Reliability Society

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C O N T E N T S

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Dave Franklin
Associate Editor:
Dr. Robert J. Loomis, Jr.

President's Message

RS Goes International Again

In response to an invitation from the Tokyo Chapter, the Reliability Society AdCom held its October AdCom meeting in Kyoto, Japan. The AdCom meeting was part of a program that also included a special lecture at Kyoto University and a reliability workshop at Tokyo Metropolitan Institute of Technology. This was the second AdCom meeting held outside the U.S. and, like last year's Zurich AdCom meeting, it was a complete success. Other articles in this newsletter will provide more information about the program.

Those of you who have participated in multinational projects know the complexity that is associated with arranging international meetings. Special credit is given to Prof. Suichi Fukuda, chair of the Tokyo Chapter, and Prof. Koichi Inoue, past chair of the Tokyo Chapter, for converting that complexity into a highly stimulating and successful series of events. Briefly, Prof. Fukuda and Prof. Inoue: many thanks!

In the meeting, the Tokyo chapter provided a special report on its activities. It was extremely gratifying to hear how the chapter increased its activity level since January 1997. Even more encouraging was the increased interest by chapter members in participating in Reliability Society activities and management.

Meetings such as our 1998 Zurich meeting and our 1999 Kyoto meeting go a long way in supporting the IEEE globalization initiative. Through its AdCom and its technical committees, the Reliability Society truly is an international society. Its membership spans several continents and has a spectrum of reliability interests. To all of our members, regardless of the country in which you reside: participate actively and enjoy the diversity and camaraderie of the society.

Ken
Reliability Society President
Kenneth P. LaSala, Ph.D.
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Editor's Column

A Truly International Visit

By Dennis R. Hoffman

Our visit to Japan was truly international. Our hosts, the leaders of Japan's IEEE Reliability Society and of the Tokyo RS Chapter, met and dined with the AdCom in Kyoto and in Tokyo. At our Seminar in Tokyo held at the Tokyo Metropolitan Institute of Technology, we met and spoke with Japanese students and foreign exchange students from Germany, Sweden, Macedonia, and Yugoslavia. While trying to figure out how to use the automated machines to get a token for the subway, a young man from Australia came to my rescue. When trying to determine the right direction to take from the subway station to our hotel, I was helped by three young men on vacation from Toulouse, France. While admiring the huge trees near the Nikko Toshogu Shrine and commenting about the trees to Ken LaSala, a voice out of the blue said, "You must be from Texas." I turned to see a Japanese man. I said yes that I was from Texas, but how did he know. He said, "Your voice." He works

Continued on page 24

Reliability Society Newsletter Inputs

All RS newsletter inputs should be sent to:

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April	January 8
July	April 8
October	July 8

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Japan Chapter

Introducing the officers of the Japan Chapter

(The chapter changed its name from Tokyo Chapter to Japan Chapter recently)

Shuichi Fukuda (Chair)

Shuichi Fukuda received his bachelor's, master's and doctor's degree in mechanical engineering from the University of Tokyo in 1967, 1969 and 1972 respectively. He was with Department of Precision Machinery, University of Tokyo from 1972 to 1976. He moved to Osaka University, Welding Research Institute in 1976 and from 1978 to 1991, he was an associate professor there. From 1989 to 1991, he was concurrently an associate professor at University of Tokyo, Institute of Industrial Science. From 1991, he has been professor at Tokyo Metropolitan Institute of Technology, Department of Production, Information and Systems Engineering. He was a visiting scholar at EES, Stanford University in 1994, visiting professors at CERC, West Virginia University in 1996, at SLL, Stanford University and at JWRI, Osaka University in 1998. He has been and is very active either as chair or as board member for many committees related to reliability problems in design, manufacturing and inspection which lies in between electrical and mechanical sectors. He also teaches Fuzzy Theory and Knowledge Engineering at Department of Electrical Engineering, Nihon University.

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Yoshinobu Sato is the chair of the PhD course in system safety, Tokyo University of Mercantile Marine. He received his BS and MS in Mechanical Engineering from Waseda University and his Doctorate in systems engineering from Kyoto University. His main interests are reliability, system safety and risk analysis.

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Toshiyuki Inagaki (Secretary)

Toshiyuki Inagaki received his BS, MS, and Doctor's degrees in systems engineering from Kyoto University in 1974, 1976, and 1979, respectively. From 1979 to 1980 he was a Research Associate at the University of Houston. Since 1980 he has been with the University of Tsukuba, where he is a Professor at the Institute of Information Sciences. From 1990 to 1991 he was at the University of Kassel as a Research Fellow of the Alexander von Humboldt Foundation. Since

1996, he has been a director of an international research project on human-centered automation for system safety at the Center for TARA (Tsukuba Advanced Research Alliance), University of Tsukuba. His research interests include dynamic function allocation between human and machine and its effect on system reliability and safety, human trust in and distrust of automated warning systems, mathematical and experimental evaluation of human interface, modeling of situation awareness, reasoning and decision making under imperfect or possibly unreliable information. He has been a Senior Member of IEEE since 1988.

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Tohru Tsujide (Treasurer)

Tohru Tsujide received Master and Doctor of Engineering from Nagoya University in1968 and 1977, respectively. He has been working for NEC. He is now a general manager of Device Analysis Technology Laboratories where he manages development of the failure analysis and diagnosis, testing and manufacturing technologies of LSI, LCD and PDP. He was a Vice Chairman of Reliability Engineering Association of Japan. He is now committee member of IEEE-jointly-sponsored conferences such as IPFA (Singapore) an ASMC(USA) and other conferences. He received Ishikawa Prize and the outstanding paper award from Union Japanese Scientist and Engineering Association of Japan in 1991 and 1995. He also received Remarkable Patent Prize from the Chief Secretary the Science Technology Agency in 1996.

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Shuichi Nitta (AdCom Member, Senior Past Chair)

Shuichi Nitta earned BSEE from Kyoto University and PhD from the University of Tokyo, in 1960 and 1978, respectively. After working for electric industry as a systems engineer and quality assurance director in the area of process computer control since 1960, he is currently a professor of Tokyo University of Agriculture & Technology. His research interests are EMC and Systems maintenabitility and safety.

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Koichi Inoue (AdCom Member, Jr. Past Chair)

Dr. Inoue received his B.S., M.S. and Ph.D. degrees all in Applied Mathematics and Physics from Kyoto University in 1963, 1965 and 1968, respectively. Since 1986, he has been Professor of Control and Systems Engineering in the Department of Aeronautics and Astronautics, Graduate School of Engineering, Kyoto University. From 1969 to 1986, he was an Associate Professor in the Department of Precision Mechanics, Kyoto University. From 1971 to 1973, he was with the Department of Chemical Engineering, University of Houston, Houston, TX. where he began working on systems reliability and safety. He has published more than 200 technical papers in renowned journals, among them he authored or co-authored more than 20 papers in the IEEE Transactions on Reliability since 1974. For many years, he served as a referee to the Transactions. He received Outstanding Paper Awards five times from the Society of Instrument and Control Engineers (3 times), the Institute of Systems, Control and Information Engineers and Japan Society for Safety Engineering, for his contributions in Control and Systems Engineering. From 1997 to 1998, he was a Chair of Tokyo Chapter, and presently he is a member of AdCom, IEEE Reliability Society. Dr. Inoue is also the President of Human Interface Society and is on the Board of Directors of Japan Society for Safety Engineering.

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A Challenge of Tokyo Chapter

Summary Report of Activities

(From January, 1997 to December, 1998)

Koichi Inoue, Jr. Past Chair and AdCom member
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When I took the responsibility of Chairmanship of Tokyo Chapter on January 1997, I thought I would do as my predecessors did. Up to that time, the only thing the Chairperson had to do was to have a general assembly meeting once a year and to approve events proposed by other groups as our cooperative events. That is, we did almost nothing as our host events. The reason for that is: (1) the budget allotted to the Chapter from the Tokyo Section was only \30,000 (equivalently $250) per year. Most of the money disappeared in the mail to announce a meeting to the members. (2) The situation being different in the US from in Japan, most of the IEEE members in Japan think that the IEEE is a US institution and it is not our own. For example, most of reliability engineers join the Reliability Engineering Association of Japan or other reliability related technical society such as the Institute of Electrical Engineers of Japan, or the Institute of Electronics, Information and Communication Engineers of Japan and so on. Only a small portion of them joins the IEEE Reliability Society, and, to be worse, their objective to join the Reliability Society is only to collect technical information in the US or to publish papers in the Transactions. I have authored more than twenty papers in the Transactions of the Reliability Society since 1974. Until recently this is the only way for me, or generally for us, members of Tokyo Chapter, to contribute to the Society. (3) The geographical distance and the language barrier are also very difficult problems to overcome.

