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Contents

Department of computer science

Department of digital media

Professor

Runhe HUANG

Refereed Publications

1. Jianhua Ma, Laurence T. Yang, Bernady O. Apduhan, Runhe Huang, Leonard Barolli and Makoto Takizawa, "Towards a Smart World and Ubiquitous Intelligence: A Walkthrough from Smart Things to Smart Hyperspaces and UbicKids", International Journal of Pervasive Comp. and Comm., 1(1), March 2005. pp. 53-68.

   Abstract — Following ubiquitous computers, sensors, e-tags, networks, information, services, etc., is a road towards a smart world (SW) created on both cyberspaces and real spaces. It is mainly characterized by ubiquitous intelligence or computational intelligence pervasion in the physical world filled with smart things. In this paper, we discuss the potential trends and related challenges toward the smart world and ubiquitous intelligence from smart things to smart spaces and then to smart hyperspaces.

2. Yoshizo Ishihara, Runhe Huang and Kwang Mong Sim, "Learning Opponent's Eagerness with Bayesian Updating Rule in a Market-driven Negotiation Model", in IEEE CS Proceedings of the 19th International Conference on Advanced Information Network and Applications (AINA'05), pp. 903-908, Taipei, March 2005.

   Abstract — Sim proposed a market-driven negotiation model for designing negotiation agents that make adjustable rates of concession by reacting to changing market situations. Although agent itself eagerness was taken into consideration as a fixed value in the proposed model, opponent's eagerness was missing. It is believed that opponent's eagerness has strong influence on the agent's decision. This paper proposes an improved market-driven negotiation model in which Bayesian updating rule is applied to learn opponent's eagerness since opponent's eagerness is unknown to an agent and may vary with dynamic changing market situation.

3. Sachio Mizuta and Runhe Huang, "Automation of Grid Service Code Generation with AndroMDA for GT3", in IEEE CS Proceeding of the 1st International Workshop on Information Networking and Application (INA'05), pp. 417-420, Taiwan, March 2005.

   Abstract — To automate code generation, grid services are represented in class models of Unified Modeling Language (UML). The UML output in XMI (XML Metadata Interchange) format derived from a CASE (Computer Aided Software Engineering) tool is used as input of AndroMDA to generate a suite of source code files and related settings. In

order to achieve this, a new cartridge of AndroMDA for GT3 (Globus Toolkit 3) was developed, named "andromda-gt3". Stereotypes for expressing the specific services of GT3 are also newly defined, and corresponding templates for generating files are included in the new cartridge.

4. Hiroyuki Morohoshi and Runhe Huang, "A User-friendly Platform for Developing Grid Services over Globus Toolkits3", in IEEE CS Proceedings of the 11th IEEE International Conference on Parallel and Distributed Systems, pp. 668-674, Japan, July 2005.

Abstract — This paper presents a platform that provides developers with a friendly development environment of grid services over Globus Toolkit 3. This platform includes a class of functions for processing parameters inputted from a developer via GUI and a class of functions for generating files required for defining grid services that the developer specifies. As a result, the development of grid services requires less special expert knowledge of a developer, the efficiency of developing grid services can be improved, and Globus Toolkit therefore increases its popularity and is for more practical and wider uses. This paper describes our design ideas, necessary functions, and implementations. The comparisons with other related toolkits are given in the paper.

5. Runhe Huang, Hiroshi Ouchiyama, and Jianhua Ma, "EEERB: an Experience and Environment based Evolutionary Rule Base for Simulated Exploration Robots", in IEEE CS Proceedings of the DEXA/NBiS-2005, pp. 27-31, Copenhagen, Denmark, August, 2005.

Abstract — This paper proposes an experience and environment based evolutionary rule base (EEERB) system. With it the simulated exploration robots, also called robot agents perform a specific exploration towards their predefined goal with their individual increasing experience and shared information from their environment. The rule base is evolving with the individual increasing experience by applying genetic algorithm together with the reward scheme and the dynamic available information posted by the robot agents to the public shared board. A group of robot agents in the system, which are looking for the specified object in a 2-D grid field, is performed. The system for can be extended for the more practical applications such as a mine detector, a space exploration robot, and so on.

6. Jianhua Ma, Akito Nakamura and Runhe Huang, "A Random ID Update Scheme to Protect Location Privacy in RFID-based Student Administration Systems", in IEEE CS Proceedings of the 16th DEXA/NBiS-2005, pp. 67-71, Copenhagen, Denmark, August, 2005.

Abstract — Recently the RFID has been received great attentions and gotten wide applications in many different areas including some administration systems. However, a RFID tag may infringe on its owner's location privacy because of its traceability.

Therefore, location privacy problems in RFID-based student administration systems become a critical issue. This paper proposes a safe, fast and low cost scheme in which a hash value is generated from a secret ID and a random number in a RFID tag by using a cheap hash circuit.

7. Yoshizo Ishihara, Runhe Huang, and Tomoya Enokido, "A Real World Trading Oriented Market-driven Model for Negotiation Agent", in IPSJ Symposium Series Vol. 2005, No. 19, Proc. of DPSWS13, pp. 131-135, Okinawa, November, 2005.

   Abstract — In both Sim's original model and our modified model, however, it was implied that a negotiation agent has same behaviors and actions to all trading partners referring to a same trading issue. It is not quite true in a real world trading negotiation. Based on Sim's and our previous modified model, this paper proposes a revised market-driven model that takes each trading partner as an individual with different strategies and actions. Moreover, negotiation actions between the negotiation agent and a trading partner are kept in secrete and unknown to other partners.

8. Kei Nakanishi, Makoto Setozaki, Jianhua Ma and Runhe Huang, "A Java-based RFID Service Framework with Semantic Data Binding between Real and Cyber Spaces", in Springer's Lecture Note in Computer Science (LNCS), Vol. 3823, pp. 365-374, December 2005.

   Abstract — This paper presents a Java-based framework that offers a set of general services to support various RFID systems for different purposes and application scenarios. The framework emphasizes on the semantic data binding for contextual information mapping between real and cyber spaces. The Java interface classes are provided to support general communications among a RFID, a reader and an application. Real and cyber spaces are synchronized via dynamic and real-time mapping from symbolic strings or IDs to the semantic XML data representations.

Professor

Satoru S. KANO

Books

1. Satoru S. Kano and Munetake Ichimura, "Introduction to Physics, II", Tokyo Kagaku Dojin, ISBN 4-8079-0609-7, 2005.

   Abstract — This introductory textbook on electromagnetism is for under-graduate students of natural science or engineering without a prior education in physics at high school.

Professor

Nobuhiko KOIKE

Refereed Publications

1. Norihiro Fujii and Nobuhiko Koike: "A New Remote Laboratory for Hardware Experiment with Shared Resources and Service Management", International Conference on Information Technology and Applications (ICITA2005), Sydney, Australia, 4-7th July, 2005

Abstract — A new remote laboratory system for hardware experiment has been developed. It employs shared resources and enhanced service management scheme based on the Web Services. Wide spread use of the Internet and broadband remote network access capability to the home, motivated us to develop a seamless remote and actual hardware laboratories for hardware design laboratory course. Unlike existing virtual laboratories, which only simulate actual experiments, the proposed remote laboratory utilizes actual hardware and actual measurement tools in a time sharing fashion. Hardware experimental environment is usually treated as an exclusive resource, for single user usage. However, the actual test run time is rather short and most of the time is spent for CAD preparation and post-experiment analysis, leaving those precious resources remain idle. The combinatorial use of FPGA/PC connected test hardware and PC-based measurement equipments such as logic analyzer or pattern generator has make it possible to develop a remote multi-user time-sharing hardware experiment system, where students can perform actual experiments using actual hardware equipments and tools concurrently. As all students are equipped with high-performance Laptop PCs, CPU intensive tasks such as CAD schematic/HDL design entry, logic simulation, FPGA compilation, or post-analysis can be off-loaded from the server host and can be performed by each student's client Laptop PC. Thus, the server can concentrate on the service management tasks, such as course management, self-learning course guide, and hardware resource managements. The Web-services-based course material distribution, course guidance and report collection system are also developed to realize the remote-laboratory self e-learning system. The prototype system is under-construction, and will be used for the third grade CS students from year 2005.

2. Norihiro Fujii and Nobuhiko Koike: "A Time-sharing Remote Laboratory for Hardware Design and Experiment with Shared Resources and Service Management", International Conference on Information Technology Based Higher Education and Training (ITHET2005), Santo Domingo, DR, July 2005

Abstract — A new remote laboratory system for learning hardware designs and experiment of digital circuits has been developed. Wide use of the Internet motivated us to develop seamless remote and actual hardware laboratories for hardware design laboratory course. Unlike existing virtual laboratories, the proposed remote laboratory

utilizes actual hardware and actual measurement tools in a time-sharing fashion. Hardware experimental environment is usually treated as an exclusive resource, for single user usage. However, the actual test run time is rather short and most of the time is wasted leaving those precious resources idle. To make those resources operate more efficiently, it employs shared resources and enhanced service management scheme based on the Web services. It finds an available service site and schedules the executable processing. The combinatorial use of FPGA/PC connected test hardware and PC-based measurement equipments such as logic analyzer or pattern generator has make it possible to develop a remote multi-user time-sharing hardware experiment system, where students at remote sites can perform actual experiments using actual hardware equipments and tools concurrently. As all students are equipped with high-performance Laptop PCs, CPU intensive tasks such as development of the digital circuits for FPGA can be off-loaded from the server host and can be performed by each student's client PC. A floating license scheme allows students through the Internet to utilize commercial FPGA development tools. Thus, we created Virtual Private Network to access the floating license server over firewalls. Such a rich-client configuration allows the server to concentrate on the service management tasks, such as hardware resource managements. The prototype system is scheduled to be used for the third grade CS students from year 2005.

