Annals of the Faculty of Computer and Information Scienses, Hosei University

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Associate Professor
Akira Sasaki

Refereed Publications

1. Shigeyuki Kabano and Akira Sasaki, "Automatic Generation of Optimized Instruction Patterns Using a Portable Superoptimizer and Peephole Optimization using their Patterns", Information Technology Letters, vol. 6, pp. 17-20, 2007.

Abstract: Peephole optimization locally examines assembly language and replaces one sequence of instructions by another equivalent, but faster, sequence of instructions. Usual peephole optimization uses pattern matching rules written by human, but it requires their expertise and experience. One solution to this problem is to use superoptimization. Superoptimization automatically generates such patterns in a "brute force" manner. However, the existing method in which superoptimization is performed on the instruction set of a target machine has a problem. When a compiler developer needs to port a superoptimizer to another machine, he or she must remake a new superoptimizer from scratch. In our approach, we employed a portable superoptimizer. It searches optimized instruction sequences on an intermediate representation. Accordingly, we will be able to port the superoptimizer and the peephole optimizer to another machine by creating a new mapping of the intermediate representation and the target machine. We implemented this method by using the COINS compiler infrastructure and detected some effective patterns.

2. Akira Sasaki and Hiroshi Deguchi, "Interactive Agent-Based Simulation Environment of SABER" in S.Takahashi, D. Sallach and J.Rouchier (Eds.) Advancing Social Simulation: The First World Congress, pp. 177-188, 2007, Springer, ISBN 978-4-431-73150-4, Tokyo, Japan. (One of selected papers for post-proceedings, originally presented at the First Congress on Social Simulation, 2006, partially rewritten for publication.)

Abstract: In this paper, we describe SABER - Simulator for Agent Based Education Architecture. SABER provides an interactive simulation environment that employs methodology of agent based modeling. Users can model virtual worlds and run the models on SABER. SABER provides tools for visual programming suitable for rapid prototyping especially for teachers to construct educational material. Through user interfaces of SABER, users can access objects on their model during simulation runtime, and can update states and behavior of objects

on-the-fly. Using teachers' material on SABER, students can understand the
model deeply by freely updating or enlarging the model.

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Professor
Hiroshi Hanaizumi

Other Publications

1. Hiroshi HANAIZUMI, "Improved Method for Registering Lung Vessels Using Multi-temporal Helical CT Data," IEICE Technical Report, MI2007-1, pp. 11-14, January 2007.

Professor
Runhe Huang

Refereed Publications

1. Hiroyuki Morohoshi, Runhe Huang, Jianhua Ma and Ying Huang, "A Bridge Linking Ubiquitous Devices and Grid Services," in IEEE CS Proceedings of the 21st International Conference on Advanced Information Networking and Applications (AINA2007), Canada, May 2007, pp. 747-753.

   Abstract: Grid computing has made rapid strides from their first serving the scientific computing domain to having great impact on the life science area and their use in the daily activities of users from the resource constrained ubiquitous devices such as PDA and mobile phone. To allow ubiquitous devices to use Grid services, there is a necessity to having a platform or middleware, a bridge linking the devices to Grid services. This paper presents such bridge named BtoG (Bridge to Grid). The design idea and system architecture are described, a sample application of skin checking, accessing to a skin-expert service from a mobile phone via the proposed bridge, is explained, and evaluation and comparisons with other related platforms are given in the paper.

2. Katsuhiro Takata, Masataka Tanaka, Jianhua Ma, Runhe Huang, Bernady O. Apduhan, and Norio Shiratori, "A Wearable System for Outdoor Running Workout State Recognition and Course Provision," in the Lecture Note in Computers Science on Autonomic and Trusted Computing (ATC2007), Vol. LNCS 4610, Springer, 2007, pp. 385-394.

   Abstract: The objective of this research is to develop a wearable prototype system to assist people doing outdoor running workout safely and effectively. One essential research issue is to correctly recognize a runner's state during a running workout process by analyzing contextual data obtained from sensors and GPS positioning device carried on by the runner. The running workout process is represented as a state transition diagram using the Space-Oriented Model. The state recognition is based on the state correlations with the runner's heartbeat rate and running speed. Our test results show that by utilizing the runner's state correlation, is more precise to recognize a runner's state as compared to the state judgment which is only based on detecting whether a sensed value exceeds some medical threshold value.

Professor
Munetake Ichimura

Refereed Publications

1. T. Wakasa, Y. Hagihara, T. Noro, T. Ishida, S. Asaji, Y. Nagasue, K. Hatanaka, Y. Sakemi, A. Tamii, Y. Shimizu, K. Fujita, Y. Tameshige, H. Sakai, H. Kuboki, M. Sasano, M. Ichimura, H. Kamada, M. Yamaguchi, "Isovector effective NN interaction in ^{28}Si(p, n)^{28}P(6⁻) at 198 MeV," in Physics Letters, B645, (2007) pp. 402-407.

Abstract: We report measurements of the cross section and a complete set of polarization observables for the ^{28}Si(p,n)^{28}P(6⁻) reaction at a bombarding energy of 198 MeV. The data are compared with distorted wave impulse approximation calculations employing response functions normalized to inelastic electron scattering. The spin-longitudinal polarized cross section ID_q is slightly over-predicted by the calculations, while the normal spin-transverse polarized cross section ID_n is significantly under-predicted. The calculated in-plane spin-transverse ID_p and spin-scalar ID_0 polarized cross sections agree well with the experimental data. These results are consistent with those for ^{28}Si(p,p')^{28}Si(6⁻, T = 1) scattering at the same energy, and thus it is concluded that isospin-mixing effects are not responsible for the discrepancy between theory and experiment in the (p,p') case. Energy half-off-shell effects as medium effects on the effective nucleon-nucleon interaction are also investigated and found to be too small to be responsible for the discrepancy.

2. T. Wakasa, M. Dozono, E. Ihara, S. Asaji, K. Fujita, K. Hatanaka, M. Ichimura, T. Ishida, T. Kaneda, H. Matsubara, Y. Nagase, T. Noro, Y. Sakemi, Y. Shimizu, H. Takeda, Y. Tameshige, A. Tamii, Y. Yamada, "Study of nuclear correlation effects via ^{12}C(p,n) ^{12}N(g.s.,1⁺) at 296 MeV," in Physics Letters, B 656, (2007) pp.38-44.

