularly, we would hope, with the participation of 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. After all, they would be the decision-makers around the year 2050s when they would encounter with sever, fierce conflicts on various environmental issues. For this, we expect to work with the ICONS of the University of Maryland mentioned above.

2 Global University System (GUS) Project:

The Global University System (GUS) aims to build a higher level of humanity with mutual understanding across national and cultural boundaries for global peace. The GUS is a worldwide initiative to create advanced telecom infrastructure around the world for global e-learning and e-healthcare/telemedicine. GUS aims to create a worldwide consortium of educational and healthcare institutions to provide all world citizens with special emphasis on the underdeveloped countries with access to 21st Century education and healthcare via broadband Internet. The philosophy of GUS is based on the belief that global peace and prosperity would only be sustainable through education. Education and job skills are the keys in determining a nation's wealth and influence. The aim is to achieve "education and healthcare for all," anywhere, anytime and at any pace. A GUS education thus will promote world prosperity, justice, and peace, based on moral principles rather than political or ideological doctrines.

The GUS helps higher educational and healthcare institutions in remote/rural areas of developing countries to deploy broadband Internet in order to close the digital divide. Learners may take courses from different member universities around the world, obtaining their degree from the GUS, thus freeing them from being confined to one academic culture of a single university or country. GUS will serve as an educational broker for universities, thus helping them gain international influence and access to students that they would otherwise not reach. The GUS program is a comprehensive and holistic approach to building smart communities in developing countries for e-learning and e-healthcare/telemedicine. Currently, institutions with faculty members who are participating in GUS development projects are numerous in various countries.

These institutions also act as the knowledge center of their community for the eradication of poverty and isolation through the use of advanced ICTs (Figure 6). Those institutions affiliated with GUS become members of the GUS/UNESCO/UNITWIN Networking Chair Program at the University of Tampere, Finland. We envision interlinking those members through broadband Private Virtual Network to conduct mega-videoconferences as well as related research project.

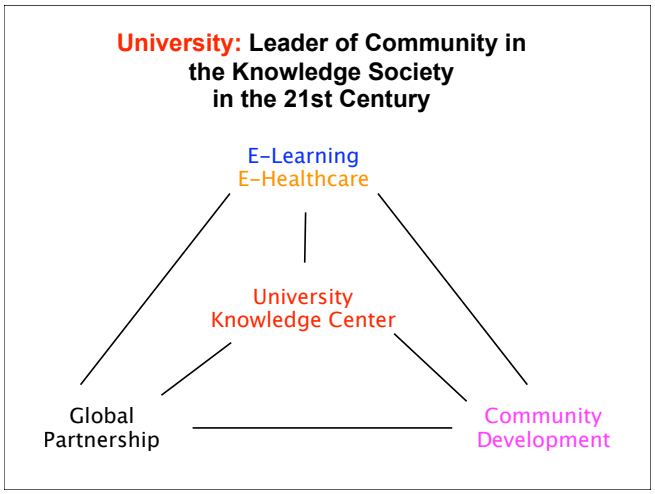

Figure 6

See more on GUS in the Sections IV and V of <http://tinyurl.com/b475v>, (Utsumi et al, 2003) and (Varis, et al, 2003).

3 Globally Collaborative Environmental Peace Gaming (GCEPG) Project:

<http://tinyurl.com/k2c7a>

3.1 Need:

In ancient time, priest or shaman assisted the decision-makings of kings or rulers in Inca, Egypt, India, China, Mesopotamia, etc., as predicting future with the "celestial movements" — which led to the astonishing achievements of mathematical development even for today's astronomers. Future leaders of global village need to have the capability of understanding the "computer simulation" of socio-economic-environmental system, since it will assist them (hopefully, even at local level) with rational analysis and critical thinking basing on "facts and figures" -- rather than with political "illusions." Trustworthy climate forecasts 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. Many voices now call for stronger institutions of global decision-making mechanism.

There is therefore a clear need to help limited understanding of the underlying causes and impacts of climate change 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, Globally Collaborative Environmental Peace Gaming (GCEPG) Project would be the best way to cope with the enormous planetary problems jointly by the people around the world.

This is the tenet of our GCEPG project (which was initiated by GLOSAS/USA in early 1970s, as mentioned above) with a globally distributed computer gaming/simulation system. This is to help decision makers construct a globally distributed decision-support system for positive sum/win-win alternatives to conflict and war, particularly focusing on the issues of environment and sustainable development in developing countries.

The idea involves interconnecting experts in many countries via the 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 — particularly with the use of cause-and-effect diagram of system dynamics methodology for clear understanding of interrelatedness among various international phenomena. Gaming/simulation is the best tool we have for understanding the world's confrontation prone problems and the solutions we propose for them. The understanding gained with scientific and rational analysis and critical thinking would be the basis of world peace, and hence ought to provide the basic principle of global education for peace.

With global GRID computer networking technology (which concept I initiated – see McLeod, 2000) and Beowulf mini-super computers of cluster computing technology, we plan to firstly develop a socio-economic-environmental simulation system and then a climate simulation system in parallel fashion, both of which are to be interconnected through broadband Internet in global scale.

