

2009 Joint Workshop on Advanced ICT

October 1st, 2009

Akiu Resort Hotel Sakan, Sendai, Japan



Sponsored by

Tohoku University GCOE and BUPT 111 Project

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Prof. Fumiyuki Adachi, Tohoku University

Prof. Yinghai Zhang, BUPT

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1) Prof. Nei Kato, Tohoku University

2) Prof. Jun Guo, BUPT

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Prof. Nei Kato, Tohoku University

Assistant Prof. Hiroki Nishiyama, Tohoku University

Note: **B**eijing **U**niversity of **P**osts and **T**elecommunications (BUPT)

Program

Date: October 1st, 2009 Room:

10:00 - 12:00

Chair: Prof. Nei Kato, Tohoku University

0) Opening Address

GCOE Leader, Prof. Fumiyuki Adachi,
Vice President of BUPT, Prof. Yin Hai Zhang

1) Research Trend in Ad Hoc Network Area and Approach towards Advanced Practical Application

Prof. Nei Kato, Tohoku University

Ad hoc network can be used in various scenes such as amusement, disaster relief, and so on. The most important feature of ad hoc networks is seen as it can be easily constructed without any network infrastructure anywhere and anytime. In this talk, latest trend of ad hoc network technologies will be surveyed and a new approach applying ad hoc and sensor network to motion measurement will be introduced.

2) Word Sense Disambiguation Using Trajectory information

Prof. Xiaojie Wang, BUPT

Classifier combination is a promising way to improve performance of word sense disambiguation. We propose a new combinational method in this paper. We first construct a sequence of Naïve Bayesian classifiers at each point along a context window trajectory, and perform sense selection for both training samples and test samples using these classifiers. We thus get a sense decision trajectory along window trajectory for each sample. Then we make use of decision trajectories to make final k nearest neighbors based sense selection. This method aims to lower the uncertainty brought by classifiers using different context window sizes and make more robust utilization of context while perform well. Experiments show our approach outperforms some other algorithms on both robustness and performance.

3) Universal Platform for Behavioral Robot Intelligence

Dr. Martin Lukac, and Prof. Michitaka Kameyama, Tohoku University

Intelligent processing and decision making requires constantly increasing amount of computational power, of environmental sensing and of human feedback. Moreover, more and more complex tasks are being solved by intelligent and automated systems. But, the hardware development of intelligent systems has been since the 80's without any major breakthrough. The software development can accommodate certain of these requirements but for robotic application hardware must be designed to meet the requirements of speed, robustness and durability. Our approach for solving highly-complex problems in robotics is to provide novel universal computing platforms based on reconfigurable VLSI and Generalized Cellular Automaton (GCA). This universal platform is designed with the goal of providing many degrees of freedom in the decision making, incorporates both the functional and behavioral robotics paradigm, and provides emergent robotic behavior, strong robot adaptation and long-term learning capability. In order to achieve all this we use both Top-Down approach to design high level algorithms for logic synthesis as well as Bottom-Up hardware driven oriented design methodologies. For instance, while analyzing robotic behavior on simple tasks, we devise generalization algorithms for the formalization of such behaviors that cannot be completely described and are too complex to be built as a unique behavior. Our methodology aims to provide step by step methods of implementing such behaviors as a result of the interaction of many smaller behavioral and functional modules.

4) A Mandarin Speech Recognition Result Evaluation Algorithm on Mixed Words

Assoc. Prof. Gang Liu, Dr. Wei Chen, Dr. Yujing Guo, and Prof. Jun Guo, BUPT

Speech recognition result is always evaluated by dynamic programming algorithm which can find the best match between recognized results and references. And the match unit could be word, syllable, phone and so on. However, in mandarin speech recognition, this traditional algorithm is not accurate because of the unique characteristics of Chinese word-formation. In order to improve evaluation performance on Chinese, we proposed a mandarin speech recognition evaluation algorithm based on mixed words. Our experiments show that our proposed algorithm can effectively reduce the false error caused by traditional evaluation algorithm.

12:00-13:30 Lunch Break

Program

Date: October 1st, 2009 Room:

13:30 -15:30

Chair: Prof. Jun Guo, BUPT

5) Introduction to Probabilistic Image Processing and Bayesian Networks

Prof. Kazuyuki Tanaka, Tohoku University

Bayesian network is one of the methods for probabilistic inferences in artificial intelligence. Some probabilistic models for image processing are also regarded as Bayesian networks. In this talk, the statistical aspect and the practical schemes of Bayesian network to probabilistic image processing are reviewed. The first part is an introduction of probabilistic model for image processing based on the basic framework of Bayesian networks. The second part is a brief review of belief propagation. In the third part, we survey fundamental algorithms of belief propagations for probabilistic image processing. Some recent developments of Bayesian networks and belief propagations in computer sciences are also shown.