Abstract: We report measurements of the cross section and a complete set of polarization observables for the Gamow-Teller ^{12}C(p,n)^{12}N(g.s., 1⁺) reaction at a bombarding energy of 296 MeV. The data are compared with distorted wave impulse approximation calculations employing transition form factors normalized to reproduce the observed beta-decay ft value. The cross section is significantly under-predicted by the calculations at momentum transfers $q \geq 0.5$fm⁻¹. The discrepancy is partly resolved by considering the non-locality of the nuclear mean field. However, the calculations still under-predict the cross section at large

momentum transfers of $q \doteq 1.6 \mathrm{fm}^{-1}$. We also performed calculations employing random phase approximation response functions and found that the observed enhancement can be attributed in part to pionic correlations in nuclei.

Professor
Tsuneo Ikedo

Other Publications

Patent Applications:

1. T. Ikedo, "Collision Detection Circuit based on Visual Projection," P01, Appl. Dec.13, 2007.
   Abstract: A collision detection technique for real-time animation in 3D space. The circuits detects the collided objects by visual testing on projected plane on cube-map and returns the geometric information and attributes at collided point without computation cost on application processor.

2. T. Ikedo, "Real-time Global Illumination used Grid Space Subdivision," P01, Appl. Dec.30, 2007.
   Abstract: Technique to illuminate objects with environmental scattered light, divided 3D object space into grids, pre-processing to determine intensity on every grid by physical based illumination model, and defining a light-intensity on polygon vertices of object surface with grid intensities.

URL:

1. http://www.parims.org/ "Technical Reports on 2007 Revision"

Professor
Katunobu Itou

Refereed Publications

1. Takehiro Shigeta and Katunobu Itou, "A Performance Prediction Method for Very Large Vocabulary Word Recognizers," Proc. of O-COCOSDA 2007, pp. 49-53, December 2007.

Abstract: This paper addresses one of the fundamental problems encountered in performance prediction for speech recognition. In particular we address problems related to the estimation of small-size development utterances that can give good error estimates and their confidence regarding very large vocabulary proper name recognition.

2. Koji Ozawa, Yoshihiro Nishiwaki, Toshihiro Wakita, Chiyomi Miyajima, Katunobu Itou, and Kazuya Takeda, "Modeling of Individual Characteristics in Driving Behavior Signals Using Spectral Analysis," in Trans. IEICE, Vol. J90-D No. 4 pp. 1115-1123, 2007.

Abstract: Driving behavior modeling using such driving signals as gas and brake pedal operation signals has been widely researched. Driving behaviors are different among drivers and driver modeling has also been investigated from different points of view in cognitive and engineering approaches. In this paper, driver's characteristics are extracted through spectral analysis of pedal operation signals as cepstral coefficients representing spectral envelopes. A driver model based on the cepstral feature is evaluated in driver identification experiments using driving signals collected in a driving simulator and a real vehicle. Experimental results show that the driver model based on cepstral features can represent the driver's individualities more efficiently than a conventional driver model.

3. Chiyomi Miyajima, Yoshihiro Nishiwaki, Koji Ozawa, Toshihiro Wakita, Katunobu Itou, Kazuya Takeda, and Fumitada Itakura, "Driver Modeling Based on Driving Behavior and Its Evaluation in Driver Identification," in Proc. of the IEEE, Vol. 95, No. 2, pp.427-437 (invited paper) 2007.

Abstract: All drivers have habits behind the wheel. Different drivers vary in how they hit the gas and brake pedals, how they turn the steering wheel, and how much following distance they keep to follow a vehicle safely and comfortably. In this paper, we model such driving behaviors as car-following and pedal operation

patterns. The relationship between following distance and velocity mapped into a two-dimensional space is modeled for each driver with an optimal velocity model approximated by a nonlinear function or with a statistical method of a Gaussian mixture model (GMM). Pedal operation patterns are also modeled with GMMs that represent the distributions of raw pedal operation signals or spectral features extracted through spectral analysis of the raw pedal operation signals. The driver models are evaluated in driver identification experiments using driving signals collected in a driving simulator and in a real vehicle. Experimental results show that the driver model based on the spectral features of pedal operation signals efficiently models driver individual differences and achieves an identification rate of 76.8% for a field test with 276 drivers, resulting in a relative error reduction of 55% over driver models that use raw pedal operation signals without spectral analysis

4. Takanori Nishino, Naoya Inoue, Katunobu Itou, and Kazuya Takeda, "Estimation of sound source direction based on Gaussian model using envelope of interaural level difference," JASJ, Vol. 63, No. 1, pp. 3-12, 2007.

Abstract: A binaural sound is one of stereo sound and includes characteristics of sound reflection and refraction at the head and ears. Using the frequency characteristic of binaural sound, robot can detect the sound source direction. In this study, we propose the detection method of sound source direction with binaural sound in reverberant environments. This method uses an envelope of interaural level difference and detects the direction of sound source with Gaussian mixture model (GMM). At 30°intervals, the detection model with GMM achieved 99.5% accuracy in white noise and 100% accuracy in Human speech like noise in the case of 48kHz sampling rate. This proposed method obtained the same accuracy rate during various reverberation time.

Professor
Satoru S. Kano

Other Publications

1. I. Otake, M. Matsuoka, Y. Tada, S. S. Kano and A. Wada, "Effects of excitation pulse in 2-color optimized pulse shaping method," The Chemical Society of Japan 87th Annual Meeting, 3G2-32, March, 2007.
2. I. Otake, Y. Tada, S. S. Kano and A. Wada, "Hybrid 2-color optimized pulse shaping method," 23rd Symposium on Chemical Kinetics and Dynamics, 2P48, June, 2007.

Professor
Nobuhiko Koike

Refereed Publications

1. Norihiro Fujii and Nobuhiko Koike: "Multi-user/Multi-test-bed Remote Hardware Laboratory with Job Management System," Proceedings 2007 International Conference on Microelectronic Systems Education (MSE07), pp. 39-40, June 2007, San Diego, California, USA.

Abstract: A new remote hardware laboratory, supporting multi-user/multi-test-bed, has been developed. Learners can perform experiments remotely utilizing actual hardware and actual measurement tools. It employs FPGAs for design implementation test-beds. It can handle many experiment sessions concurrently, by making use of actual hardware test-beds in time and space division fashions. Learners at remote sites (their homes) can perform actual hardware experiments in parallel. It realized seamless remote and actual hardware laboratories. The combinatorial use of FPGA/PC connected test hardware and PC-based measurement equipments has made it possible to develop a multi-user/multi-test-bed remote hardware experiment system. In order to allocate available experimental environments for users at the same time, job management system is developed. The prototype system of self-learning experiment environment for digital circuit designs and experiments is in use for 3rd class CS students at Hosei University.

2. Norihiro Fujii, and Nobuhiko Koike: "A New eLearning System Integrating A Top-down eLearning and New Virtual Remote Laboratory Environments for Logic Circuit Design," Proceedings 37th Frontiers in Education Conference (FIE07), pp. S3G-1-S3G-6, October 2007, Milwaukee, Wisconsin, USA.