3.2 Global Peace Gaming for Oil Crisis:

At the International Conference on Computer Communication (ICCC) held at Hilton Hotel in Washington, DC, in October 1972, I proposed a global peace gaming to cope with the oil crisis in early 1970s in response to Meadows' "Limit to the Growth" mentioned above. An outline of the hierarchical structure and distributed components of an integrated, interactive peace gaming/simulation system for energy, economics, and foreign trade in the USA and the Japanese sides was depicted in Figure 7 (Utsumi, 1974a). Each block in the figure represented dissimilar computers in those countries interconnected through data telecom network (e.g., Internet nowadays). These computers included simulation models designated in each block. All models would be executed in concertedly via satellite and terrestrial telecommunication

links. For example, suppose pollution in Japan exceeded a certain allowable level, say, around 1977 on Figure 8 (Utsumi, 1974b), the Japanese expert watching it on the display unit would stop the entire simulation. All participants, wherever they were located, would then try to find, with the use of the conferencing system, a consensus on a new set of pseudo-alternative policy parameters which would be executed until a new crisis appears, say, around 1984 on the figure. The process would be repeated for rational policy analysis, based on facts and figures, and with international cooperation of experts in both countries.

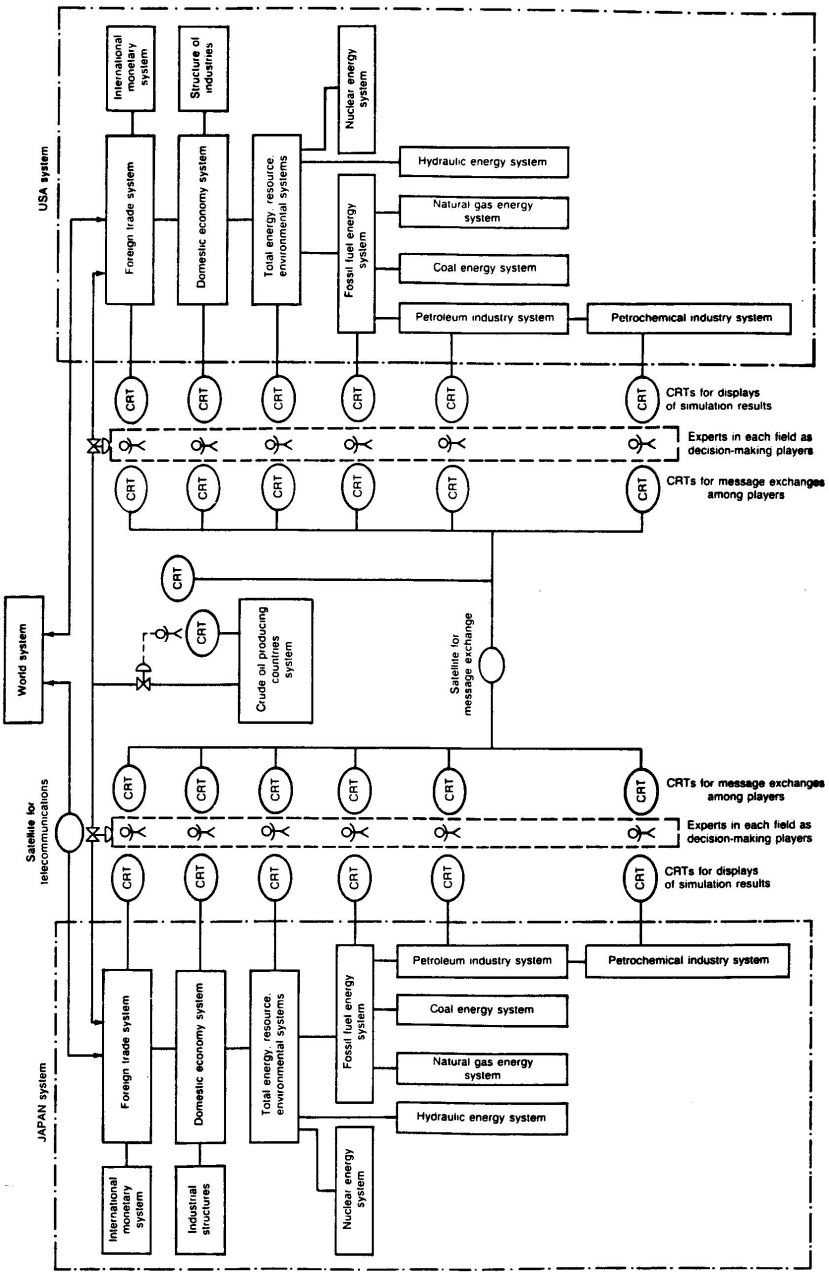

Figure 7: Structure of Integrated Models and Communication Network
Boxes are dispersed, dissimilar computers around the global Internet.