3. Norihiro Fujii and Nobuhiko Koike: "Work in Progress - A New Time-sharing Remote Laboratory E-learning System for Hardware Design and Experiment of Digital Circuits", International Conference on Frontiers in Education 2005 (FIE2005), October 2005, Indianapolis, USA

Abstract — A new remote laboratory system for learning hardware design and experiment of digital circuit has been developed. It employs shared resources and an e-learning system based on the top-down method specializing in the logic circuit design and featuring a quick acquisition of the Hardware-Description-Language-based design skill. Wide use of the Internet motivated us to develop seamless remote and actual hardware laboratories for hardware design laboratory course, and for students to learn the digital circuit design by themselves. The proposed remote laboratory utilizes actual hardware and actual measurement tools in a time-sharing fashion. The combinatorial use of FPGA/PC connected test hardware and PC-based measurement equipments has made it possible to develop a remote multi-user and time-sharing hardware experiment system. As all students are equipped with high-performance Laptop PCs, CPU intensive development tasks can be performed by each student's client PC in a rich-client environment. The prototype the remote-laboratory and self e-learning system are under-construction, and will be used for the third grade CS students from year 2005.

Professor

Yamin LI

Books

1. Ziyu Zhu and Yamin Li, "CPU Chip Logic Design", The Press of Tsinghua University. Jan 2005. ISBN 7-302-09753-4, 353 pages.

   Abstract — The CPU logic design and functional simulation waveforms were given in this book. The contents include the basic digital circuit design, instruction set architecture, computer arithmetic algorithms and the hardware implementations, single-cycle CPU design, multiple-cycle CPU design, pipelined CPU design, system control coprocessor design, memory management unit, interrupt and exception processing. All the circuits were verified with assembly/binary programs.

Refereed Publications

1. Yamin Li, Shietung Peng, and Wanming Chu, "Adaptive Box-Based Efficient Fault-tolerant Routing in 3D Torus", Proceedings of the 11th International Conference on Parallel and Distributed Systems (ICPADS 2005), Volume 1. Fukuoka, Japan, July 20 - 22, 2005, IEEE Computer Society Press, pp.71-77.

   Abstract — In this paper, we propose efficient fault-tolerant routing algorithms for 3D torus with possible large number of faulty nodes. There is no any presumption on the number and the distribution of faulty nodes. The proposed algorithms find a fault-free path between any two nonfaulty nodes with high probability in linear time by using only the local faulty information of the network. The results of our empirical analysis through simulations show that the algorithms can find a fault-free path between any two nonfaulty nodes with a probability higher than 90% in a 3D torus with the number of faulty nodes up to 30%.

2. Yamin Li, Shietung Peng, and Wanming Chu, "Fault-Tolerant Cycle Embedding in Dual-Cube with Node Faulty", International Journal of High Performance Computing and Networking Vol. 3, No. 1, 2005. pp.45-53.

   Abstract — A low-degree dual-cube was proposed as an alternative to the hypercubes. A dual-cube DC(m) has m+1 links per node where m is the degree of a cluster (m-cube) and one more link is used for connecting to a node in another cluster. There are 2^{m+1} clusters and hence the total number of nodes in a DC(m) is 2^{2m+1}. In this paper, by using Gray code, we show that there exists a fault-free cycle containing at least $2^{2m+1}-2f$ nodes in DC(m), $m \geq 3$, with $f \leq m$ faulty nodes.

3. Yamin Li, Shietung Peng, and Wanming Chu, "Online Adaptive Fault-Tolerant

Routing in 2D Torus", Proceedings of Third International Symposium on Parallel and Distributed Processing and Applications, ISPA 2005. Lecture Notes in Computer Science 3758 Springer 2005, ISBN 3-540-29769-3, Nanjing, China, November 2-5, 2005, pp.150-161.

Abstract — In this paper, we propose efficient routing algorithms for 2D torus with possible large number of faulty nodes. There is no presumption on the number and the distribution of faulty nodes. The proposed algorithms find a fault-free path between any two nonfaulty nodes with high probability in linear time by using only the local routing information of the network. The results of our empirical analysis through simulations show that the algorithms can find a fault-free path between any two nonfaulty nodes with high probability. For example, in a torus of size up to 128x128, where, the number of faulty nodes up to 15%, the heuristic-square routing algorithm finds a fault-free path with a probability of 90% or higher. The experimental results are impressive for 2D torus with only four links per node.

4. Yamin Li, Shietung Peng, and Wanming Chu, "An Efficient Distributed Broadcasting Algorithm for Wireless Ad Hoc Networks", Proceedings of the Sixth International Conference on Parallel and Distributed Computing, Applications and Technologies (PDCAT'05), Dec. 5-8, 2005 Dalian, China. IEEE Computer Society Press. pp.75-79.

Abstract — In this paper, we propose a distributed broadcasting algorithm for wireless ad hoc networks. In the algorithm, an efficient strategy is used to determine the forward status of a node by just checking whether there exists a ring that contains all its neighbors. The proposed algorithm is more efficient than the existing broadcasting algorithms in the literatures. That is, the size of the forwarding nodes found by our algorithm is smaller and the running time is faster than other broadcasting algorithms. Reducing the number of forwarding nodes will decrease the probability of transmission collision, and hence improve the packet delivery ratio. The algorithm runs in $O(d^2)$ time, where d is the maximum node degree. The full coverage is not guaranteed but as shown by the simulation results, the probability of full coverage can be over 99 percent when the network contains 100 or more nodes.

Professor

Shaoying LIU

Refereed Publications

1. Shaoying Liu, Fumiko Nagoya, Yuting Chen, Masashi Goya, and John McDermid. "An Automated Approach to Specification-Based Program Inspection" The 7th International Conference on Formal Engineering Methods (ICFEM 2005), Manchester, UK, LNCS 3785 Springer-Verlag, 1-4 November 2005, pp. 421-434.

   Abstract — In this paper, we describe how formal specification is adopted to improve the commonly used verification and validation technique known as program inspection, in order to establish a more rigorous, repeatable, and efficient inspection process than the conventional practice. We present a systematic approach to inspecting program code on the basis of the relation between functional scenarios defined in a specification and execution paths implemented in its program. We report a prototype tool for the approach to support both forward and backward inspection strategies, and a case study of inspecting an Automatic Teller Machine system to evaluate the performance of the approach and the tool.

2. Fumiko Nagoya, Shaoying Liu, Yuting Chen, "A Tool and Case Study for Specification-Based Program Review", The 29th Annual International Computer Software and Applications Conference (COMPSAC2005), Edinburgh, Scotland, July 25-28,2005 IEEE Computer Society Press, pp. 375-380.

   Abstract — Effective tool support is crucial for successfully applying software review techniques in practice. In this paper, we describe the design and implementation of a software tool to support an approach to reviewing programs based on their formal specifications, which was initially proposed in our previous publication to improve the rigor, repeatability, and effectiveness of existing code review methods. We also present a case study of reviewing an ATM system to assess the performance of the review approach when used with the software tool. The result of the case study shows that the approach is effective in detecting errors in programs and the tool is helpful in enhancing the efficiency of the review process.

3. Fumiko Nagoya, Shaoying Liu, Yuting Chen "Design and Implementation of a Specification-Based Program Review Tool", The 9th IASTED International Conference on Software Engineering and Applications (SEA 2005), Phoenix, AZ, USA, November 14-16, 2005, pp. 48-53.

   Abstract — Software Review is an important approach for the verification and validation of programs, and tool support is crucial to ensure its cost-effectiveness in practice. In this

paper, we describe the design and implementation of a software tool to support a specification-based program review method. A review using the method is performed based on the relation between functional scenarios of the specification and program paths of the program. The tool supports the method mainly in automatic derivation of functional scenarios and program paths, automatic generation of control flow diagrams from program source code, and analysis of program paths to detect potential faults. We also present a case study reviewing an ATM system to assess the performance of the tool.

4. Yuting Chen, Shaoying Liu, and Fumiko Nagoya, "A Review Approach to Detecting Structural Consistency Violations in Programs", 4th Annual International Conference on Computer and Information Science (ICIS 2005), IEEE Computer Society Press, July 14-16, 2005, Jeju Island, South Korea, pp. 61-66.

   Abstract — The application of specification-based program verification techniques (e.g., testing, review, and proof) usually faces strong challenges in practice when the gap between the structure of a specification and that of its program is large. In this paper we describe an approach to detecting the violations of the structural consistency in programs based on their specifications by review. The approach is aimed at supporting software development in which programs are constructed based on their formal specifications. We establish a set of criteria and a review process that can guide reviewers to uncover structural consistency violations in programs, and apply the approach in a case study to assess its effectiveness.