Abstract: A new distance learning system, integrating a top-down design support system and a multi-user/multi-test-bed remote laboratory system for digital circuit hardware design and implementation course, has been realized. The proposed system employs the hardware description language (VerilogHDL) for the design database and FPGAs for design implementation test-beds. It can handle many experiment sessions concurrently, by making use of actual hardware test-beds in time-division and space-division fashions. Students at remote sites can perform actual hardware experiments in parallel. The top-down design support system guides students to complete projects. The course material database is organized in the form of a design-module-cell hierarchy tree, where

each design-module-cell contains a sample circuit design, described in VerilogHDL. The use of XML wrapped VerilogHDL descriptions and specially extended XML vocabularies contributed to share designed modules among students and teachers across the Internet via the Web. This remote laboratory utilizes actual hardware and actual measurement tools in a time-sharing fashion, and has made it possible to develop a remote multi-user and time-sharing hardware experiment system. It enabled to realize seamless remotes and actual hardware laboratories. The prototype of the distance learning system, integrating both the digital circuit design support system using top-down approach and the multi-user remote laboratory system for running experiment of digital circuit, has been developed. It resolves conflicts among users, when many users request the same services at the same time. Moreover, this laboratory is available to run all experiments without missing users' requests. It has achieved an effective and efficient distance learning system.

Professor
Yamin Li

Refereed Publications

1. Yamin Li, Shietung Peng, and Wanming Chu, "A Localized Algorithm for Reducing the Size of Dominating Set in Mobile Ad Hoc Networks", Proceedings of the International Conference on Mobile Computing, Communications, and Applications (ICMOCCA)}, to be published. Uzbekistan, September 26-27, 2007.

Abstract: Connected dominating set based routing is a promising approach for enhancing the routing efficiency in the mobile ad hoc networks. However, finding the minimum dominating set in an arbitrary graph is an NP-complete problem. Restricted Rule k is a localized algorithm for finding a small dominating set in mobile ad hoc networks. It starts with a large initial dominating set and uses the local information of all neighbors of a node to attempt to remove the node from the set. In this paper, instead of using a large initial set, we use a rather small number of nodes as the initial set and then reduce the size of the set with Rule k algorithm. The small initial set is generated by a distributed NLogN algorithm with lower computational complexity than Rule k. The simulation results show that using the small set generated with NLogN algorithm as the initial set can make Rule k algorithm to achieve better performance.

2. Yamin Li, Shietung Peng, and Wanming Chu, "An Algorithm for Constructing Hamiltonian Cycle in Metacube Networks", Proceedings of the International Conference on Parallel and Distributed Computing, Applications and Technologies (PDCAT'07)}, Adelaide, Australia, December 3-6, 2007, pp. 285-292.

Abstract: The high-performance supercomputers will consist of several millions of CPUs in the next decade. The interconnection networks (INs) in such supercomputers play an important role. Metacube (MC) is an attractive IN that can connect extremely large number of nodes with small number of links, meanwhile it holds a short diameter and keeps the simplicity of routing algorithm. An MC(k,m) network can connect 2^{k+m2^k} nodes with $m+k$ links per node, where k is the dimension of the high-level cubes (classes) and m is the dimension of the low-level cubes (clusters). For example, an MC(3,3) with 6 links per node can

connect 2^{27}, or 134,217,728, nodes. In this paper, we show that the Metacube is Hamiltonian and give an efficient algorithm to construct a Hamiltonian cycle in Metacube networks.

3. Yamin Li, Shietung Peng, and Wanming Chu, "Efficient Algorithms for finding a Trunk on a Tree Network and its Applications", Proceedings of the International Conference on Parallel and Distributed Computing, Applications and Technologies (PDCAT'07)}, Adelaide, Australia, December 3-6, 2007, pp. 355-362.

Abstract: Given an edge-weighted tree T, a trunk is a path P in T which minimizes the sum of the distances of all vertices in T from P plus the weight of path P. In this paper, we give efficient algorithms for finding a trunk of T. The first algorithm is a sequential algorithm which runs in $O(n)$ time, where n is the number of vertices in T. The second algorithm is a parallel algorithm which runs in $O(\log n)$ time using $O(n/\log n)$ processors on EREW PRAM model. We also present an application of trunk for efficient multicast in wireless ad hoc networks.

Professor
Shaoying Liu

Refereed Publications

1. Shaoying Liu and Hao Wang, "An Automated Approach to Specification Animation for Validation", Journal of Systems and Software, Elsevier Science Inc., Vol. 80, No. 8, August 2007, pp. 1271-1285.

Abstract: Formal specification has been increasingly adopted for the development of software systems of the highest integrity. However, the readability of the specifications for large-scale and complex systems can be so poor that even the developers may not easily understand whether the specifications define the "intended behaviors". In this paper, we describe a software tool that supports the animation of specifications by simulating their functional scenarios using the Message Sequence Chart (MSC). The tool extracts automatically functional scenarios from a specification and generates a message sequence chart for each of them for a syntactic level analysis. The tool can also execute a functional scenario with test cases for a semantic level analysis if all the processes involved in the scenario are defined using explicit specifications. With the tool support the animation of a specification can be carried out incrementally to assist its user to review the adequacy of the specification. We present a case study applying the tool to animate a formal specification for a library system and evaluate its result.

2. Shaoying Liu, "Utilizing Test Case Generation to Inspect Formal Specifications for Completeness and Feasibility", Proceedings of 10th IEEE High Assurance Systems Engineering Symposium, IEEE Computer Society Press, Dallas, Texas, November 14-16, 2007, pp. 349-356.

Abstract: Completeness and feasibility of a specification are important properties for the assurance of a valid and correct implementation, but they are extremely difficult to be formally verified. In this paper, we describe an inspection method for analyzing the completeness and feasibility of an operation specified using pre- and post-conditions. The characteristic of the method is that it utilizes test case generation criteria in forming questions of checklist and test case generation process as a reading technique for inspection. We formally define the

properties, the criteria for test case generation, and discuss how they are used for inspection in practice.

3. Shaoying Liu, ``Integrating Specification-Based Review and Testing for Detecting Errors in Programs", Proceedings of 9th International Conference on Formal Engineering Methods (ICFEM 2007), LNCS 4789, Springer-Verlag, Florida Atlantic University, Boca Raton, Florida, USA, November 13-15, 2007, pp. 136-150.