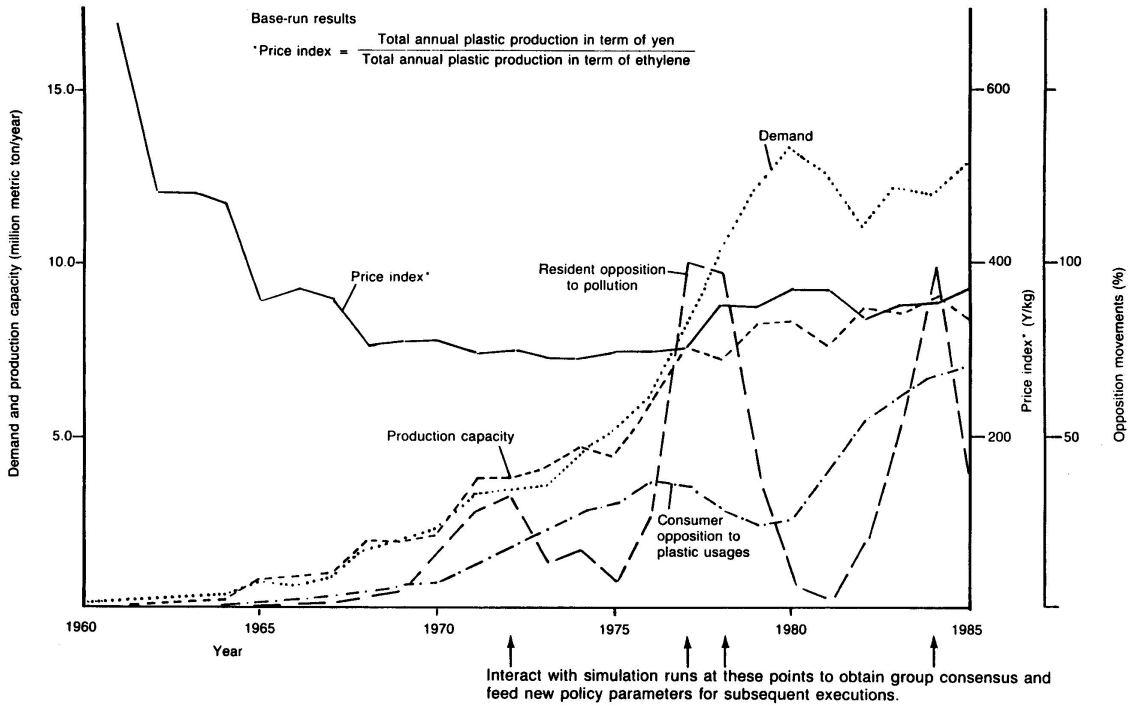

Figure 8: Growth of Japanese Petrochemical Industry

3.3 Use of Global Gaming with Open Modeling Network:

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.

It is now possible to combine existing technologies to make sophisticated and more holistic explorations of various scenarios for solving global social problems. Many small computers in different countries can be interconnected, through globally distributed network and information processing, into modeling and simulation instruments for playing peace games on the scale of Pentagon war games (McLeod, 1987).

In early 1970s, 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) and interactive gaming simulation. 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 modeling 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 Modeling 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 GLObal Systems Analysis and Simulation (GLOSAS) 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***.

After making those comprehensive project proposals (Utsumi and DeVita, 1982 and Utsumi, et al, 1986), I embarked on the systematic testing and successful demonstrations of various hybrid telecom infrastructures by way of the "Global Lecture Hall (GLH)." GLH consists of multipoint-to-multipoint, interactive multimedia videoconferencing almost every year spanning around the globe, as mentioned above. The following are descriptions of necessary components and recent developments, which may be integrated into further achievement of the GCEPG Project.

3.4 Computer Simulation Models:

3.4.1 Socio-Economic Models:

Since I created Summer Computer Simulation Conference (SCSC) in Denver, CO in 1970, myriad of simulation models in almost every facets of our globe appeared. However, the four categories depicted in Figure 5 above are to be the major ones to be dealt with by our GCEPG project.

There are also three major methodologies (Figure 9) of socio-economic modelings; (1) econometric modeling (initiated by Professor Lawrence R. Klein of University of Pennsylvania and an economic Nobel Laureate), (2) input-output modeling (initiated by Professor Wassily Leontief of New York University, an economic Nobel Laureate and a panelist of our Nagoya/Japan GLH videoconferencing on environmental issues from New York), and (3) system dynamics modeling (initiated by Professor Jay W. Forrester of M.I.T.).

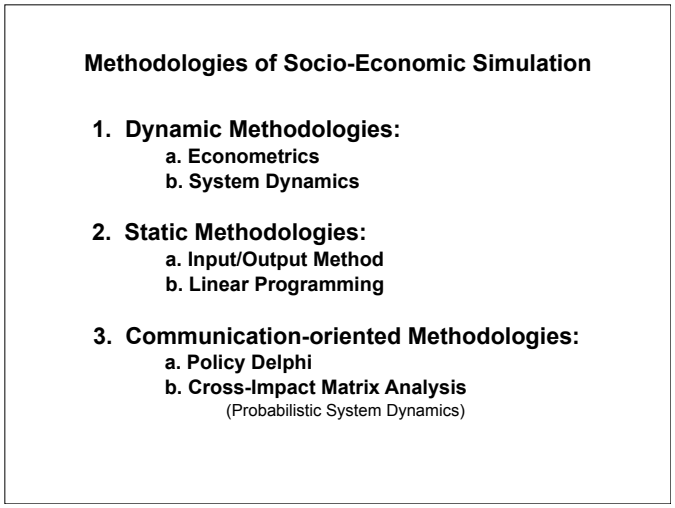

Figure 9

Prof. Onishi compiled about 20 socio-economic models of various kinds in his new book "UNESCO EOLSS (Encyclopedia of Life Support System) Theme 1.47: Integrated Global Models for Sustainable Development," (Onishi, 2003).

Prof. Onishi has already indicated his strong willingness to cooperate with this GCEPG project as providing his Futures of Global Interdependence (FUGI) model. When we conducted a US/Japan foreign trade peace gaming in 1986, we used it as a single simulation model residing in a supercomputer in Tokyo and we asked him to execute his simulation model with the alternative policy parameters according to the progress of our gaming scenario, as mentioned above.

However, this time, his FUGI's sub-models will be split and be dispersed to the countries where the sub-models belong. We will arrange GUS' in various countries, which are members of our GUS/UNESCO/UNITWIN NETWORKING Chair Program, to host the sub-models of their countries – along with construction and maintenance of its databases, revision and modification of their sub-models, and supply of game players in cooperation with their overseas counterparts through the global neural computer network.

Prof. Forrester (Forrester, 1996) has also indicated to me that his System Dynamics Group already constructed a US national model, which may be used in conjunction with FUGI model. The Millennium Institute in Arlington, VA also has national models of Bangladesh, China, Ghana, Guyana, Italy, Malawi, Somaliland, Tunisia, and the United States. As soon as we establish our GUS in these countries, we may ask their cooperation to tie together those national models. Dr. G. O. Barney, the founder of the institute, once presented their work from his office in Virginia near Washington, DC, during our "Global Lecture Hall (GLH)" videoconference held in Florianopolis, Brazil in the summer of 1996.