Three most recent presidents enjoying a free morning of sightseeing. Golden pavilion in the background.

It was in April 1997, when I changed my mind from "do nothing" to "do as much as I can". At that time I was invited to participate the AdCom meeting at Adams Mark Hotel in Denver, Colorado and to take part in the Chapter Award Banquet to receive the one hundred dollar prize, where I noticed that the AdCom members discussed very eagerly and enthusiastically the various problems in the Society for better services to the members not only in the US but also in the world including Japan. I strongly felt that now is the time for us to contribute directly to the Society by other ways than to publish papers in the Transactions, for example, by interchanging people and information with each other. It is still difficult to come over to the US, but instead we can use electronic means such as e-mail, web and/or Internet to communicate with each other. Now the distance is no more major problem.

Soon after I returned to Japan, I formed an Executive Committee with 6 members in Tokyo Chapter, in which the members were K. Inoue, Chair, S. Fukuda, Vice-Chair, Y. Sato, Secretary, Y. Suzuki, Treasurer, S. Nitta, Jr. Past Chair and M. Horigome, Sr. Past Chair. We had an Executive Meeting in May, and established the following two Activity Goals and the six Action Items to achieve the goals.

The two Chapter activity goals were:

(1) To reform the Chapter for the purpose of making it more active and

(2) To make closer ties between the headquarters (AdCom) of the Society and the Tokyo Chapter.

To achieve the above goals, the following six action items (1) ~ (6) were set up. Usually action items are items to be done and not necessary assured to be done. To contrast the items to be done and what was actually done, what was done is written in italic in the following.

(1) To establish an E-mail network among members and the Chapter to reduce communication costs,

1. *An E-mail network was formed to cover over 90 members out of the total of 167 members.*

Top row- from left: Dennis Hoffman, Philip Tsung, Yoshinobu Sato, Bob Gauger, Koichi Inoue, Shuichi Nitta, Shuichi Fukuda, Tohru Tsujide, Takehisa Kohda, Bud Trapp
Bottom row- Yasuko Inoue, Dick Doyle, Loretta Arellano, Ken LaSala, Mariam Helm, Onolee Trapp

continued on page 6

Special Japan Section

continued from page 5

2. *A Fax-mail network was formed to cover those who did not have e-mail.*
3. *A mailing list was formed between the ExCom members.*

(2) To create our own Internet Web home page,

1. *Our own Web Site was created at the URL:*
   http://yang.kuaero.kyoto-u.ac.jp/index.html (in Japanese).
   http://yang.kuaero.kyoto-u.ac.jp/index_e.html (in English).
   Since then we have had more than 20 hundreds accesses in a year.
2. *Another Web Site was created in the Tokyo Section home page.*
   http://launcher.g-search.or.jp/ieeetokyo/r.htm (in Japanese)
   http://launcher.g-search.or.jp/ieeetokyo/r_e.htm (in English)

(3) To encourage possible volunteers and recommend them to take parts in various activities going on in the Society,

1. *Proposed to create a new TC on Reliability-related System Safety, and recommended Yoshinobu Sato as the Chairman of this proposed TC, this is accepted and now in preparation (see another document in this issue).*
2. *Recommended Takehisa Kohda as a member of TC on Human Performance Reliability, this is accepted.*
3. *Recommended Takehisa Kohda as an Associate Editor of the Transactions, this is accepted.*
4. *Koichi Inoue was nominated as an AdCom member by the nominating committee, he is elected.*

(4) To launch a new series of seminars directed to graduate students as well as college students by active use of the Society's Tutorial Video series,

A new series of Video Seminars have been created:
No. 1: "Developing Reliable Software in the Shortest Cycle Time"
Feb. 19, 1998, Kyoto University, 12 participants.
No. 2: "Developing Reliable Software in the Shortest Cycle Time"
Mar. 7, 1998, Tokyo Univ. of Mercantile Marine, 15 participants.
No. 3: "Designing Systems for Reliable Human Performance"
Sept. 11, 1998, Kyoto University, 17 participants.
No. 4: "Designing Systems for Reliable Human Performance"
Oct. 2, 1998, Tokyo Univ. of Mercantile Marine, 6 participants.

(5) To realize two Special Lectures, one in Tokyo and the other in Kyoto, inviting one of our Distinguished Lecturers of the Society,

A new series of Special Lectures inviting Society's Distinguished Lecturers or Officers has been created: (thanks to Tokyo Section's budgeting of \200,000 ($1,600) per year)
No. 1: "Reliability, Maintainability, Supportability and System Safety (RMSS)-
A Total Systems Approach" by Loretta Arellano.
Dec. 2, 1997, Tokyo Univ. of Mercantile Marine, 41 participants.
No. 2: "Reliability, Maintainability, Supportability and System Safety (RMSS)-
A Total Systems Approach" by Loretta Arellano.
Dec. 4, 1997, Kyoto University, 30 participants.
No. 3: "Thermal Analysis of Electronics" by Dick Doyle.
Oct. 20, 1998, Tokyo Univ. of Mercantile Marine, 34 participants.
No. 4: "Thermal Analysis of Electronics" by Dick Doyle.
Oct. 23, 1998, Kyoto University, 17 participants.
No. 5: "Human Performance Reliability" by Ken LaSala.
Oct. 1, 1999, Kyoto University, 15 participants.
No. 6: "Human Performance Reliability" by Ken LaSala.
Oct. 4, 1999, Tokyo Metropolitan Institute of Technology.

(6) To submit Tokyo Chapter Activity Reports and News to every issue of RS newsletter.

The Activity Report from Tokyo Chapter has been appeared in every issue of the Newsletter since July issue, 1997 except October issue, 1998, when the input was e-mailed to the editor but he lost it in the process of editing.

To organize and to operate the above mentioned activities or meetings, the ExCom members met more than 10 times in Tokyo in the two years. I would like to express my sincerest thanks to the members for their cooperation and devotion. At last, but not at least, I would like to express our heartiest thanks to the AdCom and its members for their very friendly supports towards us and towards Tokyo Chapter. Without their supports, we should have been sleeping until now and never wake up.

Human Interface Society

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After 15-year activities as a section of SICE (Society of Instrument and Control Engineers), Human Interface Society has started its own history since January 13, 1999. Between IEEE Reliability Society and our Society, I believe we have common interests, so I hope we will cooperate together and exchange ideas and information for the mutual benefit. Some facts of the Society are to follow:

- Founded: January 13, 1999
- Number of members: 913 including 105 student members. At the time of establishment, the numbers was 546, so we obtained 367 new members in 9 months. I believe the establishment of this new Society has been welcomed and supported by the academic and technical communities related to Human Computer Interaction, Man-Machine Systems, Human Performance and so on.
- Activities:

1. Publication of the Journal of Human Interface Society, 4 times in a year.
2. Publication of the Transactions of Human Interface Society, 4 times in a year.
3. Publication of the Proceedings of the Human Interface Symposium, once in a year.

Ken presenting Koichi Inoue and Shuichi Fukuda IEEE hats as a thank you for coordinating the Japan AdCom meeting and Workshop.

4. Publication of the Correspondences on Human Interface, 5 times in a year.
5. Publication of the Texts on Human Interface Tutorials, once in a year.
6. Publication of the International Journal of Human Computer Interaction together with the International Ergonomics Association and The Human Factors and Ergonomics Society.
7. Sponsoring the Human Interface Symposium, once in a year. On Oct. 4 ~ 6, 1999, we had the Symposium at Osaka University. The number of participants was 390, 166 papers were presented, and a Special Lecture "Universal Design and Human Interface" was given by Ms. Astuko Kamoshida. For the purpose of your understanding what subjects were discussed in the Symposium, I name a few examples of the session titles: Interface Design, Virtual Reality, Barrier Free Technology, Usability, Cognitive and Physiology, Sign Language, Design Support, User Behavior and Model, etc.
8. Sponsoring the Human Interface Meeting for Reading Papers, 5 times in a year.
9. Sponsoring the Human Interface Colloquium, several times in a year.
10. Sponsoring International Conferences. It was decided that the Society would sponsor the IFIP INTERACT 2001 Conference in Tokyo in the summer of 2001.
11. Other activities are discussed and will be developed in Technical Operations Committee.