Abstract: Review and testing are the most practical verification techniques that complement each other, and their effectiveness can be enhanced by utilizing formal specifications. In this paper, we describe a verification method that integrates specification-based review and testing for detecting errors of programs in three phases. First, inspection is used to check whether all the relevant conditions defined in a specification are implemented in the corresponding program and whether there are any errors that may prevent the program from normal termination. Second, testing is carried out to detect errors through dynamic executions of the program and to build a useful relation between the specification and the program. Finally, walkthrough analysis is performed to check whether every functional scenario defined in the specification is correctly implemented by the traversed execution paths in the program and whether any untraversed paths exist and are desired. We present an example to show how our method is applied in practice.

4. Jichuan Wang, Shaoying Liu, Yong Qi, Di Hou, ``Developing an Insulin Pump System Using the SOFL Method", Proceedings of 14th Asia-Pacific Software Engineering Conference, IEEE Computer Society Press , Nagoya, Japan, December 5-7, 2007, pp. 334-341.

Abstract: Insulin pump system is a safety-critical embedded system controlling the amount of injection of insulin to diabetics based upon their blood glucose levels, and the high reliability of the software used in the pump is crucial. One way to achieve the high reliability of software is to build an accurate and complete model through effective analysis and specification, and to implement the system based upon the specification. In this paper, we describe how the SOFL formal engineering method is applied to develop a specific insulin pump system in practice. In particular, we focus on the issue of how the three-step modeling approach advocated by the SOFL method, which includes informal,

semi-formal, and formal specifications, is utilized to obtain a precise and valid specification of the embedded software for the insulin pump system. We also discuss how the specification benefits the implementation of the system, and report our experience and lessons learned.

5. Shaoying Liu and Eric Wong, "Applications of Formal Engineering Method for Modeling and Testing", Proceedings of 4th International Conference In IT and Application (ICITA2007), Macquarie Scientific Publishing, Harbin, China, January 15-18, 2007, pp. 727-732.

Abstract: In this paper, we describe and analyze the results of applying the Structured Object-oriented Formal Language (SOFL) formal engineering method for modeling and testing of software systems in four student projects. The purpose of the study is to provide the first-hand information on SOFL, including the effectiveness, usability, impact on the cost, and potential weakness for further improvement. Our analysis result shows that most students believe that SOFL is easy to use and effective for developing quality user requirements, design, and programs. It also indicates that SOFL helps reduce time and effort of software projects, although the lack of a powerful tool support was identified as a potential barrier for large scale applications of SOFL.

6. Shaoying Liu, "A Framework for Practical Specification-Based Testing", Proceedings of 2007 International Conference on Software Engineering Theory and Practice, ISRST, Orlando, FL, USA, July 9-12, 2007, pp.176-189.

Abstract: Specification-based testing has been researched intensively over the last two decades, but its application in industry still faces many challenges. The major problem is that the gaps between the initially constructed specifications and the finally implemented programs are so great that test cases generated based on the specifications may not be effectively used to run the programs and the specifications may not be effectively used for the analysis of the test results either. In this paper we describe a framework for performing practical specification-based testing. It shows how formal specification, reverse engineering, and inspection techniques help to enhance the feasibility of specification-based testing in practice. A simplified library example is given to illustrate the application of the framework.

Professor
Jianhua Ma

Refereed Publications

1. Yan Zhang, Laurence T. Yang, Jianhua Ma, Jun Zheng, Mingtuo Zhou and Shaoqiu Xiao, "Quantitative Analysis of Location Management and QoS in Wireless Mobile Newtroks," in IEEE CS Proceedings of the 21st International Conference on Advanced Information Networking and Applications (AINA2007), Canada, May 2007, pp. 573-579.

   Abstract: In this paper, we perform a quantitative analysis of the location management effect on QoS in the wireless networks. The metrics call blocking probability and the average number of blocked calls are introduced to reflect the QoS. For the sake of general applicability, the performance metrics are formulated with the relaxed tele-traffic parameters. Namely, the call inter-arrival time, cell residence time, location area residence time and location update inter-arrival time follow a general probability density function. The formulae are additionally specified in the static and several dynamic location management mechanisms. Numerical examples are presented to show the interaction between the performance metrics and location management schemes.

2. Hiroyuki Morohoshi, Runhe Huang, Jianhua Ma and Ying Huang, "A Bridge Linking Ubiquitous Devices and Grid Services," in IEEE CS Proceedings of the 21st International Conference on Advanced Information Networking and Applications (AINA2007), Canada, May 2007, pp. 747-753.

   Abstract: Grid computing has made rapid strides from their first serving the scientific computing domain to having great impact on the life science area and their use in the daily activities of users from the resource constrained ubiquitous devices such as PDA and mobile phone. To allow ubiquitous devices to use Grid services, there is a necessity to having a platform or middleware, a bridge linking the devices to Grid services. This paper presents such bridge named BtoG (Bridge to Grid). The design idea and system architecture are described, a sample application of skin checking, accessing to a skin-expert service from a mobile phone via the proposed bridge, is explained, and evaluation and comparisons with other related platforms are given in the paper.

3. Katsuhiro Takata, Masataka Tanaka, Jianhua Ma, Runhe Huang, Bernady O. Apduhan, and Norio Shiratori, "A Wearable System for

Outdoor Running Workout State Recognition and Course Provision," in the Lecture Note in Computers Science on Autonomic and Trusted Computing (ATC2007), Vol. LNCS 4610, Springer, 2007, pp. 385-394.

Abstract: The objective of this research is to develop a wearable prototype system to assist people doing outdoor running workout safely and effectively. One essential research issue is to correctly recognize a runner's state during a running workout process by analyzing contextual data obtained from sensors and GPS positioning device carried on by the runner. The running workout process is represented as a state transition diagram using the Space-Oriented Model. The state recognition is based on the state correlations with the runner's heartbeat rate and running speed. Our test results show that by utilizing the runner's state correlation, is more precise to recognize a runner's state as compared to the state judgment which is only based on detecting whether a sensed value exceeds some medical threshold value.

4. Katsuhiro Takata and Jianhua Ma, "Habitual Exercise State Aware Automatic Running Course Provision," in Proceedings of the SICE Annual Conference, Takamatsu, 2007, pp. 2739-2742.

Abstract: In this paper we present a novel approach for automatically generating running courses. There is no need of worries about overworking (over-training), as running workout courses are generated according to real-time detections of users' states. Reasoning is based on a running situation determination method that can be applied to various runners. Our designed method utilizes the users' running information based on habitual exercises to provide current running states.