3.4.2 Climate Simulation Model:

Earth Simulator built by NEC at US$350 million can simulate environment of the entire earth with the use of real-life climate data from satellites and ocean buoys. Japanese scientists have already completed a forecast of global ocean temperatures for the next 50 years, and a full set of climate predictions was ready by the end of 2002. "Soon, instead of speculating about the possible environmental impact of, say, the Kyoto accord, policymakers will be able to plug its parameters into the virtual Earth, then skip ahead 1,000 years to get a handle on what effect those policies might have. That kind of concrete data could revolutionize environmental science. By digitally cloning the Earth, we might just be able to save it." (TIME.com, "Best Inventions, 2002")

Albeit the world acclaim on its speed, however, because of its price and size (four tennis courts), we cannot expect to mass-produce this simulator in the near future to install in every participating countries of our GCEPG project. Luckily, as taking the principle of "Leave the Driving to Us," the motto of the Greyhound Bus Company mentioned above, the distributed computer simulation with the network of the clusters of inexpensive personal computers is now on the horizon, as I have continued to advocate since the fall of 1972.

3.5 Beowulf Mini Supercomputer with Cluster Computing:

In contrast to the single supercomputer as the Earth Simulator, the current and future trend of high performance computing is to build a cluster of personal computers with inexpensive off-the-shelf (or even second-hand, used) PCs. The parallel processing of this cluster system divides a complex problem into smaller component tasks, as similar to distributed computer simulation system mentioned above. This scheme of PC cluster is now called the Beowulf mini supercomputer.

> Beowulf was the name of a lean, mean hero of medieval legend who defeated the giant monster Grendel by ripping off one of the creature's arms. This name has been widely adopted to refer to any low-cost cluster constructed from commercially available personal computers (Hargrove, et al, 2001).
>
> Incidentally, David Miller, founder of Denelco in Denver, CO was the general chairman and I was the program chairman of the Summer Computer Simulation Conference (SCSC) in Denver in 1970. I then was the general chairman of the SCSC in Boston in 1971. In the spring of 1973, there was a simulation conference in Tokyo, and David and I discussed about the future of computer.
>
> He chose to construct the Heterogeneous Element Processor (HEP) with 50 Central Processing Units (CPUs) of PDP/11 mini-computer in a single box, which was the first commercially available parallel processing supercomputer in early 1970s. Prior to this, he consulted me of his venture. My response was why not distribute those CPUs around the world and connect them with global data telecom network, e.g., DARPANet (Department of Defense/Advanced Research Project Agency Network), which was the predecessor of Internet. My suggestion (which is a similar one to global grid computing network of nowadays – see below) (McLeod, 2000) was based on my experiences with analog and hybrid computers over a dozen years by then, i.e., as making analogy between computing elements of analog computer with CPUs of digital computer, and of wiring on the former to telecom network.
>
> Incidentally, I had a privilege of exclusively using then the world largest hybrid computer (made by Bechman Instrument Co., **) for a half year, which was later used for the simulation of the first lunar landing by Eagle at the Massachusetts Institute of Technology in late 1960s. Both the hybrid computer and HEP were designed by Dr. Maxwell Gilliland. Almost two decades ago, I had introduced HEP to NEC, which then produced the Earth Simulator mentioned above.
>
> (**) two analog computers with 500 amplifiers for each with Xerox's Sigma real time computer with 32 K words memory. This machine was priced at US$ 1.5 million for NASA, but NASA did not have such money at that time so that it was sitting at Beckman's research lab in Richmond, California. It was later moved to the Lincoln Lab of the Massachusetts Institute of Technology and used to simulate the EAGLE lunar landing by Armstrong. I used it as if for my exclusive use for almost a half year to simulate the chemical reaction to extract oil from shale rocks, which reserve in Rocky Mountain is almost same as the one of Saudi Arabia. This was a major project of Mobil Oil at that time — alas, this project was not materialized because it was very difficult compared with the tar sand project in Canada.

This cluster concept promises to revolutionize the computing field by offering tremendous processing power to any research group, school or business. This is, in a sense, a poor-man's approach since the cluster can often be built with less than $50,000, which is about one tenth the price of a comparable commercial supercomputer. Compared with the exorbitant price of Earth Simulator at $350 million, those commodity clusters – networked arrays of standard computing subsystems – are perceived as the only economically viable pathway: they require little additional development in spite of the programming difficulties and communications delays inherent in using clustered systems.

The Beowulf concept (PC-Cluster) is an empowering force. It wrests high-level computing away from the privileged few and makes low-cost parallel-processing systems available to those with modest resources. Research groups, high schools, colleges or small businesses can build or buy their own Beowulf clusters, realizing the promise of a supercomputer in every basement (Hargrove, et al, 2001).

> Hiroshima University in Japan has 500 PCs which are used with Microsoft Window operating system by students in day-time, and which are converted to Linux operating system to connect all of them to be a clustered supercomputer in night time. The Japanese Ministry of Education once announced a plan to connect PCs in K-12 schools in week-ends to form a supercomputer for local researchers and scientists. POWUA in Milan, Italy provides supercomputing power readily to ordinary people, e.g., scientists, academicians, students, etc., even with some philanthropic intention of providing them with 20% of capacity at free of charge for educational, healthcare and humanitarian purposes.

As interconnecting those Beowulf mini supercomputers around the world via Global Broadband Internet (GBI) (see Figure 10 below), researchers of GUS can conduct joint research across continents and oceans as tapping into a "computational grid" that will work like a power grid: users will be able to obtain processing power just as easily as they now get electricity. This is the next future of Internet development.