5. Fumiko Nagoya, Shaoying Liu, Yuting Chen, "Design of a Tool for Specification-Based Program Review", Workshop on SOFL in the 10th IEEE International Conference on Engineering of Complex Computer Systems (ICECCS2005), Shanghai, China, 16-20 June 2005, IEEE Computer Society Press, pp. 10-11

   Abstract — We propose a rigorous method for reviewing programs that emphasizes the use of formal specifications. The formal specification of a program serves as a standard for analyzing whether the corresponding program correctly implements all the functional-scenarios defined in the specification.

6. Yuting Chen, Shaoying Liu, and Fumiko Nagoya, "A Framework for SOFL-Based Program Review", Workshop on SOFL in the 10th IEEE International Conference on Engineering of Complex Computer Systems (ICECCS2005), Shanghai, China, 16-20 June 2005, IEEE Computer Society Press, pp. 6-7.

   Abstract — Program review is a practical and cost-effective method for detecting errors in program code. This paper describes our recent work aiming to provide support for revealing errors which usually arise from inappropriate implementations of desired

specifications. In our approach, the SOFL specification language is employed for specifying software systems. We provide a framework that guides reviewers to compare a code with its specification for effective detection of potential defects.

Professor

Tetsuo MIZOGUCHI

Other Publications

1. Tetsuo Mizoguchi, "Communication Transaction, Communication Performance and Requirements", Working Paper 10, Operational Data Link Panel Working Group Meeting, ICAO, Montreal, Canada, 14-18 February 2005

   Abstract — As a technical advisor to Civil Aviation Bureau of Japanese Government and a member to develop ICAO Manual on Required Communications Performance (RCP) of OPLINK Panel, the author represented Japan as an expert at the meeting. The paper presented the definitions of Communication Transaction, Communication Performance and Requirements as well as the relationships among them. They are incorporated to the ICAO Manual, finalized at the first OPLINK Panel meeting, September 2005.

2. Tetsuo Mizoguchi, "Asia/Pacific Communication Performance for ATN", Working Paper 11, ICAO Asia/Pacific ATN Transition Task Force Meeting, Shanghai, 18-22, April, 2005

   Abstract — As a technical advisor to Civil Aviation Bureau of Japanese Government and also tasked as the editor to develop the ICAO Regional Document on Communication Performance, the author reported the edited document to the Task Force meeting. The paper explains the concepts related to Aviation Communication, its Performance and its Performance Requirements as well as the procedure to develop requirements and to comply with them. The document is accepted for registry and distribution in the Asia Pacific region.

Professor

Kenji OHMORI

Refereed Publications

1. Kenji Ohmori, "Introduction of master of Business Information Technology – Hosei Business School of Innovation Management," Journal of Information Processing and Management, Jan 2005, pp. 698-702.

   Abstract — Hosei University established Business School of Innovation Management in 2004. This year, a new graduate school system oriented to professional schools started in Japan. Hosei Business School has two courses, one of which is called Master of Business Information Technology. This school is designed to study management promoting of innovation. The course provides concepts of programming, methods to produce innovative software systems, development of large scale software systems. In particular, object oriented methods and open software systems are extensively studied.

2. Kenji Ohmori, "An Internet Accounting System," in Proceedings of the 7th International Conference on Enterprise Software System, May 2005, pp. 407-410.

   Abstract — Software development should be changed from a handcraft industry to industrialization like manufacturing to obtain high productivity. In knowledge creating industry of software development, engineers have to concentrate on core works. Peripheral works should be avoided as much as possible. Model driven architecture helps programmers work mainly in analysis and design without considering much about implementation. Internet Accounting System, which is a standard model of enterprise systems have been developed with model driven architecture with high productivity.

Other Publications

1. Jumpei Akabane, and Kenji Ohmori, "Measuring 3D Positions Using Picture Angles," Research Report of System LSI Design Methodology, IPSJ-SLDM121, Nov. 2005.

Professor

Akira K. ONOMA

Refereed Publications

1. Chris Germano, George T. Wang, and A. K. Onoma, "Framework and Network Based Multimedia Object Management Environment", in Proceedings of *Seventh IEEE International Symposium on Multimedia* (ISM2005), *Irvine California 12-14 December 2005*, pp. 328-335.

   Abstract — Because multimedia objects are becoming more prevalent, on ever-increasing volume, inventing an efficient multimedia object management environment is a matter of increasing urgency. In recognition of this crisis, we developed the Multimedia Object Management Environment (MORE) that includes a suite of tools such as the Vortex Framework, and Network File Indexer(NFI).MORE also includes a fully featured graphical user interface for maximum user control and flexibility. With meta-data, it automatically generate indexes and paths for different types of multimedia objects and allows user to quickly find what they are looking for. In this paper, we address the background architecture, and performance of MORE in detail.

2. Ginji Sawa, Masaya Osaki, Akira K. Onoma, and Tosiyasu L. Kunii, "The Biotope Model, An Op-en-Source Cyberlerning Model and Its Impact on Social Evolution", in Proceedings of *International Conference Cyberworlds 2005, 23-25 November Singapore*, pp. 383-387, 2005.

   Abstract — In the current information society, open-source software products such as Linux have attracted considerable attention due to their widespread public and private use. Information-technology-oriented firms tend to empty open-source software as a part of their business strategy, and as a result conventional business behaviors and customs have begun to break down. Such software has hitherto been discussed mainly in relation to software development, politics, economics, and sociology, but it can and should also be investigated from educational aspects as a means for solving some of the problems affecting society. In this paper, therefore, we explore the potential of open-source learning from the point of view of cyberworlds. We propose here an open-source learning model named in the Biotope Model on the basis of legitimate peripheral participation and scale-free networks as a potential contribution to the improvement and evolution of our society.

3. Tsuneo Yamaura and Akira K. Onoma, "Numerical Software Quality Control in Object Oriented Development", in Proceedings of *IEEE International Workshop on Service-Oriented System Engineering (SOSE 2005), Beijing, China, 20-21 October 2005*, pp. 177-182

Abstract — This paper proposes a new methods to predict the number of the remaining Bugs at the delivery inspection applied to every iteration of OOD, Object Oriented Development. Our method consists of two parts. The first one estimates the number of the remaining bugs by applying the Gompertz curve. The second one uses the interval estimation called OOQP, Object Oriented Quality Probe. The basic idea of OOQP is to randomly extract a relatively small number of test cases, usually 10 to 20% of the entire test cases, and to execute them in the actual operation environment. From the test result of OOQP, we can effectively predict the number of the remaining bugs by the interval estimation. The premier problem of OOQP is that OOD is imposed to use the system design specification document whose contents, like UML, tend to be ambiguous. Our estimation method will work well at a matrix-typed organization where a QA team and a development team collaboratively work together to improve the software quality.

Professor

Shietung PENG

Refereed Publications

1. Yamin Li, Shietung Peng, and Wanming Chu, "Adaptive Box-Based Efficient Fault-tolerant Routing in 3D Torus", Proceedings of the 11th International Conference on Parallel and Distributed Systems (ICPADS 2005), Volume 1. Fukuoka, Japan, July 20 - 22, 2005, IEEE Computer Society Press, pp.71-77.

   Abstract — In this paper, we propose efficient fault-tolerant routing algorithms for 3D torus with possible large number of faulty nodes. There is no any presumption on the number and the distribution of faulty nodes. The proposed algorithms find a fault-free path between any two non-faulty nodes with high probability in linear time by using only the local faulty information of the network. The results of our empirical analysis through simulations show that the algorithms can find a fault-free path between any two non-faulty nodes with a probability higher than 90% in a 3D torus with the number of faulty nodes up to 30%.

2. Yamin Li, Shietung Peng, and Wanming Chu, "Fault-Tolerant Cycle Embedding in Dual-Cube with Node Faulty", International Journal of High Performance Computing and Networking Vol. 3, No. 1, pp.45-53, 2005.

   Abstract — A low-degree dual-cube was proposed as an alternative to the hypercube. A dual-cube DC(m) has m+1 links per node where m is the degree of a cluster (m-cube) and one more link is used for connecting to a node in another cluster. There are 2^{m+1} clusters and hence the total number of nodes in a DC(m) is 2^{2m+1}. In this paper, by using Gray code, we show that there exists a fault-free cycle containing at least $2^{2m+1}-2f$ nodes in DC(m), $m \geq 3$, with $f \leq m$ faulty nodes.

3. Yamin Li, Shietung Peng, and Wanming Chu, "Online Adaptive Fault-Tolerant Routing in 2D Torus", Proceedings of Third International Symposium on Parallel and Distributed Processing and Applications (ISPA2005), Nanjing, China, November 2 - 5, 2005, pp.150-161. Lecture Notes in Computer Science 3758 Springer 2005.

   Abstract — In this paper, we propose efficient routing algorithms for 2D torus with possible large number of faulty nodes. There is no presumption on the number and the distribution of faulty nodes. The proposed algorithms find a fault-free path between any two non-faulty nodes with high probability in linear time by using only the local routing information of the network. The results of our empirical analysis through simulations show that the algorithms can find a fault-free path between any two non-faulty nodes with high probability. For example, in a torus of size up to 128x128, where the number of

faulty nodes is up to 15%, the heuristic-square routing algorithm finds a fault-free path with a probability of 90% or higher. The experimental results are impressive for 2D torus with only four links per node.