Professor

Tetsuo Mizoguchi

Other Publications

1. Tetsuo Mizoguchi, "Formalizing Flight Efficiency in Air Traffic," IPSJ Technical Report, ITS-29-2, June 2007.

Professor
Toshihisa Nishijima

Other Publications

1. Toshiyuki Kohnosu, Kin-ichiroh Tokiwa and Toshihisa Nishijima, "Convergent Points of Asymptotic Distance Ratio of Some Justesen Codes," IEICE Technical Report, IT2006-56, pp. 37-40, January 2007.

2. Toshihisa Nishijima and Kazuyuki Endo, "An Upper and a Lower Bound on the Probability of an Undetected Error for Concatenated Codes Having Time-varying Inner Codes," Proceedings of 2007 Shannon Theory Workshop, pp. 17-21, September 2007.

3. Toshihisa Nishijima, "Weight Enumerators to Compute Upper and Lower Bounds on the Probability of an Undetected Error for Concatenated Codes Having Time-varying Inner Codes," CD-ROM Proceedings of the 60th Union Rally of Kyushu Branches of Academic Societies related to Electricity, 01-1P-04, September 2007.

4. Toshiyuki Kohnosu, Kin-ichiroh Tokiwa and Toshihisa Nishijima, "A Relationship between Reed-Solomon Codes and Justesen Codes from the Standpoint of Asymptotic Distance Ratio," CD-ROM Proceedings of the 60th Union Rally of Kyushu Branches of Academic Societies related to Electricity, 01-1P-04, September 2007.

Professor
Kenji Ohmori

Refereed Publications

1. K.Ohmori and T.L.Kunii. "Development of an Accounting System", in 9th International Conference on Enterprise Information System (ICEIS2007), Madeira, Portugal, June 2007, pp. 437-444

Abstract: The new methodology for software development is introduced and applied to an accounting system. The new method is called the incrementally modular abstraction hierarchy (IMAH). IMAH has an abstraction hierarchy from abstract to concrete levels. Invariants defined on an abstract level are kept on a concrete level, which allows adding modules incrementally on each hierarchical level and avoiding combinatorial explosion of the serious problem in software engineering, while climbing down abstraction hierarchy in designing and modeling a complex system. This paper shows how IMAH is applied in developing an accounting system, which is fundamental in enterprise systems and a suitable example of complex software systems. At first, very simple example recording only journal vouches to a database system is used to describe methodologies of IMAH. Then, it is described how this simple system is incrementally developed to a conventional complex accounting system.

2. K.Ohmori and T.L.Kunii. "The Mathematical Structure of Cyberworlds" in Cyberworlds 2007, IEEE Computer Society, Hannover, Germany, October 2007, pp. 100-107.

Abstract: The mathematical structure of cyberworlds is clarified based on the duality of homotopy lifting property and homotopy extension property. The duality gives bottom-up and top-down methods to model, design and analyze the structure of cyberworlds. The set of homepages representing a cyberworld is transformed into a state finite machine. In development of the cyberworld, a sequence of finite state machines is obtained. This sequence has homotopic property. This property is clarified to map a finite state machine to a simplicial complex. Wikipedia, bottom-up network construction and top-down network analysis are described as examples.

Professor
Akira K. Onoma

Other Publications

1. Akira K. Onoma, "Introduction of Graphic Diagram Description Techniques into Preparation of Requirements Specifications," 18 pages, HUTN, November 20, 2007.
2. Akira K. Onoma and Phillip C. –Y. Sheu, "Proposal for International Standardization of Requirements Specifications Documents for Software Development Projects", 10pages, UCI Technical Note, August 25, 2007.

Refereed Publications

1. Tatsuro Watanabe, Keiichi Kaneko, Shietung Peng, "Node-to-Set Cluster-Fault-Tolerant Disjoint Routing in Pancake Graphs," in Proceedings of the ISCA 20th International Conference on Parallel and Distributed Computing Systems, Las Vegas, USA, Sept. 24-26, 2007, pp. 200-205.

   Abstract: With rapid increase of parallel computation systems in their sizes, it is inevitable to develop algorithms that are applicable even if there exist faulty elements in the systems. In addition, the algorithms should tolerate cluster faults instead of a single fault for actual operation. In this paper, we assumed $n - k - 1$ cluster faults in an n-pancake graph, which is promising for a topology of interconnection networks and we developed a cluster-fault-tolerant routing algorithm that constructs disjoint paths from one node to k distinct nodes. The maximum length of the paths given by the algorithm is $2n + 3$, and the time complexity to construct the paths is $O(kn^2)$.

2. Keiichi Kaneko, Naoki Sawada, and Shietung Peng, "Cluster Fault-Tolerant Routing in Pancake Graphs," in Proceedings of the 19th IASTED International Conference on Parallel and Distributed Computing and Systems, Cambridge, Massachusetts, USA, Nov. 19-21, 2007, pp. 423-428.

   Abstract: In this paper, we propose an $O(n)$ algorithm that finds a fault-free path between any pair of non-faulty nodes in an n-pancake graph with $n - 2$ faulty clusters whose diameters are at most 2. The lengths of the paths obtained by our algorithm are at most $d^o(P_n) + 7$ where $d^o(P_n) = \lfloor 5(n+1)/3 \rfloor$ represents the upper bound of the diameter of P_n given by Gates and Papadimitriou. According to the computer experiment, the average time complexity of the algorithm turned out to be about $O(n)$.

3. Yamin Li, Naoki Sawada, Shietung Peng, and Wanming Chu, "An Algorithm for Constructing Hamiltonian Cycle in Metacube Networks," in Proceedings of the Eighth International Conference on Parallel and

Distributed Computing, Applications and Technologies, Adelaide, Australia, Dec. 3-6, 2007, pp. 285-292.

Abstract: The high-performance supercomputers will consist of several millions of CPUs in the next decade. The interconnection networks (INs) in such supercomputers play an important role. Metacube (MC) is an attractive IN that can connect extremely large number of nodes with small number of links, meanwhile it holds a short diameter and keeps the simplicity of routing algorithm. An MC(k,m) network can connect 2^{m2^k+k} nodes with $m+k$ links per node, where k is the dimension of the high-level cubes (classes) and m is the dimension of the low-level cubes (clusters). For example, an MC(3,3) with six links per node can connect 134,217,728 nodes. In this paper, we show that the Metacube is Hamiltonian and give an efficient algorithm to construct a Hamiltonian cycle in Metacube networks.

4. Yamin Li, Naoki, Shietung Peng, and Wanming Chu, "Efficient Algorithms for finding a Trunk on a Tree Network and its Applications," in Proceedings of the Eighth International Conference on Parallel and Distributed Computing, Applications and Technologies, Adelaide, Australia, Dec. 3-6, 2007, pp. 355-362.