3.6 Grid Computing Network:

Rapid improvements in communications technologies (e.g., broadband Internet) are leading many to consider more decentralized approaches to the problem of computing power. Internet computing seeks to create powerful distributed computing systems with global reach and supercomputer capabilities for communities to share resources as they tackle common goals. Science today is increasingly collaborative and multidisciplinary, and it is not unusual for teams to span institutions, states, countries and continents. E-mail and the web provide basic mechanisms that allow such groups to work together. But what if they could link their data, computers, sensors and other resources into a single virtual laboratory? So-called Grid technologies seek to make this possible, by providing the protocols, services and software development kits needed to enable flexible, controlled resource sharing on a large scale (Foster, I., 2000).

Grid technology takes Cluster Computing to the next level by providing a distributed architecture that delivers computational and data resources over the Web in much the same way that electricity is delivered over the power grid – making resources available to users when and where they are needed. The vision of scientific computing in the future relies on computational grids – powerful processors, research instruments, and huge data archives linked by fast networks and advanced software. These grids will be as easy to use as the Web and as convenient as turning on your kitchen faucet to get water.

Grid computing refers to computing in a distributed networked environment in which computing and data resources are located throughout the network. Grid infrastructure provides basic infrastructure for computations that integrate geographically disparate resources, create a universal source of computing power that supports dramatically new classes of applications. Globus, Infospheres and DARPA CoABS are efforts, which are now underway to build computational grids (Cybenko, G., et al, 1999).

Grid Computing is one of the fastest-growing trends in high-end scientific and engineering computing, which builds on the result of previous and ongoing research in networking, distributed computing, seamless

computing, meta computing, web technologies, and other related topics. Like the Web, it has grown from an education and government R&D concept into a major component in any company's strategy (Sun.com, no date). The grid is an emerging infrastructure that will fundamentally change the way we think about and use computing. Grid computation is foreseen to be one of the most critical yet challenging technologies to meet the exponentially growing demands for high-performance computing in a large variety of scientific disciplines. Especially the universal connectivity provided through the Internet gives hope that the vision depicted by a Grid Computing can become reality in day-to-day production outside a closed research community – see POWUA mentioned above.

Designed to support and address the needs of multiple sites and organizations, Global Grid Computing Network provides the power of distributed resources to users anywhere in the world for computing and collaboration. Individuals or organizations can use them, as sending overflow work to a grid provider. Or, multiple parties can work together as sharing data, crossing their boundaries with ease. Grid computing is computation, collaboration and communication over the advanced web. It's a model for problem solving, through resource pooling in virtual systems (Gentzsch, W., no date).

> The principle of Internet is "sharing," and the one of Grid is "collaboration." The sharing and collaboration are the basis of global peace. We are promoting those principles along with GCEPG and GUS projects.

3.7 Global Grid Computing Network for GCEPG Project:

We face a basic dilemma on the conduct of GCEPG Project. John McLeod, the founder of the Society for Computer Simulation (which I named) once said that the successful simulation requires the simulation model to be very close to its "*simuland*" (a term coined by McLeod), which is the object for which the model is to simulate. Namely, decision-makers must be concerned with the issues and matters of their constituents within the boundaries of regions, countries, municipalities, and counties for which they are elected and have their jurisdictions. 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. For example, dust storm from Sahara often causes trouble to Amazon rain forest or coral in the Caribbean sea; the other dust storm from Gobi desert causes respiratory disease in Korea and Japan and even reaching Denver, CO or Australia; or forestry and fishery in Scandinavia are dying due to acid rain caused by industrial smoke from European countries, etc. 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 modeling 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 mini supercomputers in parallel fashion and both networks to be interlinked at appropriate locations (red lines in Figure 10). 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 two-tier system will not only ensure comprehensive system for each by their experts, but also assure close mingling and dialogue between climatologists and sociologists and economists for solving our global environmental problems, which are often social confrontation-prone. It is strange that even though climatologists claim that it is undisputable fact that the global warming is caused by human activities, yet they do not talk with sociologists and economists (Leeuw, 2007) (*). This two-tier system will remedy this problem, and be a perfect democratic participatory of global simulation. This will then eliminate the need of such a giant Earth Simulator mentioned above.

(*) A climatologist exclaimed "Don't believe the forecast made by economist!!" at the "State of the Planet 08" conference in March, 2008, which was sponsored by the Earth Institute of Columbia University and The Economist of the U.K..