4. Yamin Li, Shietung Peng, and Wanming Chu, "An Efficient Distributed Broadcasting Algorithm for Wireless Ad Hoc Networks", Proceedings of the Sixth International Conference on Parallel and Distributed Computing, Applications and Technologies (PDCAT'05), Dec. 5 - 8, 2005 Dalian, China, pp.75-79. IEEE Computer Society Press.

Abstract — In this paper, we propose a distributed broadcasting algorithm for wireless ad hoc networks. In the algorithm, an efficient strategy is used to determine the forward status of a node by just checking whether there exists a ring that contains all its neighbors. The proposed algorithm is more efficient than the existing broadcasting algorithms in the literatures. That is, the size of the forwarding nodes found by our algorithm is smaller and the running time is faster than other broadcasting algorithms. Reducing the number of forwarding nodes will decrease the probability of transmission collision, and hence improve the packet delivery ratio. The algorithm runs in $O(d^2)$ time, where d is the maximum node degree. The full coverage is not guaranteed but as shown by the simulation results, the probability of full coverage can be over 99 percent when the network contains 100 or more nodes.

Professor

Yuji SATO

Refereed Publications

1. Yuji Sato and Ryutaro Kanno, "Event-driven Hybrid Learning Classifier Systems for Online Soccer Games," in Proceedings of the 2005 IEEE Congress on Evolutionary Computation, Vol.3, September 2005, pp. 2091-2098.

   Abstract — This paper reports on the application of classifier systems to the acquisition of decision-making algorithms for agents in online soccer games. The objective of this research is to support changes in the video-game environment brought on by the Internet and to enable the provision of bug-free programs in a short period of time. To achieve real-time learning during a game, a bucket brigade algorithm is used to reinforce learning by classifiers and a technique for selecting learning targets according to event frequency is adopted. A hybrid system combining an existing strategy algorithm and a classifier system is also employed. In experiments that observed the outcome of 10,000 soccer games between this event-driven classifier system and a human-designed algorithm, the proposed system was found to be capable of learning effective decision-making algorithms in real time.

2. Ryuji Goto and Yuji Sato, "Application of Genetic Algorithms to Movement Analysis of a Moving Object by Analyzing Sound Signals," in Proceedings of the 2005 IEEE Congress on Evolutionary Computation, Vol.2, September 2005, pp. 1605-1612.

   Abstract — We have researched for the applicability of the genetic algorithms (GA) to issues such as multi objective optimization, time series prediction, the analysis from observed noisy data and the solution of implicit functions. Concerning these problems, we reported that GA is effective for tracking of the moving ships, and for tracking of the objects orbiting the earth from observed time series bearing and distance data. In this paper, we report the analysis for the movement characteristics of an object in sea water from the observed time series sound signal. This analysis is more complex than those of earlier reports. To analyze the movement characteristics, we applied a two-step GA analysis. The first step GA analyzes harmonic frequencies and their phases of the sound signal radiated by the moving object. The second step GA analyzes the movement characteristics by using output of the first step GA. We could prove the applicability of GA to this analysis through the computer simulation.

3. Yuji Sato and Yuko Kera, "Wireless Access Point Configuration By Genetic Algorithm Using A Local Rule," in Proceedings of the 2005 IEEE Congress on Evolutionary Computation, Vol.2, September 2005, pp. 1516-1523.

Abstract — In this paper, a report is released in relation to an example of the application of the genetic algorithm based on a local evaluation rule where attention is paid to a region in a communication circle from an access point taking up an access point layout problem in the wireless LAN construction as an objective. When the optimum solution is probed by means of an evaluation function taking up the whole entity of the LAN, a circuit becomes unstable in a specific service area even if a solution is the quasi-optimum solution as the whole entity of the system in case that attention is paid to the individual clients, there might be a possibility that an area not necessarily successful in realizing high-quality service is in existence. In this paper, it is explained that the method hereby proposed can first of all obtain the quasi-optimum solution taking up the whole entity of the wireless LAN system, as with the case that an evaluation function taking up the whole entity of the system as an objective is applied. At the next stage, it is explained whether there is a possibility that a solution for practical use where clients' communication situation is considered in a service area will be obtained.

4. Yuji Sato and Ryutaro Kanno, "Event-driven Learning Classifier Systems for Online Soccer Games," in Proceedings of the 2005 Genetic and Evolutionary Computation Conference, ACM Press, Vol.2, June 2005, pp. 2201-2202.

Abstract — This paper reports on the application of classifier systems to the acquisition of decision-making algorithms for agents in online soccer games. The objective of this research is to support changes in the video-game environment brought on by the Internet and to enable the provision of bug-free programs in a short period of time. To achieve real-time learning during a game, a bucket brigade algorithm is used to reinforce learning by classifiers and a technique for selecting learning targets according to event frequency is adopted. A hybrid system combining an existing strategy algorithm and a classifier system is also employed. In experiments that observed the outcome of 10,000 soccer games between this event-driven classifier system and a human-designed algorithm, the proposed system was found to be capable of learning effective decision-making algorithms in real time.

5. Yuji Sato, "Text Dependency in Voice Quality Conversion Using Interactive Evolution," WSEAS Trans. on Information Science and Applications, May 2005, pp. 564-569.

Abstract — This paper reports the results of evaluation experiments performed in relation to text dependency in voice quality conversion using interactive evolution. It is important to investigate beforehand whether text dependency exists when considering engineering applications of voice quality conversion technology. In these experiments, for both natural speech recorded with a microphone and synthetic speech generated from text data, prosodic conversion coefficients previously determined for each conversion target by the interactive evolution technique was applied to different text data for the same speaker, and subjects having no knowledge of the purpose of the experiments were asked to evaluate the speech after conversion. We confirmed that prosodic conversion coefficients determined by the interactive evolution technique, while exhibiting speaker

dependency, is not text dependent.

6. Ryuji Goto and Yuji Sato, "The Analysis for the Movement Characteristics of the Flying Object with Genetic Algorithms," in Proceedings of the Tenth Int. Symp. on Artificial Life and Robotics, February 2005.

Abstract — Issues such as multiobjective optimization, time-series prediction, the analysis from noisy observation data, and the solution of implicit functions are all crucial in the consideration of real world problems, and research into the applicability of evolutionary computer techniques to these problems has already begun. In this paper, we verify the applicability of GA to the problem of analyzing the movement characteristics of flying objects based on only passive observed data.

7. Takenori Nishizono , Satoshi Noami , Yuji Sato, " Proposal of Genetic Operations Reducing the Evaluator Workload to the Voice Quality Conversion Using Interactive GA," in Proceedings of the Tenth Int. Symp. on Artificial Life and Robotics, February 2005.

Abstract — We already proposed the voice quality conversion system using interactive evolution aiming at the technology by which general users can convert to favorite voice quality not confining to convert between specified speakers that are registered previously and without preparation of VQ-codebook etc. On another front, by using interactive evolution, the system needs to reduce the user's burden required to evaluate a voice quality to put into practical use. This paper proposes genetic operations aiming at the reduction of search time when the system uses the tournament selection. The two operations are "the child individual creation based on parent population information" aiming at efficiency improvement of reproduction and reduction of the evaluation time required on one generations and "the population adjustment" aiming at the improvement of diversity. The experimental result that uses the function which evaluates voice quality for convenience shows that the proposed two operation can reduce the number of generations which needs until the detection of target voice quality.

8. Yuji Sato, "Voice Quality Conversion Using Interactive Evolution of Prosodic Control," Applied Soft Computing Journal, Elsevier, January 2005, pp. 181-192.

Abstract — This paper proposes the application of evolutionary computation, a stochastic search technique based on organic evolution, to parameter adjustment for voice conversion, and reports on several experimental results applicable to the fitting of prosodic coefficients. Evolutionary computation is said to be "applicable to even cases where the properties of the target function are not well known," and we decided to apply it considering that this feature might be effective in our study. Providing an explicit evaluative function for evolutionary computation, however, is difficult, and we here adopt an interactive-evolution system in which genetic manipulation is performed repeatedly while evaluating results based on human emotions. Evaluation experiments were

performed on raw human speech recorded by a microphone and speech mechanically synthesized from text. It was found that the application of evolutionary computation could achieve voice conversion satisfying specific targets with relatively little degradation of sound quality and no impression of artificial processing in comparison to parameter adjustment based on designer experience or trial and error. This paper also shows that prosodic conversion coefficients determined by the interactive evolution technique, while exhibiting speaker dependency, is not text dependent.

Other Publications

1. Yuji Sato, "Review: Voice Quality Conversion and Interactive Evolution of Prosodic Control," SICE, January 2005, Vol.44, No. 2, pp. 38-43.

Professor

Hiroshi HANAIZUMI

Refereed Publications

1. Noriyuki Chiba and Hiroshi Hanaizumi, "Development of 3D Face Recognition System," in Proceedings of the 11th Symposium on Image Sensing, June 2005, pp. 257-260. (in Japanese)

   Abstract — This paper addresses the system for measuring 3D shape of human face and the method for recognizing them. The measurement system consists of 3 cameras with calibration. The face surfaces are obtained by stereo matching of these camera images. The 3-D face surfaces are rendered under various illumination conditions, head-pose, scale and occlusion. The effectiveness of our system is demonstrated by the experimental results.