- Scope of the Society: In the Founding Prospectus, it is said that, The 20th century is said as the century of the machine, and endlessly various machines were invented and were improved. While technically advanced systems were developed, automatic and business machines which make a general user the target came into wide use, and the importance of human-friendly machines which are easy to use and easy to understand has been widely recognized, and then the so-called human interface technology was given birth to. As the result, both young and old are coming to make use of automatic and business machines every day in both the workplace and home, and in both the work and play. The machines which people put on the body such as a pager and a cellular phone have been increasing, too. Acquaintance with the automatic and business machines spreads out all the more, and it is probably to become the thing that the people enjoy as a part of the life environment from the cradle to the graveyard, not as a tool and means to achieve the purposes. The machines included into a part of the human environment are asked to be not only convenient for the users but also comfortable to non-users, and also asked to be of cultural flavor and of spiritual latitude. It is the human interface that develops high-tech and high-touch machines and which fit the human. The 21st century should be the century of the human and the human interface is the key technology that makes it happen. The human interface is learning about the relations between the technology and the human, and it provides useful technology to produce machines but also it takes research from the user side. The Human Interface Society has decided to give important contribution in the development of the learning of the 21st century and the society through various activities.

"Research and Development of Lead-free Solder for Standardization"

by Shuichi Fukuda

This project was started on January 1999. The ministry of International Trade and Industry supports this project, and NEDO (New Energy Development Organization) entrusted the project to 2 organizations, JWES (Japan Welding Engineering Society) and JEIDA (Japan Electronic Industry Development Association). The objective of JEIDA is the feasibility study on specific solders. The purpose of JWES group is the basic study to clarify the characteristics of promising candidate alloys and their solder joints and the development of lead-free solders with improved characteristics. The reliability of solder joints are mainly at issue in this project. In both organizations the members from universities, electronic and electric companies, solder and flux companies are included. Both groups will make final reports until March 2000.

Committee on Reliability Engineering, Society of Material Science, Japan

The Committee on Reliability Engineering was constructed by 25 members in the Society of Materials Science, Japan(JSMS) in 1975. Professor Toshiro Yamada in Kyoto University had activated the construction of this new committee, and he was the first chairman. At the beginning, committee members were selected mainly from the limited area of the mechanical engineering according to such a background of JSMS. Thus application of the reliability engineering to the mechanical engineering was the typical target of the works in this committee. Professor Takao Nakagawa, Professor Akira Nishimura and Professor Hiroshi Ishikawa had played important roles in the development of the reliability engineering in Japan as the chairmen of the

continued on page 8

Special Japan Section

continued from page 7

committee consecutively. I have been working as the fifth chairman since December 3, in 1997.

In my opinion, the history and activity of this committee can be divided into three phases. Phase I was the first decade where the areas of committee members and works were both concentrated to the mechanical engineering. The most typical work in Phase I was publications of a Databook on Fatigue Strength of Metallic Materials which was accomplished by cooperation with the Committee on Fatigue in JSMS. Full contents of this databook was also compiled as machine-readable database and this project had activated the new trend in data supplying system for the materials property in Japan.

Phase II was the second decade where the number of committee members were remarkably expanded by welcoming new researchers and engineers in the field of civil engineering. Among many projects in the second phase, I can pointed out the most important work of gDevelopment of Practical Reliability Design of Bridge Structures h organized by Professor Hiroshi Ishikawa and sponsored by Hanshin Express Way Public Corporation. This was a typical example of the successful joint project among industries, universities and academic societies in Japan.

I trust that the present stage of the committee is the beginning of Phase III. The third phase should be a new era in which scientists and engineers in the area of electronics would be involved. Concept of the reliability engineering was originally developed in this area as every one knows. Fortunately a new committee on Semiconductor Electronics was constructed in JSMS last year. Thus new members in this field are expected to participate in the Committee on Reliability. These circumstances are very convenience to facilitate the activity of our committee on reliability engineering. In addition, I hope that the mutual communication between IEEE Reliability Society and the Committee on Reliability Engineering in JSMS is established to each other.

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The Japan Society of Non-Destructive Inspection

The Japan Society of Non-Destructive Inspection was formed in 1952 and has been actively pursuing reliability issues in NDI. Not only reliability issues in NDI equipment, but also those associated with human performance are studied because human aspects play a very important role in NDI sector. Details can be found at the web site

http://wwwsoc.nacsis.ac.jp/jsndi/index.html

FYI. http://wwwsoc.nacsis.ac.jp/ is an academic society home village and it links you to any academic society you would like to find in Japan.

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Reliability Engineering Association of Japan

Reliability Engineering Association of Japan (REAJ) was established in 1991, with Reliability Technology Association of Japan which was set up in 1978 as its founding body. The Honorary President is Prof.Noboru Takagi, Emeritus Professor of University of Tokyo, Dept. of EE. The President is Prof.Tohma of Tokyo Denki Daigaku (tohma@c.dendai.ac.jp) and one of the Vice President is Prof.Horigome of Tokyo University of Mercantile Marine (horigome@ipc.tosho-u.ac.jp) who was formerly chair of IEEE RS, Tokyo Chapter. And Shuichi Fukuda , present chair of IEEE RS, Japan Chapter is one of the board members. And the present Vice Chair Prof.Yoshinobu Satois heading a research committee as described later. Thus, REAJ has a close connection with IEEE RS, Japan Chapter.

The target area of REAJ is very broad, ranging from electronic hardwares, electronic packaging, optoeletronics devices,CAD, simulation, joining, adhesion, corrosion, system, softwares, etc. There are several research committes such as equipment reliability chaired by Mr.Takahara (77001796 CLARION@clarion.co.jp), dependability chaired by Mr.Komori which focuses on application issues relating to IEC 60300 seris, functional safety chaired by Prof.Yoshinobu Sato, VC for IEEE RS, Japan Chapter which focuses on issues relating to TEC 61508, parametric data chaired by Mr.Seki and Information System Reliability chaired by Prof.Mukaidono which focuses on hardwares and softwares of computers and network reliability and safety.

They hold General Meeting in May to select officers and special lectures are given at the meeting. And Reliability Symposium is held annually in autumn and there are many tours organized to visit research facilities and industries.

The secretariat of REAJ can be reached by e-mail at reaj@ca.mbn.or.jp or by fax at +81-3-5379-1393 and their website is

http://reaj.i-juse.or.jp/

It should be also mentioned REAJ has a strong tie with Technical Group on Reliability in The Institute of Electronics, Information and Communication Engineers. Information on IEICE can be found at the website http://www.ieice.or.jp/

Although REAJ does not cover such field as ITS, IEICE has Technical Group on ITS Technology or Technical Group on Safety, which would be of interest to IEEE RS members. REAJ also has a connection with LSI Testing Symposium. For information, contact LSITS@ise.eng.osaka-u.ac.jp or +81-6-6879-7812 by fax.

Other societies which is associated with REAJ include the Japan Society for Quality Control (http://jsqc.i-juse.or.jp/) JSQS is now trying to expand their activities and quality in education or in hospital and kansei engineering are their new areas. Another society is Environmental Testing Laboratory, Reliability Center for Electronic Components of Japan (http://www.rcj.or.jp) or they can be reached at rcj test@pop01.odn.ne.jp Quality Engineering Society is centered around the Taguchi Method and can be reached by fax at +81-3-3582-0698.

Shuichi Fukuda

"Recently Published Safety Standard of IEC 61508"

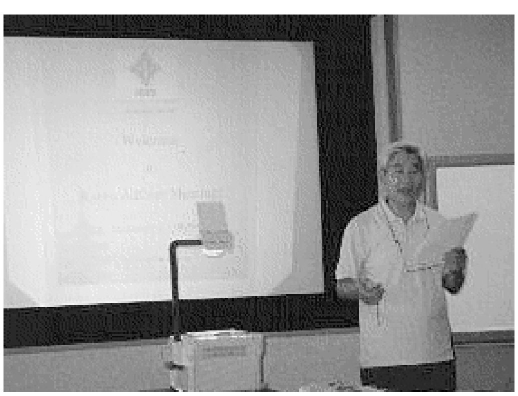
Given at the Tokyo Chapter Seminar, Oct. 4, 1999, by Yoshinobu Sato, Tokyo University of Mercantile Marine

In order to certify safety of a product, an authorized body has checked the product using a certain class of safety applications such as design guidelines, checklists and expert opinions. Namely, products were examined with predominantly qualitative techniques. So far, the following problems were found out for such qualitative approaches: 1) more quantitative informations on the product like the probability of failure is required, and 2) the occurrence of failure depends not only on the product itself but also on the particular production environment.

Thus, new safety standards, ISA SP84 and IEC 61508, have been developed and published. Those cover quantitative safety analyses and overall-lifecycle safety-requirements of the product, The latter standard establishes performance-based criteria called safety-integrity levels (SILs) for the design, installation, operation, and decommissioning of electrical/electronic/programmable electronic (E/E/PE) safety-related systems (SRSs).