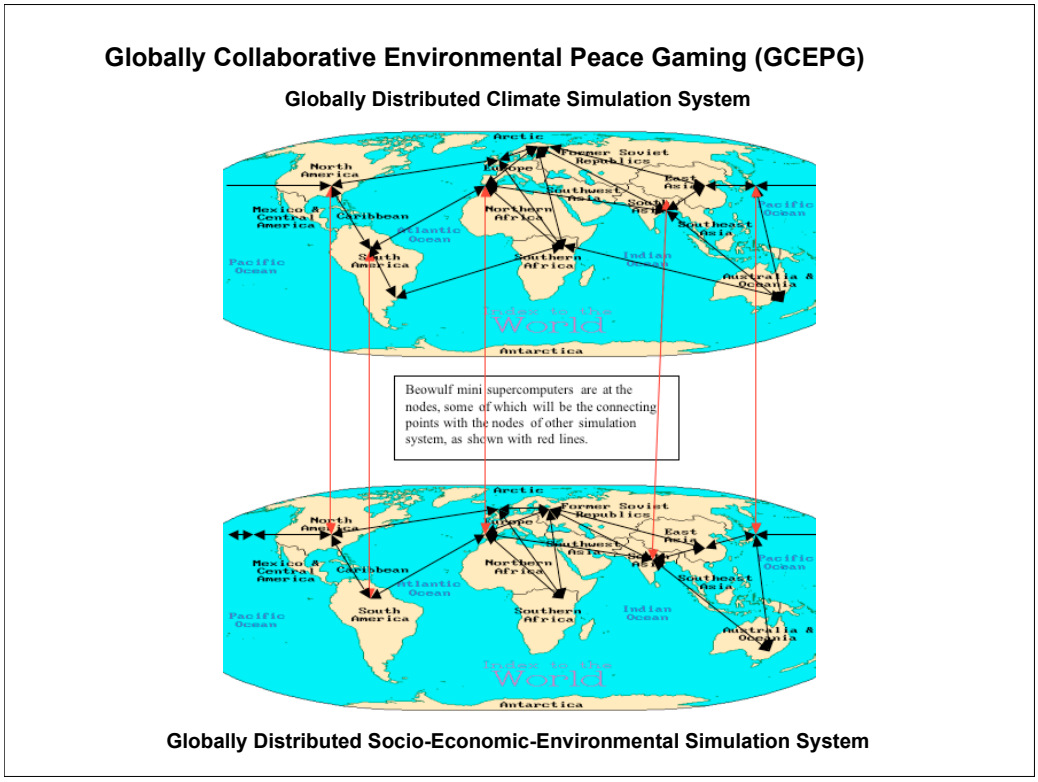

Figure 10: Globally Collaborative Environmental Peace Gaming Networks

This is a way that I also envisioned almost three decades ago (McLeod, 2000), i.e., a global neural computer network (which was mentioned above) with the use of globally distributed computer simulation system for globally distributed decision support system. 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 on various subjects, e.g., micro-biology, meteorology, chemical molecular study, DNA analysis, medicine/bioscience, 3D human anatomy, agriculture, commerce and finance, nanotechnology, advanced engineering, 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.

3.8 Access Grid Project:

During the execution of the proposed GCEPG, it would be essential to have close human contacts among model builders, game players, and technical support groups, not only by asynchronous computer conferencing but also by audio/video conferencing. This need is the same for any other joint global scale research and development projects mentioned above. Subsequently, as soon as we establish GUS around

the world and connect them with Global Broadband Internet (GBI), we will associate with the Access Grid Project.

The Access Grid (AG) is the ensemble of resources that can be used to support human interaction across the grid. It consists of multimedia display, presentation and interactive environments, interfaces to grid middleware, and interfaces to visualization environments. The Access Grid will support large-scale distributed meetings, collaborative work sessions, seminars, lectures, tutorials and training. The Access Grid design point is group-to-group communication (thus differentiating it from desktop to desktop based tools that focus on individual communication).

> During our "Global Lecture Hall (GLH)" videoconference at the University of Tennessee in Knoxville in July, 1994, a professor at the US Naval Postgraduate School in Monterey, CA demonstrated multicasting videoconferencing via broadband Internet with a 3D ocean current model of El Nino in the South Pacific, which was broadcast throughout the world, including Japan, an international conference on e-learning in Moscow, etc. During our international workshop/conference on "Emerging Global Electronic Distance Learning (EGEDL/'99)" at the University of Tampere in Finland in August of 1999, we demonstrated NetMeeting point-to-point videoconferencing via broadband Internet with an inexpensive desktop camera. Both demonstrations produced superb audio/video quality, indicated the vital necessity of having broadband Internet.

The Access Grid environment must enable both formal and informal group interactions. Large-format displays integrated with intelligent or active meeting rooms are a central feature of the Access Grid nodes. Access Grid nodes are "designed spaces" that explicitly contain the high-end audio and visual technology needed to provide a high-quality compelling user experience.

The Access Grid complements the computational grid; indeed, the Access Grid node concept is specifically targeted at providing "group" access to the Grid. This access may be for remote visualization or interactive applications, or for utilizing the high-bandwidth environment for virtual meetings and events.

Access Grid Nodes provide a research environment for the development of distributed data and visualization corridors and for the study of issues relating to collaborative work in distributed environments.

3.9 Global Socio-Economic-Energy-Environment Development (GSEEED) Project:

<http://tinyurl.com/337nrn>

The GSEEED Project is a variation of and the initiation of the GCEPG. The quantitative policy analysis, assessment and recommendation of globally collaborative GSEEED Project will focus on the sustainable development in Japan, the US, China, Russia, Kazakhstan, and many other relevant countries.

The initial focus on energy security will be on the global interrelations and interdependencies among those countries with the deployment of a gas pipeline from Tomsk, Siberia to China, and the construction of hydroelectric dam in the Republic of Altai, Siberia where there are five UNESCO World Heritage sites which draw increasing number of tourists (400,000) into a small town of Gorno-Altaisk with only 9,000 residents. This gas pipeline will certainly affect socio-economic developments of Siberia, China, and hence the ones of Japan, the US, Europe and others. Japan will also increasingly depend on the energy (oil and gas) supply from Russia and uranium from Kazakhstan.

Another issue will be on the energy development in Niger Delta Region of Nigeria which is the largest crude oil producing area in Africa, and 40% of which oil is exported to North America, hence, the vital national interest to the United State of America, too.

This GSEEED Project will then demonstrate integrated and synergistic approach among grassroots, government, university, stakeholder, etc. Use of graphic information modeling/mapping and potential "peace gaming" on key issues and solutions will assist each group's ability for standardized data gathering

and situational analyses, projecting out possible outcomes for more informed decision making and activities. It brings together most sophisticated university-based mathematical modeling techniques and experts and regular people who can then more easily see—at a glance--how issues and outcomes can impact and interact each other.