Abstract: Given an edge-weighted tree T, a trunk is a path P in T which minimizes the sum of the distances of all vertices in T from P plus the weight of path P. In this paper, we give efficient algorithms for finding a trunk of T. The first algorithm is a sequential algorithm which runs in $O(n)$ time, where n is the number of vertices in T. The second algorithm is a parallel algorithm which runs in $O(\log n)$ time using $O(n/\log n)$ processors on EREW PRAM model. We also present an application of trunk for efficient multicast in wireless ad hoc networks.

5. Naoki Sawada, Keiichi Kaneko, and Shietung Peng: "Pairwise Disjoint Paths in Pancake Graphs," in Proceedings of the Eighth International Conference on Parallel and Distributed Computing, Applications and Technologies, Adelaide, Australia, Dec. 3-6, 2007, pp. 376-382.

Abstract: Disjoint paths problems have attracted much attention due to its numerous applications in fault-tolerant routing. The pairwise disjoint paths problem is one of them. In this paper, we propose an algorithm for the pairwise disjoint paths problem in a pancake graph. The algorithm can find k disjoint paths in an n-pancake graph where $k \leq \lfloor n/2 \rfloor$. The k disjoint paths can be constructed in $O(kn)$ time and the maximum path length is bounded by $5n/3 + 6$.

Professor
Yuji SATO

Refereed Publications

1. Ryuji Goto and Yuji Sato, "The Analysis of Sound Source Spectrum and Motion Characteristics of a Moving Object in Sea with Genetic Algorithms", IEICE Trans., Vol.J90-D, No. 12, pp. 3181-3191, December 2007.

Abstract: We have researched for the applicability of the genetic algorithms (GA) to problems 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 the tracking of the moving ships and for the tracking of the objects orbiting the earth from observed time series bearing and distance data or only from sound signals radiated by of unknown moving object. In this paper, we report on the analysis for the movement characteristics (distance, bearing, velocity, course) and sound source frequency by elimination Doppler effect from sounds radiated by the propulsion system of an unknown object in sea. To analyze those data, we applied two kinds of GA. One of them analyzes harmonic frequencies and their phases of the Doppler effected sound signals. The other GA analyzes the movement characteristics and sound source frequency based on the output of the former GA. We could prove the applicability of GA to this analysis through a computer simulation.

2. Yuji Sato, Yuhki Inoue, and Yosuke Akatsuka, "Applying GA to Self-allotment of Rewards in Event-driven Hybrid Learning Classifier Systems", in Proceedings of the 2007 IEEE Congress on Evolutionary Computation, IEEE Press, pp. 1800-1807, September 2007.

Abstract: This paper describes our study into the concept of using rewards in a classifier system applied to the acquisition of decision-making algorithms for agents in a soccer game. Our aim is to respond to the changing environment of video gaming that has resulted from the growth of the Internet, and to provide bug-free programs in a short time. We have already proposed a bucket brigade algorithm and a procedure for choosing what to learn depending on the frequency of events with the aim of facilitating real-time learning while a game is in

progress. We have also proposed a hybrid system configuration that combines existing algorithm strategies with a classifier system, and we have reported on the effectiveness of this hybrid system. This paper proposes applying genetic algorithms to the search for rewards in reinforcement learning where designers have hitherto used empirical trial-and-error methods. By pitting this new technique against an existing soccer game with algorithms designed by humans, we demonstrate the possibility of using genetic algorithms to automate the setting of rewards from the viewpoint of achieving a greater success rate and faster convergence than in cases where the success rewards for each play are set by the designers based on trial and error.

3. Yuji Sato, Yuta Yasuda, and Ryuji Goto, "Analysis of Noisy Time-series Signals with GA Involving Viral Infection with Tropism", in Proceedings of the 2007 Genetic and Evolutionary Computation Conference, ACM Press, pp. 1396-1403, July 2007.

Abstract: In this paper we report on a study in which genetic algorithms are applied to the analysis of noisy time-series signals, which is related to the problem of analyzing the motion characteristics of moving bodies (distance, bearing, course, velocity, etc.) by covertly sampling the sound of moving objects with submarine monitoring systems that track moving objects traveling on or through the water. In particular, we propose improving the system's ability to search through noisy data by grafting viruses onto the chromosomes used in genetic algorithms. Specifically, we propose a search method that can cope robustly with noise through the cooperative action of a wide-area search implemented by host chromosomes and a local search implemented by viruses grafted onto these chromosomes. To improve the infection rate, we also impose limits on the types of host entity that can be infected by viruses. By conducting evaluation tests in computer simulations, we show that the proposed technique can achieve a better rate of convergence and is capable of searching for a solution with fewer entities.

4. Yosuke Akatsuka and Yuji Sato, "Reward Allotment Considered Roles for Learning Classifier System for Soccer Video Games", in Proceedings of the 2007 IEEE Symposium on Computational Intelligence and Game, IEEE Press, April 2007.

Abstract: In recent years, the video-game environment has begun to change due to

the explosive growth of the Internet. As a result, it makes the time for maintenance longer and the development cost increased. In addition, the life cycle of the game program shortens. To solve the above-mentioned problem, we have already proposed the event-driven hybrid learning classifier system and showed that the system is effective to improving the game winning rate and making the learning time shorten. This paper describes the investigation result of the effect in case we apply the reward allotment considered each role for classifier learning system. Concretely, we investigate the influence to each player's actions by changing the algorithm of the opponent and to team strategy by changing reward setting, and analyze them. As a result, we show that the influence of learning effects to each player's actions does not depend on the algorithm of opponent. And we also show that the reward allotment considered each role has possible to evolve the game strategy to improving the game winning rate.

Other Publications

1. Yuhki Inoue, Yosuke Akatsuka, and Yuji Sato, "Applying GA to Searching Reward Value in Reinforcement Learning," in Proceedings of the 21st Annual Conf. of JSAI, 3D9-1, June 2007.

2. Junichi Miura and Yuji Sato, "Genetic Manipulation and Evolution Process to the Edge of Chaos in Imitation Game," in Proceedings of the 34th AI Symposium of SICE, pp.137-142 March 2007.

Professor
Vladimir Savchenko

Refereed Publications

1. M. Savchenko, O. Egorova, I. Hagiwara, V. Savchenko, "Techniques for Improving the Quality of Tetrahedral Meshes", Transaction of Society of Automotive Engineers of Japan (JSAE), vol.38, No.2, March, 2007, pp. 299-306.