2. Noriyuki Chiba and Hiroshi Hanaizumi, "A Face Recognition System using 3D Face Model – Face Recognition Based on 3D Surface Information" in Proceedings of Meeting on Image Recognition and Understanding, July 2005, pp. 577-582. (in Japanese)

   Abstract — The performance of face recognition systems that use 2D images is dependent on conditions such as lighting, pose, and face expressions. We are developing a face recognition system that uses 3D face surface information to make the system more robust to these arbitrary conditions. This paper addresses the method for recognizing a person using 3D human face model. The recognition is performed by evaluating the distance between reference face surfaces and measured one. The Iterative Closest Point (ICP) algorithm is used for the evaluation. Experimental results showed the validity of the method.

3. Noriyuki Chiba and Hiroshi Hanaizumi, "Three-Dimensional Face Recognition System - Face Recognition Based on 3D Surface Information-,"in Proceedings of the SICE Annual Conference 2005, August 2005, pp.2965-2968

   Abstract — This paper addresses the method for surface matching between the reference face surfaces and measured one. The distance between these face surfaces are evaluated by the minimum distance among point sets on both surfaces using the Iterative Closest Point (ICP) algorithm. Experimental results show that the methods is capable of determining pose and recognition faces accurately over a wide range of poses, with naturally varying illumination conditions and face expressions.

4. Kazuto Tokunaga and Hiroshi Hanaizumi, "Extraction of Aortic Aneurysm

from CT images using Active Contour Models, "in Proceedings of the SICE Annual Conference 2005, August 2005, pp.357-360

Abstract — This paper addresses the method for automated extraction of an aortic aneurysm using the active contour algorithm. Firstly, aortic aneurysm is roughly extracted using MPR image on the assumption that blood flow area in MPR image is part of a circle. Then, we use the circle as the initial contour. The experimental results showed the validity of the method.

Other Publications

1. Noriyuki Chiba and Hiroshi Hanaizumi, "A Face Recognition Sysstem using 3D Facial Model - 3D Shape Retrieving and Recognition-," Reports of Technical Conference of the Information processing Society of Japan, No.2005-CVIM-148, pp.87-92 March 2005. (in Japanese)

2. Noriyuki Chiba, Makiko Nagata and Hiroshi Hanaizumi, "A Generalized Method for Constructing Complete 3D Model from Multi-Directional Distance Images," Proceedings of the 67th of the Annual Conference of the Information processing Society of Japan, Vol.2, pp.51-52 March 2005. (in Japanese)

Professor

Munetake ICHIMURA

Books

1. Satoru Kano and Munetake Ichimura, " Introduction to Physics II . Electromagnetism", Tokyo Kagaku Doujin, ISBN 4-8079-0609-7, 2005. (in Japanese)

   Abstract — Textbook for introductory course of physics. Volume II is devoted to electromagnetism.

2. Munetake Ichimura and Naoki Onishi, "Quantum Mechanics", (new revised version) Housou Daigaku Kyouiku Shinkoukai, ISBN4-595-30560-5, 2005, (in Japanese).

   Abstract — Textbook for quantum mechanics aired on TV by the air-university.

Refereed Publications

1. M. Ichimura, T. Wakasa, and H. Sakai, "Unified Understanding of Spin Isospin Response Functions of Nuclei", *Spin 2004*, (Proc. of the 16th International Spin Physics Symposium), ed. by Kurt Aulenbecher, Franco Bradamante, Andrea Bressen, and Anna Martin, World Scientific, 2005) pp.641-644,

   Abstract — Recent (p,n) and (n,p) experiments at intermediate energies provided reliable data on the nuclear spin-isospin responses. We investigated them with emphasis on the contrastive phenomena, the quenching of the total strength of the Gamow-Teller transition and the enhancement of the pionic response in the quasi-elastic region, in a unified theoretical framework, that is the continuum RPA with the λ+ñ+g' model, incorporated with DWIA and two-step calculations. We extracted a common set of the Landau-Migdal parameters, g'_{NN} =0.6--0.7 and $g'_{N\Delta)}$ =0.2--0.4 for both low and high momentum transfers.

2. Munetake Ichimura, "Configuration mixing for spin-isospin modes", Journal of Physics: Conference Series, 20 (2005) pp.35-40, (ed. by T. Suzuki, T. Ohtsuka, and M. Ichimura, Proc. of International Symposium "Correlation Dynamics in Nuclei", 2005).

   Abstract — Development of theories of configuration mixing is reviewed, concentrating on their application to spin-isospin modes, especially to the Gamow-Teller transitions. This talk is divided into three historical stages, the first order configuration mixing as the

first stage, the second order configuration mixing as the second stage, and the delta-isobar-hole mixing as the third stage.

3. T, Wakasa, M. Ichimura, and H. Sakai, "Unified Analysis of Spin Isospin Responses of Nuclei", Phys. Rev C 72 (2005) 067303-1--4

Abstract — We investigate the Gamow-Teller (GT) response function at a momentum transfer of q = 0fm^{-1} and the pionic response functions for the quasielastic scattering (QES) at q≈1.7fm^{-1}, using the continuum random phase approximation with the λ+ñ+g' model interaction. The Landau-Migdal (LM) parameters, g'$_{NN}$ and g'$_{NÃ}$ are estimated by comparing the calculations with recent experimental data. The peak of the GT resonance and the pionic response functions below the QES peak constrain g'$_{NN}$, whereas the quenching of the GT total strength and the enhanced pionic strength around the QES peak provide information about g'$_{NÃ}$. We obtained g'$_{NN}$=0.6±0.1 and g'$_{N}$=0.35±0.16 at q = 0 fm^{-1} and g'$_{NN}$ = 0.7±0.1 and g'$_{NÃ}$= 0.3±0.1 at q ≒1.7 fm^{-1}. These results indicate that the q dependence of the LM parameters is weak.

Professor

Tsuneo IKEDO

Other Publications

1. T. Ikedo, "Fuzzy Object Renderer," Japan Patent Appl. No. 2005-33610, Jan.13, 2005.
2. T. Ikedo, "Glare Renderer," Japan Patent Appl. No. 2005-33611, Jan.13, 2005.
3. T. Ikedo, "Shadow Silhouette Anti-alias Circuit," Japan Patent Appl. No. 2005-33612, Jan. 13, 2005
4. T. Ikedo, "Semi-Transparent Object Renderer," Japan Patent Appl. No. 2005-33613, Jan. 13, 2005.
5. T. Ikedo, "An-isotropic Reflection Renderer," Japan Patent Appl. No. 2005-124144, March 28, 2005.
6. T. Ikedo, "Frame Buffer Parallel Architecture," Japan Patent Appl. No. 2005-124145, March 28, 2005.
7. T. Ikedo, "Reconfigurable Shader," Japan Patent Appl. No.2005-171590, May 17, 2005.
8. T. Ikedo, "Stripped Polygon Stream Generator," Japan Patent Appl. No. 2005-171589, May 17, 2005.
9. T. Ikedo, "Environment Mapping Renderer," Japan Patent Appl. No. 2005-267621, Aug. 17, 2005.
10. T. Ikedo, "Silhouette Line Anti-alias Circuit," Japan Patent Appl. No. 2005-359568, Nov. 15, 2005.
11. T. Ikedo, "Image Synthesizer," Japan Patent No.3733493, Oct. 28, 2005.
12. T. Ikedo, "Bump-Map Shader," Japan Patent No.3733502, Oct.28, 2005.
13. T. Ikedo, "University Knowledge-Based Venture Industrialization," University and Industry Complex Forum 2005 sponsored by Shizuoka University, Hamamatsu University School of Medicine and Organization for Hamamatsu Technopolis., Hamamatsu-shi, Oct. 21, 2005.

Professor

Jianhua MA

Refereed Publications

1. Jianhua Ma, Laurence T. Yang, Bernady O. Apduhan, Runhe Huang, Leonard Barolli and Makoto Takizawa, "Towards a Smart World and Ubiquitous Intelligence: A Walkthrough from Smart Things to Smart Hyperspaces and UbicKids", International Journal of Pervasive Comp. and Comm., 1(1), March 2005. pp. 53-68.

   Abstract — Following ubiquitous computers, sensors, e-tags, networks, information, services, etc., is a road towards a smart world (SW) created on both cyberspaces and real spaces. It is mainly characterized by ubiquitous intelligence or computational intelligence pervasion in the physical world filled with smart things. In this paper, we discuss the potential trends and related challenges toward the smart world and ubiquitous intelligence from smart things to smart spaces and then to smart hyperspaces.

2. Jianhua Ma, B. O. Apduhan and Laurence T. Yang, "Smart Hyperspaces and Project Ubikids", in IEEE CS Proceedings of the 19th Int'l IEEE Conference on Advanced Information Network and Applications (AINA'05), Vol. 2, Taipei, March 2005. pp. 574-579.

   Abstract — A smart space is an electronics-enhanced physical environment that can sense the existence of users and other entities, and provide them the right services, in the right way, at the right time. The next research issue to emerge, we believe, is to interconnect and integrate these isolated smart spaces together into a higher level space known as a hyperspace. This paper explains our motivations and designs in building a specific smart hyperspace, called Ubikids, to assist parents and provide services to take care of their kids.