This project will train local experts, civil servants and public administrators for leadership development, in relation to strategic use of technologies and cooperation among stakeholders for more effective advocacy, informed policy, public understanding and participation and concrete community development.

We will then create the Globally Collaborative Network for Conflict Prevention, Management and Resolution (GCN/CPMR) on Environmental Issues in various countries for conducting the following two-tier system as utilizing our GCEPG/GSEEED project approach;

a. One for training young would-be decision makers for understanding interwoven world phenomena with rational analysis and critical thinking, and then in crisis management, conflict resolution, and negotiation techniques basing on "facts and figures" and
b. The other for helping decision makers constructing a globally distributed decision-support system for positive sum/win-win alternatives to conflict and war.

We plan to work on this GCN/CPMR in cooperation with;

1. Polytechnic Institute of New York University,
2. Millennium Institute,
3. Center for International Earth Science Information (CIESIN) of the Earth Institute of Columbia University,
4. ICONS of the University of Maryland, etc.

See additional potential participants in ANNEX I of <http://tinyurl.com/6fb8bb>.

This may go along with the intention of the Millennium Institute to be one of the United Nations University/Research and Training Programs

3.10 Globally Collaborative Innovation Network (GCIN):

The essence of education is the inheritance of wisdom (i.e., know-how on how to live a life), more than mere transfer of knowledge. We hope that, as an extension of our GCEPG/GSEEED projects, learners will also form a global knowledge forum for the exchange of ideas, information, knowledge and joint research and development, which will foster collective creativity of youngsters around the world. Researchers in developing countries can co-work with colleagues in advanced countries to perform joint collaborative research with use of virtual laboratories for hands-on experiential/constructive learning and creation of knowledge through the global GRID technology, thus forming Globally Collaborative Innovation Network (GCIN) (Utsumi, 2006). Such interactions among youngsters around the world through global broadband Internet would certainly promote mutual understanding and hence global peace.

4 Conclusions:

GUS and GCEPG are clearly ambitious programs due to its scope and nature. Any one group, university, or national government cannot achieve it. As mentioned above, every step we have taken since its inception three decades ago was in the right direction. For example, we initiated and/or helped on;

(1) creation of Summer Computer Simulation Conference (SCSC), most advanced and authoritative conference in computer simulation field, -- which I named,
(2) creation of “Advanced Computer Simulation Language (ACSL),” most widely used continuous system simulation language, -- which I named,
(3) “closing digital divide” as introducing Telenet (a predecessor of Internet) to Japan, etc.,

(4) deregulation of Japanese telecom policies on the use of e-mail,
(5) de-monopolization and privatization of telecom industries in Japan,
(6) end of life-time employment system in Japan, which was triggered with the proliferated use of e-mail,
(7) global neural (or grid) computer network,
(8) "Global Lecture Hall (GLH)" videoconferencing,
(9) use of voice over Internet Protocol (VoIP),
(10) use of wireless broadband Internet,
(11) global e-learning movement,
(12) Global University System project,
(13) pledges of Japanese government's ODA fund (US$15 billion at Okinawa Summit in July, 2000) which triggered the global movement on the closing of digital divide, etc.

We can expect further numerous spin-off benefits in various fields in global e-learning and e-healthcare. The program will however need substantial collaborative contribution of ideas, expertise, technology resources, and funds from multiple sources. We invite those who value the visions of Global University System (GUS) and Globally Collaborative Environmental Peace Gaming (GCEPG) Projects to join in this great and noble enterprise, and urgently necessary project for human survival.

The proposed global peace gaming system can become an educational tool for the students of international affairs and political science. Moreover, such a system can also become the fundamental foundation for our Global University System with students and faculty members of various countries, which will promote mutual understanding among people of the world. Education of youngsters/adults on a global scale is the ***best*** future investment for global peace and progress. Senator Fulbright once said that *learning together and working together are the first steps toward world peace*.

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.

References: (Retrieved on September 7, 2008)

"Access Grid Project"
http://www-fp.mcs.anl.gov/fl/accessgrid/default.htm

Baran, P., (no date), "Origin of Packet-switching Technology," Section X-1 of
http://tinyurl.com/b475v

Cybenko, G., Jiang, G. and Bilar, D., (1999), "Machine Learning Applications in Grid Computing," Dartmouth College, September 22,
http://agent.cs.dartmouth.edu/research/Allerton/sld001.htm

"Electronic Global University System and Services"
http://tinyurl.com/27ykrf

"Emerging Global Electronic Distance Learning (EGEDL/'99)"
http://www.uta.fi/~titava/EGEDL/

Forrester, J. W. (no date), "Systems Dynamics methodology"
http://tinyurl.com/2svgts

Forrester, J. W. (1996), "System Dynamics and K-12 Teachers," May 30,
http://sysdyn.clexchange.org/people/jay-forrester.html

Foster, I. (2000), "Internet Computing and the Emerging Grid," Nature: web matters, 7 December.
http://www.nature.com/nature/webmatters/grid/grid.html

Gentzsch, W. (no date), "Grid Technology: Interview," sun.com.
http://wwws.sun.com/software/grid/interview.html

"Global Lecture Hall (GLH)"
http://tinyurl.com/6r8c63

"Globus"
http://www.globus.org/

Hargrove, W. W., Hoffman, F. M., and Sterling, T. (2001). "The Do-It-Yourself Supercomputer," Scientific American, August, pp. 72-79
http://tinyurl.com/453b2b (Copy this URL to browser.)

"High Performance Computing"
http://www.sun.com/servers/hpc/index.jsp

Jefferson, D. and Motro, A. (1984), "The Time Warp Mechanism for Database Concurrency Control," Technical Report TR-84-302, January, Los Angeles: University of Southern California.