The SIL consists of four possible levels for specifying the safety integrity requirements of the safety functions to be allocated to SRSs. In order to select SILs the standard classifies E/E/PE SRSs into two modes of operations, i.e., low demand and high-demand/continuous modes.

The standard defines the target failure measures of SRS for both modes of operation: 1) the time-average probability of failure to perform the design function on demand (for a low demand mode of operation), and 2) the probability of a dangerous failure per hour (for a high-demand/continuous mode of operation). The target failure measures are linked to SILs in order to specify the possible risk reduction achieved by an SRS. Thus, the standard is closely connected to the discipline of reliability.



Koichi giving a presentation of the Japan chapter activities.

Special Lectures and Workshop

In conjunction AdCom Meeting which was held in Kyoto, Saturday, Oct.2, the following Special Lectures and a Workshop were held in Kyoto and in Tokyo.

The Special Lecture was given by Dr.Ken LaSala, President of Reliability Society in the Lecture Room No.1, Department of Aeronautics and Astronautics, Graduate School of Engineering, Kyoto University from 1:30 pm to 4 pm, Friday, Oct.1. The title of his talk was "Human Performance Reliability", and Prof.Koichi Inoue chaired. Although the number of attendance was 15, there was a very lively discussion.

Another Special Lecture was given by Dr. LaSala under the same title in the Auditorium, Tokyo Metropolitan Institute of Technology, from 10:30 am to 12:30 pm, with the opening address by TMIT President Harashima and with Prof. Shuichi Fukuda as chair.

In the afternoon, there was a Workshop "Reliability Engineering in the 21st Century" from 1:30pm to 5:30pm at the same place, chaired by Prof.Toshiyuki Inagaki, University of Tsukuba. Sr Past President Richard Doyle was the first speaker and he talked on "Micro-mechanical Reliabity" and Mr.Philip Tsung , AdCom Member, talked next on "Satellite Solar Cell and Solar Panel Reliability". Then a talk on "Y2K Preparations in the US" was given by VP Robert Gauger. VP Dennis Hoffman gave "An Overview of Concurrent Engineering".

From the Japanese side, Prof.Takehisa Kohda, Kyoto University talked about "System Safety and Reliability" and VC, Prof.Yoshinobu Sato, Tokyo University of Mercantile Marine, gave a talk on "Recently Published Safety Standard of IEC61508-How Related to Reliability Engineering?".

There are many attendees about 120 in total and from many countries such as Germany, Sweden, Yugoslavia, Macedonia, etc. in addition to Japanese. This gave the Special Lecture and the Workshop the international flavor. Another point I would like to address is that there are many people from industries. The wide variety of attendees makes the discussion very interactive and informative to fully satisfy the attendees, which was even continued at the reception party at the university cafeteria after the Workshop.

Thanks to these Special Lectures and Workshop, we are now fully aware of the growing importance of reliability in the 21st century and that we come to understand where we are heading for. I join all the attendees in thanking the AdCom Members in making efforts to bring these Special Lectures and Workshop into reality.

Shuichi Fukuda

Tokyo Metropolitan Institute of Technology: Overview

Tokyo Metropolitan Institute of Technology (TMIT) was originally founded in 1954 as Tokyo Metropolitan Industrial Junior College and in 1960 Tokyo Metropolitan Junior College of Aerospace was founded and these two junior colleges merged into Tokyo Metropolitan College of Industry. In 1986, Tokyo Metropolitan Institute of Technology was started as

continued on page 10

Special Japan Section

continued from page 9

four year university with four departments and in 1990 two masters' course were established. And in 1992 Doctorate degree course was established.

So this is a very young university but with great aspiration. The special feature of TMIT is an interdisciplinary combination of four departments consisting of Electronic Systems Engineering, Mechanical Systems Engineering, Aerospace Systems Engineering, and Production, Information and Systems Engineering. The graduate school consists of two masters' degree courses: Applied Dynamic Systems Engineering and Electronics and Information Systems Engineering. The one Doctor's Degree course is offered as Engineering Systems.

Our motto is "Stronger Ties with Industries " and we have the Center for Science and Research Exchange which was established in 1994 for the purpose of conducting joint research with industries. TMIT is located in the midst of a industrial research park where such major companies as Toshiba, Fuji Electric, Fanuc, GE Medical, Olympus, Konica, Hino Motor, etc are really within walking (not driving) distance from the university.

Our another motto is "Globalization" and we have signed up collaborative agreements with Stanford University, National University of Singapore, Washington University, Bogazizi University, Pusan University and University of Technology, Sydney

Although the number of students is less than 2,000 in the physical sense, we are now going to expand our education not only within Japan, but also across the national boundaries. We have already started shared class with Stanford University and we are going to start another shared class with KTH and National University of Singapore.

We are very much interested in reliability issues in global product development which are also a major concern among the industries located around TMIT. This is one of the very few universities where concurrent engineering is taught. And it also should be mentioned that human performance is also taught at our university in addition to reliability engineering and quality engineering.Our university has a wide variety of excellent laboratory facilities for conducting joint research with industries and government. In fact, we have a studio which can be compared with the regional TV station in this area.

Finally, our President Fumio Harashima served as President of IEEE Industrial Electronics Society in 1986-87 and IEEE secretary in 1990, a member of IEEE N&A Committee in 1991-1992 and IEEE Fellow Committee in1991-1993. He served as Editor in Chief of IEEE/ASME Trans. on Mechatnorics in 1995. He hopes to make TMIT a COE for mechatronics research and education.

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Shuichi Fukuda

"Systems Safety and Reliability"

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Current research results were presented relating to "Systems Safety and Reliability". His talk is composed of two parts: the first one is on "root cause analysis of accidents involving human errors" and the second one is on " failure effect analysis using system bond-graph".

Most of accidents in technical systems such as airplanes and nuclear plants are due to human errors. The training or education to strengthen the operator performance is not sufficient to prevent human errors and their root causes such as design error must be identified. A novel framework is proposed for the root cause analysis of accidents involving human errors. Since an accident is caused by various interactions among system components including humans, the method firstly describes an accident sequence in chronological way with the consideration of not only interactions, but also environmental factors, CPC (Common Performance Conditions) such as adequacy of organization and working condition. In this description, a human error mode can be identified as a deviation from the normal/standard operation under each condition. The relation among observed events including human errors and component failure are represented as logical relation causing the accident occurrence. For human error modes, the CREAM (Cognitive Reliability and Error Analysis Method) is applied, which can obtain root causes of a human erroneous action using cause-effect relations among genotypes (causal factors of human erroneous actions). Genotypes are roughly divided into three types: (1) human-related one such as cognitive function, (2) system-related one such as equipment and procedure, and (3) organization-related one such as communication and training. All possible relations among genotypes and phenotypes (human error modes) are represented in terms of cause-effect relations. Based on these cause-effect relations, a causal sequence of genotypes leading to a human error mode can be obtained, where its source genotype corresponds to its root cause. Combining these results with the logical relation, the entire causal relation of genotypes can be obtained in a more detailed form. The database of previous analysis results expressed in general terms of genotypes and phenotypes also helps analysts to obtain an appropriate causal relation. An illustrative example of a collision accident of airplanes shows the details and merits of the proposed method.

Summary of the second part: The effect of component failure on the system performance is essential information not only for system design, but also for failure diagnosis. This kind of information is conventionally obtained through the FMEA (Failure Mode Effect Analysis) usually performed by system analysts. As the system gets larger and its complexity increases, system analysts may make errors in the evaluation. Further, as a system is generally composed of mechanical, electrical and hydraulic components, the system analyst must consider their interactions in a unified way. To solve these problems, a system bond-graph (SBG) is developed based on the design assumptions, which can model various components in a unified way using the physical analogy from the viewpoint of energy flow. Assumed component failure and disturbances can be also modeled easily using physical analogy. From the system bond-graph, the system state equations can be obtained automatically which express the system behavior in the time domain. To evaluate the effect of component failure or disturbance on the system behavior, the system state equations are transformed into a tree graph, where a node represents output of a characteristic function, state variable, or input variable, and a branch denotes an input-output relation between nodes. By propagating component failure effect along the tree graph, deviations caused on nodes can be obtained easily. A deviation denotes the effect of component failure on the corresponding System State. Using the tree graph, deviations not only under the initial transient state condition, but also under the steady state condition can be obtained in the same way. A simple illustrative example of a two-tank system shows the details and merits of the proposed method.