3. Jianhua Ma, Jeneung Lee, Kotaro Yamanouchi and Akira Nishizono, "A Smart Ambient Sound Aware Environment for Be Quiet Reminding", in IEEE CS Proceedings of the 11th IEEE Int'l Conference on Parallel and Distributed Systems, Vol. 2, Fukuoka, July 2005. pp. 412-416.

   Abstract — This paper presents a prototype of a smart sound aware environment that captures ambient sounds, analyzes sound situations and gives a be-quiet reminder to someone who generates sound exceeding certain volume level and disturbing others in the same site. It shows the microphone net to sense sound data, the speaker net to send be-quiet reminders, and discusses how sound data is captured and processed and when a be-quiet reminder decision is made with analyzing contexts of sounds and users in a

room.

4. Jianhua Ma, Akito Nakamura and Runhe Huang, "A Random ID Update Scheme to Protect Location Privacy in RFID-based Student Administration Systems", in IEEE CS Proceedings of the 16th DEXA/NBiS-2005, Copenhagen, Denmark, August, 2005. pp. 67-71.

   Abstract — Recently the RFID has been received great attentions and gotten wide applications in many different areas including some administration systems. However, a RFID tag may infringe on its owner's location privacy because of its traceability. Therefore, location privacy problems in RFID-based student administration systems become a critical issue. This paper proposes a safe, fast and low cost scheme in which a hash value is generated from a secret ID and a random number in a RFID tag by using a cheap hash circuit.

5. Jianhua Ma, "Smart u-Things – Challenging Real World Complexity", in IPSJ Symposium Series Vol. 2005, No. 19, Proc. of DPSWS13, Okinawa, November 30 - December 2, 2005. pp. 146-150.

   Abstract — The real physical things are called u-things if they are attached, embedded or blended with computers, networks, and/or some other devices such as sensors, actors, e-tags and so on. Smart u-things are ones that can sense, compute, communicate and take some responsive or automatic actions/reactions/proactions according to their goals, situated contexts, users' needs, etc. The article is devoted to possible challenges in smart u-things' research in terms of real world complexity. The challenges cover sufficiently and precisely detecting surrounding situations, anticipating users' needs, finding the dynamic relations between things, building common knowledge to u-things, letting u-things self-aware, and making looped decisions for error corrections.

6. Nobuhiro Nakamura, Leonard Barolli, Souichirou Takahama, Kaoro Sugita, Jianhua Ma and Arjan Durresi, "Implementation of a Pure P2P Collaboration Multiplatform and Its Applications", Journal of Interconnection Networks, World Scientific, Vol. 6, No. 3, September 2005. pp. 229-244.

   Abstract — In our previous work, we implemented a pure P2P groupware framework called TOMSCOP that offers four types of services: synchronous message transportation, peer room administration, peer communication support and application space management. In this paper we show its extension version, called Multi-Platform P2P System (MPPS), which can operate very smoothly in the UNIX Solaris 9 OS, LINUX Sure 9.1 OS, Mac OSX, and Windows XP.

7. Katsuhiro Takata, Yusuke Shina, Hiraku Komuro, Masataka Tanaka, Masanobu Ide and Jianhua Ma, "Designing a Context-aware System to Detect Dangerous Situations in School Routes for Kids Outdoor Safety Care", in

Springer's Lecture Note in Computer Science (LNCS), Vol. 3824, December 2005. pp. 1016-1025.

Abstract — This research, as a part of UbicKids Project, is focused on designing a context-aware system that dynamically detects the possible dangerous situations in the routes where kids go to and return from schools, and provides prompt advices to kids who may encounter some dangerous situations. Based on analyses of typical dangerous situations in school routes, the paper then shows the system architecture and discusses about danger-related context information processing including context description, representation and presentation.

8. Kei Nakanishi, Makoto Setozaki, Jianhua Ma and Runhe Huang, "A Java-based RFID Service Framework with Semantic Data Binding between Real and Cyber Spaces", in Springer's Lecture Note in Computer Science (LNCS), Vol. 3823, December 2005. pp. 365-374.

Abstract — This paper presents a Java-based framework that offers a set of general services to support various RFID systems for different purposes and application scenarios. The framework emphasizes on the semantic data binding for contextual information mapping between real and cyber spaces. The Java interface classes are provided to support general communications among a RFID, a reader and an application. Real and cyber spaces are synchronized via dynamic and real-time mapping from symbolic strings or IDs to the semantic XML data representations.

Other Publications

1. Jianhua Ma, "Ubiquitous Intelligence – The Intelligence Revolution", ID People Magazine, Published by On Publishing SA, Belgium, April 2005.

Professor

Toshihisa NISHIJIMA

Other Publications

1. Toshihisa Nishijima, "On Upper and Lower Bounds on the Probability of an Undetected Error for Binary Expansions of Generalized Reed-Solomon Codes," Proceedings of 2005 Shannon Theory Workshop, pp. 63-66, Shikotsuko, Hokkaido, Japan, September 18-20, 2005.

2. Toshihisa Nishijima, "On Upper and Lower Bounds on the Probability of an Undetected Error for a Class of Binary Expansions of Concatenated Codes with Generalized Reed-Solomon Codes," Proceedings of The 28th Symposium on Information Theory and Its Applications, pp. 431-434, Onna, Okinawa, Japan, November 20-23, 2005.

Professor

Alexander PASKO

Refereed Publications

1. V. Adzhiev, P. Comninos, M. Kazakov, A. Pasko, Functionally based augmented sculpting, Computer Animation and Virtual Worlds, vol.16, No.1, 2005, John Wiley & Sons, pp. 25-39.

   Abstract — In this paper we describe an approach to computer-aided sculpting concerned with the creation and modification of digital models based on physical abstract sculptures. We begin by presenting a survey of current methods for the creation of computer-aided sculptured artefacts. As well as presenting computer-generated animated models of pre-existing sculptures by Russian artist Igor Seleznev, we also show how some interesting novel shapes can be generated using the HyperFun system. Finally we outline two advanced projects concerned with creating a sculpture-based augmented reality which allows for the interactive participation of the observer.

2. G. Pasko, A. Pasko, T. Kunii, Bounded blending for function-based shape modeling, IEEE Computer Graphics and Applications, vol. 25, No. 2, 2005, pp. 36-45.

   Abstract — We propose new analytical formulations of bounded blending operations for the function-based constructive shape modeling. The blending set operations are defined using R-functions and displacement functions with the localized area of influence. The shape and location of the blend is defined by control points on the surfaces of two solids or by an additional arbitrary bounding solid also defined by a real-valued function. The proposed blending using a bounding solid can be applied to a single selected edge, a vertex, or another blend. We introduce new types of blends such as a multiple blend with the disconnected bounding solid and a partial edge blend. The proposed blending is shown to have versatile applications in interactive design. Influence of all parameters on the blend shape and location is illustrated.

3. R. Cartwright, V. Adzhiev, A. Pasko, Y. Goto, T. Kunii, Web-based shape modeling with HyperFun, IEEE Computer Graphics and Applications, vol. 25, No. 2, 2005, pp. 60-69.

   Abstract — We present a project on research and development of the high level language HyperFun for shape modeling using implicit surfaces and the more general function representation (FRep). An approach to collaborative Web-based shape modeling using HyperFun is described in detail. The presented EmpiricalHyperFun shape modeling system based on Empirical Modeling principles provides users with an unusual degree of mutual interaction through the Web.

4. P.-A. Fayolle, B. Schmitt, Y. Goto, A. Pasko, Web-based constructive shape modeling using real distance functions, IEICE Transactions on Information and Systems, vol. E88-D, No. 5, May 2005, pp. 828-835.

Abstract — An approach and a web-based system implementation for modeling shapes using real distance functions are presented. The system consists of an applet supporting the HyperFun modeling language. The applet is extended with primitives defined by Euclidean distance from a point to the surface of the shape. Set-theoretic operations (union, intersection, difference) that provide an approximation of the Euclidean distance to a shape built in a constructive way are introduced. Such operations have a controllable error of the exact Euclidean distance to the shape and preserve $C1$ continuity of the overall function, which is an important condition for further operations and applications.

5. B. Schmitt, A. Pasko, P.-A. Fayolle, Local metamorphosis of functionally defined shapes, GRAPHITE 2005, ACM SIGGRAPH publication, 2005, pp. 355-361.

Abstract — A new operation for the local control of the metamorphosis of two functionally defined shapes is proposed. To implement this operation, a set of non-overlapping space partitions is introduced, where the metamorphosis occurs locally. The sequence of local metamorphosis processes is controlled by a specific time schedule. The definitions of the partitions, of the time schedule, and finally of the local metamorphosis operation, are described in this paper. Experimental results and comparison with the traditional metamorphosis operations are also provided.

6. E. Kartasheva, V. Adzhiev, P. Comninos, A. Pasko, B. Schmitt, Heterogeneous objects modelling and rendering using implicit complexes, Information Visualization IV'05, IEEE Computer Society, 2005, pp. 854 - 859.