Leeuw, Sander van der (2007), "Including Humans in (Earth System) Modelling," News Letter of International Geosphere-Biosphere Programme (IGBP), May, No. 69
http://tinyurl.com/2ncsch

McLeod, J. (1987). "TAK is TICKING," Simulation, December, pp 273-4

McLeod, J. (2000). "Power (?) Grid!" Simulation, September, pp 178-179.
http://tinyurl.com/22bl7v

Meadows, Donella H., et al (1972), "The Limits to the Growth," New York: Universe Books

"Millennium Institute"
http://www.millenniuminstitute.net/

Onishi, A. (2003). UNESCO EOLSS (Encyclopedia of Life Support System) Theme 1.47: Integrated Global Models for Sustainable Development. Oxford, U.K.: EOLSS Publisher.

"POWUA: The Super Internet Computer"
http://tinyurl.com/3fl5k4

Schram S, Marks H, Behrens W, Levin G, and McLeod J, et al. (1971), "Macro-system simulation," Panel Discussion Session at the 1971 Summer Computer Simulation Conference (SCSC), 1972 SCSC Proceedings, pp 1491-1502, Society for Computer Simulation

Sterling, T., (2001), “How to Build a Hyper Computer,” Scientific American, July, Pages 38-45
http://tinyurl.com/3g4ehe (Copy this URL to browser.)

TIME.com, “Best Inventions, 2002”
http://www.time.com/time/2002/inventions/rob_earth.html

Utsumi, T., (no date), "Electronic Global University System and Services"
http://tinyurl.com/27ykrf

Utsumi, T., (1974a), “Joint US/JAPAN project on global systems analysis and simulation (GLOSAS) of energy, resources and environment (ERE) systems.” Proceedings of the Conference on Energy Modelling and Forecasting. Berkeley, California, 28-29 June 1974; pp 121-144

Utsumi, T. (1974b), “Japan petrochemical industry model for the GLOSAS Project,” Proceedings of 1974 SCSC, pp 318-325, Society for Computer Simulation

Utsumi, T. (1977), “Peace game,” Simulation, November, pp. 135

Utsumi, T. and DeVita, J. (1982), “GLOSAS Project (GLObal Systems Analysis and Simulation),” In S. Schoemaker (Editor), Computer Networks and Simulation II (pp. 279-326), Amsterdam: North-Holland Publishing Company
http://tinyurl.com/32gfu6

Utsumi, T., Mikes, P. O., Rossman, P. (1986), “Peace Games with Open Modeling Network,” In S. Schoemaker (Editor), Computer Network and Simulation III, pp. 267-298, Amsterdam: Elsevier Science Publisher B.V., (North-Holland).
http://tinyurl.com/ywjjgu

Utsumi, T. and Arturo Garzon (1991), “Global University for Global Peace Gaming,” Proceedings of the 22nd International Conference of the International Simulation and Gaming Association (ISAGA), Kyoto, Japan, 15-19 July, pp 112-120

Utsumi, T., Varis, T., and Klemm, W. R., Editors (2003), “Creating Global University System,” Global Peace Through The Global University System. Tampere, Finland: University of Tampere Press, June.
http://tinyurl.com/38c4d7

Utsumi, T. (2006), “Globally Collaborative Innovation Network with Global University System," *Learning Technology*, IEEE Computer Society, Vol. 8, Issue 3, July

Varis, T., Utsumi, T. and Klemm, W. R. (Eds.) (2003), “*Global Peace Through The Global University System*,” University of Tampere, Finland, ISBN 951-44-5695-5
The entire contents of this book can be retrieved at;
http://tinyurl.com/kofpf

Author Biographical Sketch

Takeshi Utsumi, Ph.D., P.E.
Founder and Vice President for Technology & Coordination
Global University System (GUS)
Chairman, GLObal Systems Analysis and Simulation Association in the U.S.A. (GLOSAS/USA)
43-23 Colden Street
Flushing, NY 11355-3998 U.S.A.
Tel: +1-718-939-0928
Fax: +1-718-939-0656
utsumi@columbia.edu
http://www.friends-partners.org/GLOSAS/

Takeshi Utsumi, Ph.D., P.E., is Chairman of GLObal Systems Analysis and Simulation Association in the USA (GLOSAS/USA) and Vice President for Technology and Coordination of the Global University System (GUS). He is the 1994 Laureate of the Lord Perry Award for Excellence in Distance Education. His public services have included political work for deregulation of global telecommunications and the use of e-mail through ARPANET, Telenet and Internet; helping extend American university courses to developing countries; the conduct of innovative distance teaching trials with "Global Lecture Hall" multipoint-to-multipoint multimedia interactive videoconferences using hybrid technologies; as well as lectures, consultation, and research in process control, management science, systems science and engineering at the University of Michigan, the University of Pennsylvania, M.I.T. and many other universities, governmental agencies, and large firms in Japan and other countries. Among more than 200 related scientific papers and books are presentations to the Summer Computer Simulation Conferences (which he created) and the Society for Computer Simulation International (both of which he named). He is a member of various scientific and professional groups, including the Chemists Club (New York, NY); Columbia University Seminar on Computer, Man and Society (New York, NY); Fulbright Association (Washington, D.C.); International Center for Integrative Studies (ICIS) (New York, NY). Dr. Utsumi received his Ph.D. Ch.E. from Polytechnic Institute of New York University, M.S.Ch.E. from Montana State University, after study at the University of Nebraska on a Fulbright scholarship. His professional experiences in simulation and optimization of petrochemical and refinery processes were at Mitsubishi Research Institute, Tokyo; Stone & Webster Engineering Corp., Boston; Mobil Oil Corporation and Shell Chemical Company, New York; and Asahi Chemical Industries, Inc., Tokyo.