Koichi Inoue, Professor of Kyoto University and AdCom member

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President LaSala visited Department of Aeronautics and Astronautics, Graduate School of Engineering, Kyoto University on October 1, 1999 and he gave a Special Lecture "Human Performance Reliability" to the members of Tokyo Chapter, Kyoto University colleagues and students. An excellent overview of Kyoto University made by Dr. Makoto Nagao, President of Kyoto University, and a famous scientist of machine translation, is cited below from Kyoto University Bulletin, 1998/1999 editions.

"Founded in 1897, Kyoto University celebrated its centennial last year. As shown by the fact that the University has produced four Nobel laureates, the best record of any Japanese university, it is first and foremost a world-ranking research university.

With its ten faculties, thirteen graduate schools, thirteen affiliated research institutes, and seventeen research and service centers, it is the second largest national university in Japan. Its scale can be understood from the fact that it has 14,000 undergraduate students, 7,000 graduate students, including about l, 000 from other countries, 2,700 teachers and 2,500 administrative staff.

Kyoto University offers the highest quality of education and research in this country, a fact which is widely recognized. International activities are flourishing. Kyoto University faculty members travel frequently for research and meetings, and more than 1,600 overseas researchers visit Kyoto University each year. Kyoto University has established exchange agreements with various universities in other countries with a view to international exchange and cooperation in both educational and academic domains.

Kyoto University is prominent not only in scientific research but also in the humanities, including the well-known and much-admired "Kyoto School".

In recent years, Kyoto University has been giving more and more importance to activities at graduate level, and has established new graduate schools to cope with the emerging problems which will confront us in the next century. These new schools include the Graduate School of Human and Environmental Studies, Graduate School of Energy Science, Graduate School of Informatics, and the Graduate School of Asian and African Area Studies. Several further schools, including the Graduate School of Life Science, the Faculty of Health Science, and others, are in preparation. The substantial nature of these reforms has required reorganization of traditional and long-established academic domains into new academic disciplines to fit the coming century.

These activities show that Kyoto University is always fresh and flexible in education and research, a dynamism arising from the traditional spirit of Kyoto University's academic freedom, which has been cultivated through the University's history of one hundred years."

For more information, please visit Kyoto University Web Site at

http://www.kyoto-u.ac.jp/index-e.html
(in English)

http://www.kyoto-u.ac.jp/
(in Japanese).

Reliability Workshop Proceedings

Held in conjunction with October AdCom

Y2K – ARE WE READY?

Presented in Japan at the Workshop on Reliability Engineering in the 21st Century
October 4, 1999

Though I had suggested several topics for the Workshop on Reliability Engineering in the 21st Century, "Y2K Preparations in the U.S." was the subject that the Japanese audience wanted me to talk about. Actually, I would have preferred to hear about Japan's Y2K preparations. There have been a number of articles published lately that claim that Japan is a major Y2K risk, and other articles explaining that the typical Japanese computer-related applications have many manual interventions or checks that will allow human intervention and control. I checked on the use of the Japanese calendar and found that it was not solving the problem.

I shared with the audience what I knew of the worldwide status, how our U.S. preparations were proceeding, and what I had been doing for the past year in the Y2K field. From my viewpoint, Y2K failures and their likelihood of occurrence are very much like any other reliability failures, except that we know when to expect them. Looking at a map of the world, I pointed out the areas around the world that are of the greatest concern to me: Russia, China, Afghanistan, Bangladesh, Cambodia, Indonesia, Vietnam, Kenya, Morocco, and Mozambique. Nepal, Nigeria, Uruguay, Costa Rica, Ecuador, and El Salvador. For the most part, these are third world nations and have relatively few computers installed. However, to the extent that they take part in world trade and world banking, they will be seriously handicapped. At the other end of the scale, Australia, Belgium, the Netherlands, Switzerland, Denmark, Britain, Israel, Canada, and the U.S. seem to be well prepared.

I shared with the group the data that I had on U.S. spending for Y2K preparations:

- Up to $150 billion by U.S. industry.

continued on page 14

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Special Japan Section

continued from page 9

- $8.6 billion by the Federal Government.
- $450 million by the State of California.
- $11 million by General Motors.
- $5 million by a moderate-sized wastewater plant.

And all of this because the date was shown as two digits, rather than four.

I then showed the audience the recent Year 2000 headlines for each major industry, some predicting doom and gloom, but most presenting an increasingly positive outlook. For example, it was reported that 75% of the U.S. companies have already experienced Year 2000-related failures, yet only 2% of these failures have caused business interruption. The most prominent example is a nearby wastewater treatment plant, where 4 million gallons of sewage spilled into a park area during Y2K testing. The plant was remained operable and the sewage was quickly cleaned up.

I expect to be glued to the television, starting early Friday morning, as the clocks change over to 2000 around the world. I will start with New Zealand and Australia, then Japan, and on through Asia. I will be watching for failures caused by computers and other smart devices with microprocessors built in. The most difficult to find and remedy are smart devices with embedded circuits. These will be found recording time in elevators, recorders, telemetry, and a wide range of automatic devices. Having just as much impact will be the embedded systems found in process control equipment in factories, power plants, and wastewater plants.

By the time you read this, it will almost be too late. You can take a measure of personal preparation and readiness. If earthquakes are a possibility in you're area; this is the year to make up that earthquake readiness kit. Then plan what you will do and how you will cope with the possible loss of water, power, phone, and other essential services.

Normally, for industry and utilities, I recommend a plan that starts with inventorying all devices, then assessing them to determine how they could fail due to Y2K and what the impact would be. If a full answer can not be obtained, they may need to be tested and/or replaced. There is no longer time for this. What I recommend now for industry, and for you, is to develop contingency plans. Plan for the worst cases that you consider possible and then develop plans to cope with them. Let's hope you don't need them and can modify the plans and use them as the basis for a training video for some other natural disaster.

Bob Gauger
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Micro-Mechanical Reliability Analysis

Tokyo Chapter Workshop, 4 Oct. 1999

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Introduction

Micro-Mechanical Reliability analysis is a technique for predicting the life and reliability of a small part. This document recognizes that there are many problems encountered in trying to predict the reliability of Micro-Mechanical components and systems because of the unique characteristics of extremely small mechanical designs. Micro-Mechanical designs are often one of a kind, therefore historical data from "similar" equipment is not available for predicting performance reliability of the new equipment. This presentation will attempt to direct ones activities in an effort to resolve these problems.

2.0 Purpose

The purpose of a Micro-Mechanical Reliability analysis is to provide a realistic estimate of the reliability of a very small part. This estimate may be used as a basis for reliability improvements through design changes or to predict if the desired reliability of the system has been achieved. It is difficult to establish a good estimate of reliability without an organized and proper approach. The intent of this presentation is to guide one through the analysis. However, it is left up to the reader to chose which techniques to use and which probability function best fits the mechanical equipment.

As the analysis progresses, one should reevaluate reliability goals and modify the Micro-Mechanical design to ensure that these goals are met. If the product can not be modified, then the prediction provides the best estimate of the expected life and reliability of the Micro-Mechanical system.

The following analysis applies to various types of devices, including: Transducers, sensors, springs, bearings, gears, and motors.

3.0 General Description

The following practices are used for predicting the reliability of Micro-Mechanical systems.

Reliability Calculations of Individual Parts

The Predicted Reliability values shall be calculated for all major pieces in the system. The individual part failure rate is determined using the techniques described in this presentation. Summing these values will provide the Predicted Reliability values for the Micro-Mechanical system.

Environmental conditions in addition to temperature become critical for the Micro-Mechanical devices. This includes such influences as moisture, thermal shock and vibration. For vibration, it may be necessary to provide a strong support, including a three point (or more) mounting. It may be that HALT testing provides the highest loads. If failures continue to occur, changing the design may be a solution. Or it may be necessary to obtain higher strength materials.

3.2 Computing Micro-Mechanical Reliability

The method of computing the reliability of a Micro-Mechanical system, either MTBF or probability of success will depend on personal preference. The reliability can normally be determined, in descending order of preference by:

1. Probabilistic Stress and Strength Analysis for each critical part (Section 3.6).

2. Failure rate models developed in Section 3.5 (Product Multipliers / Stress Factors)
3. Parts Count Technique for all parts using generic data (Section 3.4).

For critical Micro-Mechanical parts, technique 1 should be required. For the majority of the Micro-Mechanical systems, techniques 1, 2 and 3 are usually combined.

3.3 General Solution, Micro-Mechanical Parts

There are various stress levels or loads on Micro-Mechanical systems. The lower the stress level with respect to capability or strength, the better the reliability.

To date, no single method or technique has been accepted as the standard for computing the reliability of Micro-Mechanical systems. The following 3 different processes may be used in computing the reliability of a Micro-Mechanical system. They are: 1.) Using published data (parts count method), 2.) Using product multipliers, or 3.) Calculating the probabilistic strength and stress of the part.