Abstract — This paper describes a technology for modelling and rendering heterogeneous objects containing entities of various dimensionalities within a cellular-functional framework based on the implicit complex notion. Implicit complexes make it possible to combine a cellular representation and a constructive function representation. We describe a formal framework for such a hybrid representation and propose a general structure for implicit complexes. Then, we consider how an implicit complex can be described geometrically and topologically along with its associated attributes. Rendering algorithms for implicit complexes using ray-tracing are also discussed. Finally, we present a case study illustrating the proposed methods and algorithms.

7. A. Pasko, V. Adzhiev, Y. Goto, C. Vilbrandt, Function-based shape modeling framework in multilevel education, Eurographics 2005, Educaton Papers, J.-J. Bourdin and H. McCabe (Eds.), Eurographics Association, 2005, pp.19-23.

Abstract — An approach to using the development of a shape modeling and visualization

framework based on the rapidly progressing function representation in education. The modeling language and software tools are being developed within an international HyperFun Project. We applied the theoretical framework and software tools on different levels of education starting from elementary schools to doctoral thesis research in various areas related to mathematics, computer graphics, programming languages, artistic design and animation. We illustrate the presented approach by the practical experience examples from different educational institutions and countries.

8. G. Pasko, A. Pasko, T. L. Kunii, Ternary blending operations, 21st European Workshop on Computational Geometry, Technische Universiteit Eindhoven, Netherlands, March 9-11, 2005, pp. 143-145.

Abstract — We discuss new analytical formulations for localized and controllable blending operations in the function-based solid modeling and computer animation. The blending set operations are defined using R-functions and displacement functions with the localized area of influence. The shape and location of the blend are controlled by an additional bounding solid thus turning the operation into a ternary one. We also describe a new approach to solving the problem of shape metamorphosis between k-dimensional shapes by applying space-time bounded blending to the specially constructed (k+1)-dimensional half-cylinders and making cross-sections for getting intermediate shapes under the transformation.

9. E. Kartasheva, V. Adzhiev, P. Comninos, A. Pasko, B. Schmitt, Construction of implicit complexes: a case study, WSCG'05, 13th International Conference in Central Europe on Computer Graphics, Visualization and Computer Vision, Ed. V. Skala, 2005, pp. 219-226.

Abstract — This paper presents a detailed description of a case-study demonstrating a novel method for modelling and rendering of heterogeneous objects containing entities of various dimensionalities within a cellular-functional framework based on the implicit complex notion. Implicit complexes make it possible to combine a cellular representation and a constructive function representation. We briefly describe a formal framework for such a hybrid representation as well as a general structure for implicit complexes. Then, using a representative example, we show how an implicit complex can be constructed geometrically and topologically. We also consider the main rendering issues specific to implicit complexes and describe some implementation problems.

10. E. Kartasheva, V. Adzhiev, P. Comninos, A. Pasko, B. Schmitt, Modelling with implicit complexes, ACM SIGGRAPH 2005, Sketches, LA, USA, August, 2005.

Abstract — This sketch presents a novel method for modelling heterogeneous objects. Such objects can be heterogeneous from the point of view of their dimensionality and internal structure. We have defined a hybrid model, called an Implicit Complex based on the concepts of cellular spaces and CW-complexes. We have extended CW-complexes with the implicit description of cells and allowed more sophisticated relations, between the cells, to be defined.

Professor

Yukiko SASAKI ALAM

Refereed Publications

1. Yukiko Sasaki Alam, "Lexicon Divided According to the Division of Labor," in Zygmunt Vetulani (ed.), *Human Language Technologies as a Challenge for Computer Science and Linguistics*, Wydawnictwo Poznanskie Sp. z. o.o., Poznan, Poland, pp. 134-138. 2005. (ISBN 83-7177-341-2)

Abstract — Focus of the current research is on the lexicon in natural language processing. The structure and contents of the lexicon are a vital issue to be addressed, yet much explicit discussion on them as a whole is not out. This paper proposes a model that performs morphological, syntactic and semantic analyses by using three levels of lexicons. The first level of lexicon is for morphological analysis, and lists the strings of the morphemes of a language, the morphological properties and the syntactic categories, whereas the second level is for syntactic analysis, and consists of several dictionaries divided according to the syntactic categories and subcategories. Each of the second level of dictionaries provides information on the meanings of words. Verbs are listed in syntactically subcategorized dictionaries such as a dictionary for NP/V/VCOMPP or NP/V/SCOMPP and a dictionary for NP/V/NP. The third level of lexicon is a semantic lexicon, indexed with unique meanings, and furnished with information on the semantic classes of the meanings, so that each meaning could attain more information relating to the class from the table of semantic classes. The third level of semantic lexicon is intended for all languages. For a comprehensive view of the model, the present paper elaborates a step-by-step process of parsing an English sentence in interaction with the relevant dictionaries.

Professor

Vladimir SAVCHENKO

Refereed Publications

1. I. Semenova, V. Savchenko, and I. Hagiwara, "A New Approach for Improvement of Polygonal Meshes Representing Surfaces with Sharp Edges and Boundaries," JSME International Journal Published by The Japan Society of Mechanical Engineers, Vol. 48, No. 2, June, 2005, pp. 122-129

Abstract — In this paper, we introduce a new approach to surface mesh improvement problem. In contrast to previous methods we do not tend to preserve new mesh vertices on the original discrete surface. Instead our technique keeps mesh nodes very close to a smooth or piecewise-smooth surface approximated by the initial mesh. As a result, the algorithm is able to improve mesh quality while preserving essential surface characteristics and features. Proposed approach can be applied iteratively not only to polygonal meshes but also to 2D and 3D curves that allows to treat sharp edges and surface boundaries. We demonstrate effectiveness of our method using various triangular and quadrilateral meshes. Also we compare our algorithm with some commonly used techniques and analyze their advantages and disadvantages.

2. M. Savchenko, O. Egorova, V. Savchenko, I. Hagiwara, and V. Savchenko, "Hexahedral Mesh Improvement Algorithm," JSME International Journal Published by The Japan Society of Mechanical Engineers, Vol. 48, No. 2, June, 2005, pp. 130-136

Abstract — In this paper, we present a novel method, based on an implementation of quasi-statistical modeling, for improving hexahedral solid meshes. A method for improving meshes by producing elements with a Gaussian (normal) distribution of the mesh quality parameter values is discussed. The main intention is to attain a fairly smooth change from one mesh element to another without creating a significant difference between the shapes of neighboring elements. As regards the initial distribution of the mesh quality parameter values, we assume that after improvement the distribution varies from a rather random distribution to a smoother one, such as a normal distribution. The preliminary choice of the desirable distribution affects the new parameter values modeled by the formula presented here. Our method can be used in a pre-processing stage for subsequent studies (finite element analysis, computer graphics, etc.) by providing better input parameters for these processes. Experimental results are included to demonstrate the functionality of our method.

3. M. Savchenko, O. Egorova, I. Hagiwara, and V. Savchenko, "An Approach to Improving Triangular Surface Mesh, " JSME International Journal

Published by The Japan Society of Mechanical Engineers, Vol. 48, No. 2, June, 2005, pp. 137-148

Abstract — Our method is based on an implementation of quasi-statistical modeling for improving meshes by producing mesh elements with modeled values of different mesh quality parameters. In this paper we implement this approach to triangular surface mesh. Considering the initial distribution of the mesh quality parameter values, we assume that after improvement the distribution of elements of the mesh varies from a rather random distribution to a smoother one, such as a normal distribution. The preliminary choice of the desirable distribution affects the new parameter values modeled by the formula presented here. Uncertainty of the smoothed vertex positions of the mesh element affords to use a statistical approach in sense of random variable modeling to connect quasi-statistical modeling and mesh improvement techniques. The so-called "kernel" method allows creating different applicable to a mesh processing algorithms, which can be interpreted as a kind of smoothing technique to determine vertex direction movement with the distribution control of the shape of mesh elements. An aspect ratio is mainly used in present research as a mesh quality parameter. The geometry of the initial mesh surface is preserved by local mesh improving such that the new positions of the interior nodes of the mesh remain on the original discrete surface. Our method can be interpreted as a kind of smoothing technique with using the distribution control of the mesh quality parameter values. This method is comparable with optimization-based approach for avoiding the invalid elements of the mesh by producing a mesh with a rather homogeneous distribution of the mesh elements. Experimental results are included to demonstrate the functionality of our method. The method can be used at a pre-process stage for subsequent studies (finite element analysis, computer graphics, etc.) by providing the better-input parameters for these processes.

4. V. Savchenko, "2D Local Sample-Based Interpolation as a Tool for Approximation of 3D Point Sets," JSME International Journal Published by The Japan Society of Mechanical Engineers, Vol. 48, No. 2, June, 2005, pp. 176-183

Abstract — We describe a novel algorithm for local approximation of scattered surface points, implementing a 2D finite element interpolation algorithm in combination with approximation of coordinates using quadrics for conversion of noisy data to sufficiently smooth data sets. The applied methods and time performance of the developed algorithm are discussed. Experimental results are included to demonstrate the functionality of our approximation technique.