Abstract: Mesh improvement is an almost obligatory step for obtaining a valid finite element because the requirements of an automatic mesh generator can be weakened. In this paper we suggest a method based on an implementation of quasi-statistical modeling, which can produce elements with a Gaussian (normal) distribution and a method based on decomposition of the local tetrahedral elements domain into a bundle of the plane elements. A main approach used in these local improvement methods is finally based on averaging the coordinates of all the nodes of the neighbour elements as is done in Laplacian smoothing technique. We also suggest a new method for tetrahedral mesh improvement based on the use of space mapping technique based on radial basis functions instead of using mesh smoothing technique based on averaging the coordinates. We demonstrate that our techniques can be applied to 3D volume meshes. Experimental results are included to demonstrate the functionality of our methods.

2. O. Egorova, M. Savchenko, I. Hagiwara, and V. Savchenko, "Modeling of Quality Parameter Values for Improving Meshes", Japan Journal of Industrial and Applied Mathematics (JJIAM), vol. 24 (2007), pp. 181-195.

Abstract: A novel quasi-statistical approach to improve the quality of triangular surface meshes is presented. The present method is based on modeling of an event of mesh improvement. This event is modeled via modeling of a discrete random variable. The random variable is modeled in a tangent plane of each local domain of the mesh. One domain collects several elements with a common point. Values of random variable are calculated by modeling formula according to the initial sampling data of the projected elements with respect to all neighbors of the domain. Geometrical equivalent called a potential form is constructed for each element of the domain with a mesh quality parameter value equal to the modeled numerical value. Such potential forms create potential centers of the domain. Averaging the coordinates of potential centers of the domain gives a new central

point position. After geometrical realization over entire mesh, the shapes of triangular elements are changed according to the normal distribution. It is shown experimentally that the mean of the final mesh is better than the initial one in most cases, so the event of the mesh improvement is likely occurred. Moreover, projection onto a local tangent plane included in the algorithm allows preservation of the model volume enclose by the surface mesh. The implementation results are presented to demonstrate the functionality of the method. Our approach can provide a flexible tool for the development of mesh improvement algorithms, creating better-input parameters for the triangular meshes and other kind of meshes intended to be applied in finite element analysis or computer graphics.

3. V. Savchenko, M. Savchenko, O. Egorova, I. Hagiwara, "Mesh Quality Improvement: Radial Basis Functions Approach", Journal of Algorithms and Computational Technology (JACT), vol. 2(3), ISNN 1748-3018, Multi-Science Publishing Company, 2007 (accepted).

Abstract: In this paper, we present a novel method, based on an implementation of space mapping technique, for improvement of the quality of tetrahedral and hexahedral meshes. The same approach is used for surface meshes where geometry of the initial surface mesh is preserved by a local mesh improvement such that new positions of the interior nodes of the mesh remain on the original discrete surface. The proposed 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.

4. V. Savchenko, M. Savchenko, O. Egorova, I. Hagiwara, "The Shannon Entropy-based Node Placement for Enrichment and Simplification of Meshes", In Proceedings of ICCS 2007 International Conference. 7-th International Conference on Computational Science, Lecture Notes in Computer Science, LNCS 4488, Springer-Verlag, vol2, pp. 65-72 , 2007.

Abstract: In this paper, we present a novel simple method based on the idea of exploiting the Shannon entropy as a measure of the inter-influence relationships between neighboring nodes of a mesh to optimize node locations. The method can be used in a pre-processing stage for subsequent studies such as finite element analysis by providing better input parameters for these processes. Experimental results are included to demonstrate the functionality of our method.

5. M. Sugihara and V. Savchenko, "A Combination of Hierarchical Structures and Particle Systems for Self-Collision Detection of Deforming Objects", Proceedings GRAPHICON'2007, 2007.

Abstract: The paper proposes an approach which combines hierarchical struct ures and particle systems for self-collision detection occurring in a deformabl e object. Numerous algorithms for collision detection have been proposed in computer graphics applications. Our algorithm exploits the efficiency of hiera rchical structures to deal with many polygons, and particle systems because they can be used to extract colliding polygons. We have extended these two algorithms to deal with self-collision detection. The approach is split into tw o stages. Particles are distributed on the surface of a deformable object. The n, if the particles detect a possibility of a selfcollision, hierarchical self-collisi on detection is started. The algorithm has been implemented on a square cl oth model as an example of a deformable object. We show that the algorith m efficiently reduces self-collision detection redundancy, and yet precisely det ects self-collision events we present a novel simple method based on the ide a of exploiting the Shannon entropy as a measure of the inter-influence rela tionships between neighboring nodes of a mesh to optimize node locations. T he method can be used in a pre-processing stage for subsequent studies suc h as finite element analysis by providing better input parameters for these processes. Experimental results are included to demonstrate the functionality of our method.

Other Publications

1. M. Savchenko, V. Savchenko, O. Egorova, I. Hagiwara, "Applying the Shannon entropy to Mesh Processing: Quality Improvement", In Proceedings of the JSIAM 2007 Annual Congress, Hokkaido, Japan pp.148-149, 2007.

2. O. Egorova, M. Savchenko, V. Savchenko, I. Hagiwara, "Hexahedral growth model: new guide for hexahedral meshing", In Proceedings 23-06 of the JSIAM 2007 Annual Congress, Hokkaido, Japan pp.154-155, 2007.

3. M. Savchenko, O. Egorova, I. Hagiwara, V. Savchenko, Tetrahedral Mesh Reduction Technique. APCOM'07 in conjunction with EPMESC XI, December 3-6, 2007, Kyoto, JAPAN, CD Proceedings.

4. O. Egorova, M. Savchenko, V. Savchenko, I. Hagiwara, Topology and Geometry of Hexahedral Complex: Combined Approach for Hexahedral Meshing, APCOM'07 symposium in conjunction with EPMESC XI, December 3-6, 2007, Kyoto, JAPAN, CD Proceedings.

Professor
Toru WAKAHARA

Refereed Publications

1. Toru Wakahara, Yoshimasa Kimura, Akira Suzuki, Akio Shio, and Mutsuo Sano, "Fingerprint Verification Using Ridge Direction Distribution and Minutiae Correspondence," Systems and Computers in Japan, Vol. 38, No. 3, pp. 72-82, March 2007.

   Abstract: Fingerprint verification technique is raising high expectations as a means of personal identification based on physical features. This paper proposes a fingerprint verification method which can achieve minutiae matching with highly accurate compensation for rotation and position deviation, as well as high speed and stability. The process flow after binarization of the gray-scale fingerprint image is as follows. (1) Using the fingerprint ridge direction distribution in each local region, highly accurate compensation for the rotation and the position deviation between the enrolled fingerprint and the input fingerprint is performed. (2) The optimal correspondence between enrolled and input minutiae is established by fast combinatorial search. (3) By applying threshold processing to the distances of the fingerprint ridge direction distributions and the minutiae matching rate, the acceptance/rejection of the person is decided. Fingerprint image data for 80 persons × 4 fingers × 10 samples were collected using a commercial electrostatic capacitance semiconductor fingerprint sensor. The false rejection rate and the false acceptance rate are investigated in fingerprint verification experiments, and the effectiveness of the proposed method is demonstrated.