3.4 Parts Count Method, Micro-Mechanical Parts

The use of the parts count technique greatly simplifies the reliability computations of Micro-Mechanical systems [3]. This technique, basically, is to list all mechanical pieces used, determine the generic failure rate for each piece in a specific environment, add up the failure rates (if no redundancy), and then compute the reliability, either MTBF or probability of success.

One should realize that a predicted value is not a guarantee that the value will agree with actual test results, but it will provide failure trends and will identify the critical parts.

3.5 Reliability Predictions (Using Product Multipliers)

The first step in developing these failure rate models was to derive equations for each failure mode based on design information and experimental data contained in published technical reports and journals. These equations when simplified, retain those variables affecting reliability as indicated from field data and from statistical analysis of the data. The failure rate models utilize the resulting parameters in the equations and include modification factors. These factors were compiled for each variable to reflect its effect on the failure rate of each part. The total failure rate of the part is the sum of the failure rates of each of the variables affecting reliability.

Failure rate models have been developed by the Naval Surface Warfare Center - Carderock, MD [2].

Analytical Methods of Determining Micro-Mechanical Reliability

This section will present a Probabilistic Stress and Strength

Analysis [1]. This provides techniques for determining structural reliability through the computation of the probability of failure. Although this technique provides a good reliability estimate based on stress and strength, it is a rather lengthy process.

The concept of relating mechanical stress analysis to failure rate is based on: 1.) Determining the critical failure modes, and 2.) Limiting the stress analysis to those failure modes that are critical to the proper operation of the equipment.

For those failure modes considered to be critical, an evaluation of the stress and strength of each part should be made. This evaluation may be entirely deterministic, entirely probabilistic, or a combination thereof depending on the criticality of the failure event. One should translate stress/strength relationships such as safety factors, into a reliability value during the analysis and probabilistic techniques should be used.

4. References

Chapters 18, 19 and 20 (By: Doyle, Richard L), Handbook of Reliability Engineering and Management, Published by McGraw-Hill, Inc. January 1996.

NSWC-94/L07, Handbook of Reliability Prediction Procedures for Mechanical Equipment, By Naval Surface Warfare Center - Carderock Division, March 1994.

NPRD-95, NonElectronics Parts Reliability Data Notebook and PC Data Disk, By Reliability Analysis Center, 201 Mill Street, Rome, NY 13440, Ph. 315-337-0900, dated 1995.

Solar Cell and Solar Panel Reliability and Statistical Methods

Introduction

This paper describes how statistical tools and reliability modeling techniques were introduced at TECSTAR Inc., a manufacturer of solar cells, solar panels, avionics communication equipment, and aerospace actuation and control systems. Reliability modeling of solar panels and statistical analysis to support solar cell qualification testing are addressed in this paper.

Reliability Modeling

A solar panel is comprised of solar cells configured in circuit strings. The voltage of each string is kept constant at the satellite bus voltage, and each string contributes current. At the circuit string (comprised of x number of cells in series) and solar panel levels (comprised of y number of strings in parallel), a new reliability model was developed to ensure that solar panels were not "over-designed" in terms of reliability. The power margins that were designed into the product were factored into the reliability model at the solar panel level. The reliability model was based on active redundancy where "m of n" solar cell strings have to work in order for the panel power requirements to be met, with "n" being the total number of cell strings and "m" being the number of cell strings that must work. The reliability model is shown in Eq. (1).

$$R_{STRINGS} = \sum_{k=m}^{n} [n!/(k!(n-k)!)][R]^{k} [1-R]^{n-k} \quad (1)$$

- R is the reliability of an individual string consisting of cells, interconnects, and diodes (the reliability of each string in a panel is the same for purposes of this analysis)
- m is the number of strings that must work to meet the reliability requirement
- n is the total number of strings
- Power Margin = n/m

This model supported the design function, power analysis function, and proposal preparation process. It was used to conduct trade studies of power margin

continued on page 16

Special Japan Section

continued from page 15

with circuit string configuration and panel reliability.

Statistical Tools And Analysis

Statistical tools and techniques are used at TECSTAR to determine sample sizes sufficient to meet a 90% confidence level. A key application of these techniques was the qualification of a brand new, high efficiency, multi-junction Gallium Arsenide (GaAs) solar cell.

The normal, beta, and binomial distributions are used to select sample sizes for a variety of solar cell qualification test activities, as described below.

Normal Distribution –

The normal distribution can be used to calculate sample size by applying Eq. (2):

$$N = Z_{Conf/2} \times \sigma^2 / E^2$$

N = sample size

Z = normal probability distribution Z statistic [Z = (xbar – ?) / ?]

Conf = confidence level (Z Conf/2 denotes a two-sided test and Z Conf denotes a one-sided test)

σ = standard deviation

E = allowable measurement error

This calculation can be interpreted as follows: N is the minimum sample size required to ensure with a specified confidence (Conf) of obtaining test values (xbar) within + E of the true population mean (?).

Beta Distribution –

The Beta distribution is effective in determining the lower bound on reliability at a given confidence interval. It is also used to determine a sample size required to ensure at a specific confidence level whether a reliability requirement is met, provided that there are no failures. The sample size calculation is shown in Eq. (3).

N = ln (1 – Conf) / ln R(3)

N = sample size (no failures allowed)

Conf = confidence level (between 0 and 1.0)

R = reliability (as a probability between 0 and 1.0)

Binomial Distribution –

The binomial distribution deals with situations having only two possible outcomes, such as success or failure. At TECSTAR, this distribution is used to estimate the sample size to ensure with 90% probability that a defect, if present, will manifest itself during the course of testing. For example, the probability of 0 or fewer occurrences of 10% corresponds to np=2.3; conversely, this corresponds to a 90% probability of there being one or more occurrences. Given that np=2.3 in this example, if the defect rate is 10% (p=0.10), then n=23. That is, 23 samples are required to ensure with 90% probability that there will be one or more defects manifested, given a defect rate of 10%.

Author Information

Philip W. Tsung is responsible for reliability engineering and statistics at the three divisions of TECSTAR Inc., a manufacturer of solar cells, solar arrays, avionics communication equipment, and aerospace actuation and control systems. Mr. Tsung is currently a member of the IEEE Reliability Society National ADCOM (1998-2000) and is a past chair of the Boston Chapter of the IEEE Reliability Society (1996-1997). He is an ASQ Certified Reliability Engineer.

An Overview of Concurrent Engineering

By Dennis R. Hoffman

Concurrent Engineering refers to the simultaneous, parallel design process that encompasses all aspects of a product's development in a top-down fashion by a multi-disciplinary team. The goal of Concurrent Engineering is to achieve mutual optimization of critical characteristics of the product and its related processes. This approach is intended to cause the product developers, from the outset, to consider all elements of the product life cycle from conception through disposal. Concurrent Engineering is based on the realization that: "specialty" attributes of a product are more effective when designed into the product rather than installed after-the-fact; early design decisions must consider "specialty" attributes along with other performance characteristics; and quality products need a continuously evolving quality process.

Concurrent Engineering focuses on three major concepts: 1) The integrated product development process needs to be understood and modeled to be repeatable, ensuring systematic success; 2) All relevant perspectives, from customer requirements through internal constraints, must be considered in the definition and design of the product; 3) All perspectives need to be integrated to yield a global optimum, i.e., a cost effective, robust design tolerant of manufacturing and use variations.

A relatively simple idea, Concurrent Engineering is based on a fundamentally different way to look at how products are conceived, engineered, manufactured, and supported. The idea is that people can do a better job when they cooperate to achieve a common goal. To implement this concept successfully, members of management, engineering, test, manufacturing, and product support must develop a profoundly different insight — the process insight. The process insight is the realization that all the activities, which transform a collection of inputs into a product satisfying a need, are a single "process''. This process can be defined, measured, managed, and continually improved. Improvements include breakthroughs associated with new inventions and the small improvements resulting from everyday suggestions.

Concurrent Engineering involves a product development infrastructure that fosters a unified, collaborative approach to integrate these business, engineering, and management specialists' inputs across traditionally segregated product development phases — starting with requirements definition and encompassing the design of manufacturing and support processes within product development. With this unified infrastructure, companies are able to achieve more competitive products and eliminate predictable cost, schedule, quality, and product functionality shortfalls that are inherent in sequential, review-based development practices.

Interdisciplinary process improvement and multi-disciplinary product development demand a new management approach — a different culture and viewpoint. What is required is now referred to as multi-discipline teams. Empowered teams have shown to be dramatically successful in shortening development phases, and doing so with fewer staff. Characteristics of an effective team include: involvement of the members who are essential to complete all aspects of product design and process development; a sense of responsibility among all team members for total success of the product (product focus versus organizational); team authority and responsibility; a reward structure that emphasizes team success; and a team longevity corresponding to their project's duration.