5. V. Savchenko, "Trends and Solutions in CAD/CG," JSME International Journal Published by The Japan Society of Mechanical Engineers, Vol. 48, No. 2, June, 2005, pp. 184-196

Abstract — Past and current trends in CAD/CG are discussed. An overview of the approach used in our ongoing project is given. Our final goal is primarily focused on

developing a shape modeling system for solving problems of surface generation and enhancement, which includes polygon generation from unorganized points, shape smoothing, simplification, and improvement of mesh quality parameters of 3D polygonal sets.

6. Semenova, V. Savchenko, I. Hagiwara, "Reconstruction of Shapes Based on Normals Analysis," Proceedings 15th International Conference on Computer Graphics and Vision (Graphicon'2005), June 20-24, 2005, pp. 125-131

Abstract — Most mesh processing filters (including remeshing, simplification, and subdivision) affect vertices of the mesh. Vertices coordinates are modified, new vertices are added and some original ones are removed, with the result that the shape of the original surface is changed. While a great deal of research is concentrated on preservation of surface shape during some mesh processing, there is no general tool that can be used for surface reconstruction at post processing stage. To the best of our knowledge, this paper is the first one to present a restoring algorithm that allows to "repair" output of various mesh processing filters. The proposed scheme is straightforward way to put "off-surface" vertices of the deformed mesh back to the original smooth shape. It does not require any surface parameterization and is based on normal analysis. The procedure is demonstrated by using it as post processing tool after applying local node movement and simplification algorithms. However, the technique is versatile enough to be used in a large variety of mesh optimization algorithms including remeshing and subdivision schemes.

7. D. Yamazaki and V. Savchenko, "Physically-based Visual Simulation of Comets in Virtual Environments Modeling the Solar System," Proceedings of the IASTED Eighth International Conference COMPUTERS and ADVANCED TECHNOLOGY in EDUCATION, Oranjestad, Aruba, Aug 29-31, 2005, pp. 171-176

Abstract — Visual simulation of various natural phenomena is one of the most important research fields in computer graphics. Simulations with physical correctness are useful to improve computer graphics images with more realistic rendering results. In addition, such simulations let people understand phenomena exactly and easily, and therefore play an important role in educational fields. In this article we present a simulation system for comet behavior in virtual environments such as a model of Solar System with moving comets. The purpose of our system is to visualize results of the simulation of whole phenomena of comets, including the evaporation process, the process of the coma generation, and dynamically changing tails influenced by the surrounding environment.

8. I. Semenova, N. Kozhekin, V. Savchenko, and I. Hagiwara , "A General Framework for Analysis and Comparison of Surface Mesh Optimization Techniques," Engineering with Computers, Springer-Verlag London Ltd ,

ISSN: 0177-0667 (Paper), 1435-5663 (Online),
DOI: 10.1007/s00366-005-0305-y ,Vol. 21, No, 2, December 2005, pp. 91 - 100

Abstract — Many different algorithms for surface mesh optimization (including smoothing, remeshing, simplification and subdivision), each giving different results, have recently been proposed. All these approaches affect vertices of the mesh. Vertex coordinates are modified, new vertices are added and some original ones are removed, with the result that the shape of the original surface is changed. The important question is how to evaluate the differences in shape between the input and output models. In this paper, we present a novel and versatile framework for analysis of various mesh optimization algorithms in terms of shape preservation. We depart from the usual strategy by measuring the changes in the approximated smooth surfaces rather than in the corresponding meshes. The proposed framework consists of two error metrics: normal-based and physically based. We demonstrate that our metrics allow more subtle changes in shape to be captured than is possible with some commonly used measures.

Professor

Toru WAKAHARA

Refereed Publications

1. Toru Wakahara, "Multi-template GAT Correlation for Character Recognition with a Limited Quantity of Data," in Proceedings of the 8th International Conference on Document Analysis and Recognition, Vol.2, August 2005, pp. 824-828.

   Abstract — This paper addresses the problem of how to construct a robust character classifier when statistical pattern recognition techniques fail because of a limited quantity of data. The key ideas are two ways. One is to adopt a distortion-tolerant shape matching technique. Here, we use an affine-invariant matching technique of global affine transformation (GAT) correlation to absorb linear distortion between grayscale images. The other is to prepare multiple templates for dealing with nonlinear distortion or topologically different shapes. For this purpose K-means clustering is applied to a given limited data in a simple gradient feature space. Recognition experiments using the handwritten numeral database IPTP CDROM1B show that the proposed method achieves a much higher recognition rate of 97.2% as compared to that of 85.8% obtained by the conventional, simple correlation matching with a single template per category.

2. Minoru Yokobayashi and Toru Wakahara, "Segmentation and Recognition of Characters in Scene Images Using Selective Binarization in Color Space and GAT Correlation," in Proceedings of the 8th International Conference on Document Analysis and Recognition, Vol.1, August 2005, pp. 167-171.

   Abstract — This paper proposes a new technique of segmentation and recognition of characters with a wide variety of image degradations and complex backgrounds in natural scenes. The key ideas are twofold. One is segmentation of character and background by local/adaptive binarization of one of Cyan/Magenta/Yellow (CMY) color planes with the maximum breadth of histogram. The other is affine-invariant grayscale character recognition using global affine transformation (GAT) correlation. In experiments, we use a total of 698 test images extracted from the public ICDAR 2003 robust OCR dataset containing images of single characters in natural scenes. In advance, we classify those images into seven groups according to the degree of image degradations and/or background complexity. On the other hand, we prepare a single-font set of 62 alphanumerics for templates. Experimental results show an average recognition rate of 70.3%, ranging from 95.5% for clear images to 24.3% for little-contrast images.

3. Yusuke Ojima, Satoshi Kirigaya, and Toru Wakahara, "Determining Optimal Filters for Binarization of Degraded Grayscale Characters Using Genetic Algorithms," in Proceedings of the 8th International Conference on Document

Analysis and Recognition, Vol.2, August 2005, pp. 555-559.

Abstract — Optimal binarization of degraded grayscale characters is a crucial step to subsequent character recognition. This paper proposes a new, promising binalization technique of grayscale characters using genetic algorithms (GA) to search for an optimal sequence of filters from among a set of rather simple, representative image processing filters. First, we classify degraded samples of grayscale characters into several categories. Then, in the learning stage, by selecting a training sample from each degradation category we apply GA to the combinatorial optimization problem of determining a sequence of filters that maximizes the fitness value between the filtered training sample and its target image ideally binarized by humans. Finally, in the testing stage, we apply the optimal sequence of filters thus obtained to remaining test samples for each degradation category. Experiments using the public ICDAR 2003 robust OCR dataset demonstrate promising results of binarization of grayscale characters against a wide variety of degradation causes.

4. Yoshimasa Kimura, Toru Wakahara, and Akira Tomono, "Combination of Statistical and Neural Classifiers for a High-Accuracy Recognition of Large Character Sets," The Journal Systems and Computers in Japan, Vol.36, No. 9, pp. 97-107, August 2005.

Abstract — In this paper the authors propose a method for high-accuracy recognition of large character sets using a new combination of a statistical method and neural networks. In their method, a hierarchical structure that has several neural networks arranged in a line after the statistical method is used. First, recognition using a statistical method is performed, and this represents the final result if the top candidate does not belong to a predefined set of similar characters. If it does, then the input character is discriminated in a neural network which designates the top candidate by determining the similar characters. The results are output as final results. The basic idea of this method is the functional division of a statistical method and neural networks, and the use of a neural network as determined by a statistical method. The results of recognizing 3201 character types including JIS-1 Kanji showed an improvement in the correct recognition rate due to the combined use of a statistical method and neural networks, thereby demonstrating the validity of the authors' approach.

Other Publications

1. Yosuke Ninomiya, Norio Ikeda, Kousuke Yamazaki, and Toru Wakahara, "Study on Detection and Recognition of Faces in Images Using Eigenspace and GAT Correlation," Reports of the 216th Technical Conference of the Institute of Image Electronics Engineers of Japan, No.04-07-01, March 2005.

2. Shinya Makino and Toru Wakahara, "Affine-Invariant GAT Correlation Matching of Face Images," Journal of Japanese Academy of Facial Studies, Vol. 5, No. 1, p. 176, Oct. 2005.

Professor

Kenji YOSHIDA

Other Publications

1. Kenji Yoshida, "e-Scanner," NIHON KEIZAI SHIMBUN, p. 16, Feb. 22, 2005.

2. Kenji Yoshida, "e-Scanner system," 2020AIM, Vol. 237, pp. 58-59, Feb. 2005.

3. Kenji Yoshida, "e-Scanner," Gekkan ASCII, p. 23, June 2005.

4. Kenji Yoshida, "New auto-recognition system called e-Scanner," Gekkan JIDO-NINSHIKI, pp. 32-35, July 2005.

5. Kenji Yoshida, "Auto-recognition system," Fuji Sankei Business-I, p. 15, Sep. 29, 2005.

Professor

Shuichi YUKITA

Refereed Publications

1. Shuichi Yukita, "Cellular automata in non-Euclidean spaces," WSEAS Transactions on Mathematics, Vol.4, Issue 3, July 2005, pp. 273-280.

Abstract — Classical results on the surjectivity and injectivity of parallel maps are shown to be extendible to the cases with non-Euclidean cell spaces of particular types. Also shown are obstructions to extendibility, which may shed light on the nature of classical results such as the Garden-of-Eden theorem.