2. Satoshi Otaka, Yoshihisa Nishiyama, Takahiro Hatano, and Toru Wakahara, "Fingerprint Verification Using Perturbation Method," in Proceedings of MVA2007 IAPR Conference on Machine Vision Applications, May 2007, pp. 424-427.

   Abstract: This paper describes a new, powerful technique of fingerprint verification based on a perturbation method. The proposed method consists of four parts. The first part performs local FFT band-pass filtering to enhance the cyclic ridge structure in respective local areas. The second part is optimal block-wise shift for preliminary matching. Then, the third part is application of GAT correlation to realize affine-invariant shape matching. Finally, the fourth part is detail matching by perturbation. The key ideas of our perturbation

method are in three ways: extraction of core points from enrolled fingerprint images, setting local windows around the core point, and asynchronous perturbation of local windows for optimal detail matching between input and each enrolled fingerprint images. How to design the size of local windows, the range and direction of perturbation, and the matching criteria is crucial to the success of the proposed method. Experimental results using the public FVC2000 fingerprint image database demonstrate a sufficiently low equal error rate (EER) of 5.55% for false rejection and false acceptance comparable to those obtained by competing works.

Other Publications

1. Minoru Yokobayashi and Toru Wakahara, "A Study on Optimal Binarization and Distortion-Tolerant Recognition of Color Characters in Scene Images," IEICE Technical Report, PRMU2007-110, pp. 105-110, October 2007.

Professor
Kenji   Yoshida

Other Publications
Patents:

1. K. Yoshida, "Security System Using Dot Pattern", Japan Patent No.3707694, January 26, 2007.

2. K. Yoshida, "Information Reproducing Device", Japan Patent No. 3930891, March 16, 2007.

3. K. Yoshida, "Computer Executable Program", Japan Patent No. 3956026, May 18, 2007.

4. K. Yoshida, "Dot Pattern Installed Card", Japan Patent No. 39 98701, August 17, 2007.

5. K. Yoshida, "Dot Pattern Reading Unit and Mouse Comprising I t", Japan Patent No.4008952, September 7, 2007.

6. K. Yoshida, "Method for Inputting/Outputting Information Usin g Dot Pattern", Japan Patent No.4011605, September 14, 2007.

7. K. Yoshida, "System for Input to Information Processing Devic e", Japan Patent No.4042065, November 22, 2007.

8. K. Yoshida, "System for Input to Information Processing Devic e", Japan Patent No.4042066, November 22, 2007.

Professor
Yukiko Sasaki Alam

Refereed Publications

1. Yukiko Sasaki Alam, "Algorithm for Identifying the syntactic and Semantic Categories of Prepositions: Case of *Over*," in Proceedings of the International Conference on Computing: Theory and Applications Platinum Jubilee Conference, March 2007, pp. 434-440. Los Alamitos, CA: IEEE Computer Society Press.

   Abstract: This paper proposes an algorithm for assigning the syntactic categories of *over*, many uses of which are not used as prepositions. The algorithm, enriched for the semantic capacity from earlier studies, identifies four syntactic categories of *over* and eleven meanings of the prepositional uses. The ability of the algorithm was tested manually by using five hundred instances of *over* from British National Corpus. The results are encouraging, with over 95 percent of the instances being correctly classified. This study, while pointing to an ideal direction, will reveal many important points to consider in natural language processing.

2. Yukiko Sasaki Alam, "A Software System for Second-Language Vocabulary Learning," in Proceedings of the 7th IEEE International Conference on Advanced Learning Technologies, July 2007, pp. 130-132.

   Abstract: The aim of this paper is to introduce a software system for learning English vocabulary. It is a multi-user and multi-platform system, designed on effective learning principles and available for use on the Internet. It provides graphical displays of goals for the student to attain, and of the results that have been achieved. It also offers the instructor a simple means of preparing and editing exercises and modifying them according to pedagogical needs. The system, still at an evolutionary stage, was implemented for an assignment in English courses at a Japanese university for two semesters, and has proved to be an effective tool in teaching second-language vocabulary while a rigorous assessment remains to be made.

3. Yukiko Sasaki Alam, "A Morpho-Syntactic Analyzer of Controlled Japanese," in Proceedings of Grammar Engineering Across Frameworks (GEAF07) Workshop (in the Series of CSLI Studies in

Computational Linguistics ONLINE), ed. by Tracy H. King and Emily M. Bender, pp. 306-318, at http://csli-publications.stanford.edu/GEAF/2007/geaf07.html

Abstract: The proposed morpho-syntactic analyzer parses controlled Japanese texts such as articles in newspapers, technical magazines and professional journals and public documents that are transcribed wherever applicable by using *Joyo Kanji* (frequently used Chinese characters). The analyzer parses sentences in controlled Japanese texts into morpho-syntactic units, further dividing them into the content and the functional parts, and assigning a functional role or roles to each unit in the sentences. As the system is not equipped with a dictionary, the parsing algorithm is based on the orthographic characteristics of words and morphemes, and the role assignment to each unit is based on the functional elements located at the end of the unit, which is a feature of a Head-final language like Japanese. The system is a light-weight rule-based morpho-syntactic analyzer that could be a useful tool for natural language processing. As the system identifies syntactic units rather than individual morphemes, together with the functional and/or syntactic roles of the units, it would help a computational system understand the syntactic and functional structures of sentences, and eventually interpret the semantics of the sentences.

4. Yukiko Sasaki Alam, "Analyzer to Identify Phrases and the Functional Roles in Sentences: Its Architectural Aspects," in Proceedings of the 21st Pacific Asia Conference on Language, Information and Communication (PACLIN 21), November 2007, pp. 67-75.

Abstract: This paper presents the architectural aspects of the phrase analyzer that attempts to recognize phrases and identify the functional roles in the sentences in formal Japanese documents. Since the object of interest is a phrase, the current system, designed in an object-oriented architecture, contains the *Phrase* class, and makes use of the linguistic generalization about languages with Case markers that a phrase, whether a noun phrase, a verb phrase, a postposition (or preposition) phrase or a clause phrase, can be separated into the content and the function components. Without a dictionary, and drawing on the orthographic information on the words to parse, it also contains a class that identifies the types of characters, a class representing grammar, and a class playing the role of a controller. The system has a simple and intuitive structure, externally and internally, and therefore is easy to modify and extend.

HOSEI