Concurrent Engineering requires long-term commitment to process development and optimization. This requires long-term commitment to the accumulation and application of knowledge. Lessons learned from testing and field experience must be evaluated to fix design problems and to correct the process(es) to prevent future recurrence. Competitive benchmarking of company and competitor products and processes is also a valuable source of design knowledge. This knowledge repository must be maintained and leveraged to ensure effective application to future products.

Concurrent Engineering (despite its fad or buzz-word connotation) is not just another "improvement program". As design schedules continue to shorten and budgets continue to tighten, companies will be forced to eliminate the redesign, debug, repair, and rework cycles in order to be competitive and continue to grow. Those who make the necessary changes will remain in business. Concurrent Engineering affects continuous improvement in products and processes if everyone in the enterprise buys into the philosophy that the requirements for manufacturability, testability, reliability and supportability must be satisfied in the early, conceptual stages of each new product development. Concurrent Engineering (CE), or Integrated Product Development (IPD), is applicable to any industry developing products and wanting to remain competitive in today's marketplace.

Excellence is elusive; however, the success of an enterprise is determined by its ability to excel. Organizations can become complacent and thus reluctant to "fix" or change processes that work. Concurrent Engineering has a role in attaining excellence and then avoiding complacency. The most powerful tool in business today is change. Competitors use change to unseat industry leaders: they will change customer expectations, introduce superior technology, change government regulations, and improve resource management. Today, an enterprise will remain successful only if all internal processes are adaptable and poised for rapid and unexpected changes. Iterative, frequent, evolutionary changes are necessary to sustain excellence. Proactive leaders encourage action and seek opportunities to tilt the competitive playing field rules in their favor.

New Book Announcement

Software Safety and Reliability: Techniques, Approaches and Standards of Key Industrial Sectors

by Debra S. Herrmann

IEEE Computer Society Press,
Item # BP00299
500 pages, 1999, ISBN 0-7695-0299-7

This book introduces the concepts, techniques, and approaches used to achieve and assess software safety and reliability. Next, current software safety and reliability standards from multiple industrial sectors (transportation, aerospace, defense, nuclear power, biomedical) are examined in terms of:

Implementation strategies, context relative to system safety and general purpose software engineering standards, strengths, areas for improvement, and results observed to date from performing the recommended and required practices.

continued on page 18

New Book Announcement

continued from page 17

Standards, which are not specific to an industrial sector, are examined in this manner as well. Lastly, observations, conclusions, and recommendations are derived from, similarities and differences in the standards, and the current practice of software safety and reliability engineering. Two annexes provide contact information for: 1) organizations involved in the development of software safety and reliability standards; and 2) commercial products available to assist in performing software safety and reliability analyses. The book is written for engineers, scientists, managers, regulators, and policy makers involved in the design, development, acquisition, and certification of safety-critical systems.

Contents

Software Safety and Trustworthiness Study

The Reliability Society is teaming with the Computer Society to develop proposed procedures to certify safety critical software and systems. System safety critical problems are most often rooted in logic or software. Software includes firmware, embedded complex logic as well as application and system software.

Admittedly safety is a system attribute but the safety root causal area is software based.

A related focus area is in “Systems Management” including:

1). requirements and
2). interfaces.

This is typically the largest problem sector for trustworthy systems. I am including this exposure area in Software. It could be treated separately, or it could be included in software as has beeen implicitly done in this proposal.

This effort is in the proposal stages. The study will:

- Research and size the current problem or opportunity
- Catalog problem exposures
- Identify initiatives to be explored in Certification of people, processes, and products
- Cross map probable initiatives vs problem areas
- Identify key personnel and teams to lead development of new standards and practices

If you would like to participate in this study, which will run over more than a year, please advised the author below.

Samuel Keene
s. keene@ieee.org

PU Full page Concurrent engineering ad from July 99 page 24

Reliability Society AdCom Meeting ■ ■ ■ ■

Saturday, October 2, 1999
Coop Hotel, Kyoto, Japan

Meeting was called to order at 9:00 am. A quorum existed.

The agenda was approved and the minutes were approved as amended.

President report:

Ken reported that the new financial model could impact RS. He and Dick K are closely monitoring. The RS budget was submitted according to IEEE recommended guidelines, but could be impacted with the new financial model.

Past action items: Dennis presented status on several of his former AI's. Discussion on the cost comparisons for publications resulted in action for Dick Doyle to provide Dennis with cost elements for him to include in comparisons. On-line publishing is due to start for RS in January.

Treasurers report (Ken LaSala)

Ken and Dick K to research past meeting minutes to the agreed amount of RS contribution to the History center and Dick K to send check. Projection is $40k surplus for 2000. Dick will clarify budget item 1.2 – SMT periodical.

Meetings report: (Bob Gauger)

Bob eliminated the Sunday AdCom in January and March to eliminate conflicts. AdCom meetings will be the previous Saturdays to the conferences. Bob explained the sponsorship type and responsibilities. There was a desire to have a liaison to every conference. Bob to get active contacts for all conferences that we co-sponsor. He will clarify new rules for life members reduced rates for IEEE conferences. Bob is to provide a table identifying all RS sponsored conferences, points of contacts, etc and provide at the upcoming ExCom meeting. Bob reported that the budgets for RAMS, IRPS, and IRW were approved. There is still a need to evaluate the status of conference closeouts. Bob will arrange to get a room for Tech op meeting to be held Sunday preceding RAMS. Bob mentioned that the EDS annual conference training will be held in December in Wash DC.

Membership report: (Marsh Abramo)

Marsha will determine which societies qualify for affiliate membership.

Publications: (Dennis Hoffman)

Dennis will determine what Bob Loomis needs in order to upload Newsletter onto Web. He reported that we must issue 4 Newsletters per year in order to maintain our Postage Permit. Dave is requesting input for 4th issue. AdCom recommended that a special issue be made highlighting the Japan AdCom and workshop meetings. All came up with an agenda and actions. Dennis to coordinate with Dave and all Japan participants.

Tech Op report:

Bud sent email request for articles in RSN on their areas of specialties.

Jr Past President report:

Loretta will send Wash/DC RS members listing to Ken in order to rejuvenate the chapter

RS Display report

Phil reported that in order to have the display available for RAMS, we must start the order process by Dec 1. Phil showed examples of the proposed display and material to be posted. Motion: Expend up to $7K, continue working details with vendor, but start order no earlier than Dec 1. Phil plans to start paperwork Nov 10, to meet the Dec1 order date.

IEEE-SA Members

To assist you in keeping abreast of IEEE Standards Activities, we have compiled a list of new and revised standards projects, listed by sponsoring IEEE Society, that have been recently approved by the IEEE-SA Standards Board.

If you have any questions concerning the list below, please contact Jodi Haasz at *j.haasz@ieee.org* or +1 732 562 6367.

Sincerely,

Ronni Rubenstein
IEEE-SA Membership
Marketing Administrator
445 Hoes Lane
Piscataway, NJ 08855 USA
Tel: +1 732 562 6381
Fax: +1 732 562 1571
r.rubenstein@ieee.org

IEEE STANDARDS PROCESS-AT-A-GLANCE

IEEE Standards has developed a one-stop guide, IEEE Standards Process-at-a-Glance," that walks you through the process and paperwork needed to develop a standard. This guide is an invaluable tool to new working group chairs, IEEE Sponsor chairs, and standards developers. Please view http://standards.ieee.org/resources/glance.html.

IEEE Standards Projects By Society ■ ■ ■ ■

NEW

***Aerospace & Electronic Systems Society,* Gyro Accelerometer Panel**

P1554 Recommended Practice for Inertial Sensor Test Equipment, Instrumentation, Data Acquisition and Analysis

***COMPUTER SOCIETY,* Local and Metropolitan Area Networks**

P802.5z Supplement to - Information Technology Telecommunications and Information Exchange Between Systems 0 Local and Metropolitan Area Networks - Specific Requirements - Part 5: Token Ring Access Method and Physical Layer Specifications - Aggregation of Multiple Link Segments

P802.16.2 Telecommunications and Information Exchange Between Systems - LAN/MAN Specific Requirements - Coexistence of Broadband Wireless Access Systems

REVISED

P802.5w Corrigenda to - Information Technology Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks 0 Part 5: Token Ring Access Method and Physical Layer Specification Portable Applications

NEW

P1003.1s Standard for Information Technology - Portable Operating System Interface (POSIX) - Part 1: System Application Program Interface (API) - Amendments: Synchronized Clock (C Language)

P1003.5h Standard for Information Technology - Portable Operating System Interface (POSIX) - Ada Language Interfaces - Part 1: Binding for System Application Program Interface (API) - Amendment h: Synchronized Clock

REVISED

P1003.1j Information Technology - Portable Operating System Interface (POSIX) - Part 1: System Application Program Interface (API) - Amendment: Advanced Realtime Extensions (C Language)

Standards Coordinating Committee

NEW

P2002 Internet Security Practices

***INDUSTRY APPLICATIONS,* Industrial Power Converter**

NEW

P519 Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems

NON-IONIZING RADIATION (SCC28)

NEW

P1555 Standard for Maximum Levels of Human Exposure to Electromagnetic Fields, 0 to 3 kHz

Nuclear and Plasma Sciences, Nuclear Instruments & Detectors

NEW

P1557 Standard Test Procedures for Cadmium-Zinc-Telluride (CZT) and Other Wide Bandgap Semiconductor Radiation Detectors

***POWER ENGINEERING,* Electric Machinery**

REVISION

P112 Standard Test Procedure for Polyphase Induction Motors and Generators

P666 Design Guide for Electric Power Service Systems for Generating Stations Substations

P1264 Guide for Animal Deterrents for Electric Power Supply Substations

P1379 Recommended Practice for Data Communications Between Intelligent Electronic Devices and Remote Terminal Units in a Substation Surge Protective Devices

PC62.35 Standard Test Specifications for Avalanche Junction Semiconductor Surge Protective Devices Switchgear

PC37.21 Standard for Control Switchboards

PC37.24 Guide for Evaluating the Effect of Solar Radiation on Outdoor Metal-Enclosed Switchgear Transformers

NEW

PC57.123 Guide for Transformer Loss Measurement

PC57.140 Guide for Life Extensions of Power Transformers

REVISED

PC57.113 Partial Discharge Measurement in Liquid-Filled Power Transformers and Shunt Reactors

PC57.129 Trial-Use General Requirements and Test Code for Oil-Immersed HVDC Converter Transformers Transmission & Distribution

P824 Standard for Series Capacitor Banks in Power Systems

STATIONARY BATTERIES (SCC29)

REVISED

P535 Standard for Qualification of Class 1E Lead Storage Batteries for Nuclear Power Generating Stations

TEST AND DIAGNOSIS FOR ELECTRIC SYSTEMS (SCC20)

NEW

P1552 Structured Architecture for Test Standards

Call for Papers

RSP'2000

Paris, France, June 21-23 2000

http://www-src.lip6.fr/rsp

Important Dates

- Papers due: January 28, 2000
- Notification of Acceptance: February 25, 2000
- Final Camera Ready Manuscript due: March 24, 2000

The Best papers will be selected for a publication in a special issue of a Software Engineering journal.

General Description

The IEEE International Workshop on Rapid System Prototyping (RSP) presents and explores the trends in rapid prototyping of Computer Based Systems including, but not limited to, distributed, communication, information, and manufacturing systems. It aims to bring together researchers from both hardware and software communities to share their experience with rapid prototyping and related work. The 11th annual workshop aims to be opened to various visions and techniques related to Prototyping and to facilitate sharing of new vision and innovative techniques related to Prototyping. It will focus on improved approaches to resolve prototyping issues and problems raised by incomplete specifications, increased system complexity and reduced time to market requirements for a multitude of products. The workshop will include keynote presentations and formal paper sessions with a wide range of system prototyping topics including, but not limited to:

- System Emulation
- System Specification
- Tools for Software Prototyping
- Tools for Hardware Prototyping
- Methodologies for Software Prototyping
- Methodologies for Hardware Prototyping
- Prototyping in an engineering process
- Prototyping of embedded systems
- Prototyping Case Studies
- Very Large Scale System Engineering
- Integrated telecommunications systems
- Hardware/Configware Codesign and tradeoff
- Hardware-Software Codesign
- Very Large Scale System Engineering
- Hardware/Software Tradeoffs
- System Verification/Validation
- Prototype to Product Transition
- Prototyping of Real-Time Systems
- The Role of FPGAs in System Prototyping
- Virtual Prototyping

The IEEE Rapid Systems Prototyping Workshop is co-sponsored by the IEEE Computer Society Technical Committees on: Design Automation, Simulation, Test Technology

Submission Instruction

The program committee invites authors to submit a full paper. Papers should clearly describe the nature of the work, explain its significance, highlight its novel features, and state its current status. Authors of selected papers will be requested to prepare a manuscript for the workshop proceedings. Papers length should not exceed 6 pages in the standard IEEE format. For more details see the RSP'2000 web site (http://www-src.lip6.fr/rsp).

Electronically submit all papers using: *http://www-src.lip6.fr/cgi-bin/review_submit.cgi*

Exceptionally, submission may be sent via regular mail to
Dr. Jian Guo
Software Engineering Group,
Naval Postgraduate School,
Monterey, CA 93943,
Tel: (+1) 831-656-2180
Fax: (+1) 831-656-3225
RSP2000@cs.nps.navy.mil

Meeting Notice

FINAL ANNOUNCEMENT AND CALL FOR PAPERS

Third International Conference on Modeling and Simulation of Microsystems

MSM 2000

US Grant hotel, San Diego
California, U.S.A.
March 27-29, 2000
http://www.cr.org/MSM2000

Abstract Deadline: October 15, 1999

The largest gathering in the field worldwide, MSM is the premier technical forum for presenting the latest research and development in modeling and simulation applications and tools in the micro- system, microelectronic, semiconductor, sensor, materials and biotechnology fields.

MSM 2000 will be held at the U.S. Grant hotel, located in the heart of downtown San Diego's business and cultural district, across from the Gas Lamp Quarter, and the world famous Horton Plaza, walking distance to Theaters, Restaurants and Harbor, and minutes from the famed San Diego Zoo, Balboa Park and Seaworld.

The conference will start Sunday late afternoon with registration and reception, and adjourn Wednesday afternoon. The Technical Sessions, and vendor exhibition run Monday through Wednesday. Conference registration and housing will officially open October 15, 1999. Required forms and instructions are posted on the conference web site.

The conference Technical Proceedings, consisting of articles submitted by authors of both oral and poster presentations will be distributed to participants at registration.

In addition to the Technical Program, an exciting series of Social Events are being prepared to allow attendees ample opportunity to interact socially and enjoy the sights and sounds of San Diego.

Visit the WWW-site http://www.cr.org/MSM2000 for information about registration, lodging, abstract submission, and deadlines. Exhibitor is available. Please address all inquiries to wenning@dnai.com.

Sponsored By:

- IEEE Electron Devices Society
- Applied Computational Research Society
- CFD Research Corporation
- MemsCap, S.A.
- Microcosm Technologies, Inc.
- Molecular Simulation, Inc.
- Motorola
- Swiss Federal Institute of Technology of Lausanne
- TIMA-CMP Laboratory, France
- Ibero-American Science and Technology Education Consortium

International Association of Mathematical and Computer Modelling

From the Editor

Continued from page 2

in New York and talks regularly with the Telecommunication industry people in Richardson and Plano, Texas. He said I sounded just like them. Remember, I don't have an accent. Everyone else does!

Many Thanks

18 October 1999

Dear Dr. Fukuda:

On behalf of the IEEE Reliability Society, I would like to thank the Tokyo Section and the Tokyo Chapter of the IEEE Reliability Society for hosting our October 1999 AdCom meeting and associated events in Kyoto and Tokyo. I commend both you and Prof. Koichi Inoue for arranging an outstanding program of meetings and lectures and for providing excellent hospitality. The visiting AdCom members and I thoroughly enjoyed meeting with the Tokyo Chapter officers. We were impressed with the energy that the chapter now exhibits. I would like to send my special thanks to you and Prof. Inoue for the extensive personal efforts that both of you made to make the program the success it was.

Please convey my appreciation to the President of Kyoto University and to Dr. Harashima, President of Tokyo Metropolitan Institute of Technology, and their staffs for the excellent special lecture and workshop arrangements. The visiting AdCom members and I enjoyed our brief discussion with Dr. Harashima very much.

Finally, I want to thank the Tokyo Section and Tokyo Chapter for taking another successful step in the globalization of IEEE and, in particular, the IEEE Reliability Society. As one who as worked in international technical projects before, I recognize the value of including the views from around the world into the operations of the Reliability Society. I look forward to active participation by you, Prof. Inoue, and other Japanese members in Reliability Society projects and management.

Sincerely,
Kenneth P. LaSala, Ph.D.
President
IEEE Reliability Society

Share Your Knowledge

Send your articles for the April issue by January 8 2000.

Thanks
Dave Franklin
Editor