6) Information Filtering in the Web

Prof. Jun Guo, BUPT

As information is exploring in the Web, the technology of information filtering is getting more and more importance. The core problem of information filtering is to classify information in a constantly changing data source such as the Web according to user's need. Theoretically, feature selection, classifier construction, topic clustering, and filtering model learning, especially evolutionary learning, are the focused issues. Practically, web page/document crawling, relevance ranking, parallel data processing, and user interfaces are the key points. In this talk, I will give a general introduction to the above issues as well as some personal opinions. A practical system developed by my lab will also be demonstrated.

7) Development of High-definition Auditory Displays

Prof. Yo-iti SUZUKI, Tohoku University

It is important to understand human 3D spatial hearing as a multi-modal perception process, where listener's dynamic motion plays important role to realize correct perception of 3D auditory space. That is, listener's motion effectively stabilizes the perceived auditory space and facilitates auditory spatial perception. It is, therefore, crucial to take the effect of listener's motion into account in designing high-definition 3D virtual auditory displays (VAD). A VAD middleware engine which is responsive to listener's movement was developed for ordinary MSwindows environment. Moreover, its application software systems to train the ability of 3D spatial perception for visually impaired people will be introduced.

8) Recent Topics in Digital Signal Processing

Prof. Masayuki Kawamata, Assoc. Prof. Masahide Abe, Tohoku University

This presentation introduces two recent topics in digital signal processing. One topic is concerning finite wordlength implementation of digital filters. When digital filters are implemented with finite wordlength signal processor, they are suffered from quantization effects such as roundoff noise, coefficient quantization error, and limit cycles. This presentation will introduce optimal design of state-space digital filters having minimum coefficient sensitivity, minimum roundoff noise and no limit cycles. The other topic is concerning restoration of old film sequences by digital signal processing. Old film sequences are degraded by flicker, displacement, blotches and scratches mainly due to aging, chemical and mechanical factors. This presentation will discuss a digital signal processing model of restoration of old film sequences and introduce several methods to reduce flickers, displacement, blotches and scratches.

15:30 -16:00 Coffee Break

Program

Date: October 1st, 2009 Room:

16:00 -18:00

Chair: Prof. Fumiyuki Adachi, Tohoku University

9) Allocation in Heterogeneous Cognitive Radio Networks

Dr. Lei Wang, Prof. Jiaru Lin, BUPT

In this paper, the problem of resource allocation in heterogeneous cognitive radio networks is investigated under the constraints of interference temperature limit. The resource allocation problem is formulated as a mixed-integer programming problem and solved by Lagrangian dual method based on which a centralized subgradient update algorithm is proposed. The approximate optimality of this algorithm is promised by time-sharing condition. We also realize this centralized algorithm distributively given the implication of dual decomposition. Two algorithms are compared in terms of complexity, communication signaling, latency etc.. Simulation results show the validity of the proposed algorithms.

10) Wireless Challenge for A Future Broadband Network

Prof. Fumiyuki Adachi, Tohoku University

In future wireless communication systems, Gigabit wireless technology which allows higher-than-1Gbps data transmission with extremely low transmit power may be necessary. In this talk, we will overview the state-of-the-art broadband wireless technology which we have been developing.

11) Characterizing Internet Backbone Traffic from Macro to Micro

Assoc. Prof. Jie Yang, Dr. Yang He, Dr. Ping Lin, and Dr. Gang Cheng, BUPT

The continuous growth in both commercial and public network traffic with various quality-of-service (QoS) requirements is calling for better service than the Internet's best effort mechanism. One of the challenging issues is to predict the overall behavior of aggregate network traffic. While network traffic characterization has been studied extensively due to its importance in network scheduling and throughput, an accurate characterization of network traffic still remains elusive. In this paper, in addition to characterizing the aggregate network traffic, we classify the traffic into different categories, e.g., P2P, VOIP, and provide insight to each of them in terms of their traffic pattern and impact to the overall traffic. Our study verified that like any works reported in literature, majority Internet backbone traffic is contributed by a small portion of users and a linear equation can be used to approximate the contribution of each user to the overall traffic. Many new applications appear recently and become more and more popular as Internet evolves. We show that in current Internet of China, 9 applications, which can be classified into three categories, web browsing, P2P service, and gaming, contribute 95 percent of the total traffic. It is also demonstrated the P2P applications are the dominant traffic contributor among the three categories.

12) Asian IT Academic/Career Connections - Future Shape of ASIST Project to Come -

Prof. Mitsuyuki Nakao, Tohoku University

The political and economical relationships between Asian countries and Japan have been growing rapidly. However, human resources supporting this relationship are known to be still insufficient. Our governmentally supported program, ASIST, promotes Asian student career as IT specialist in Japan. The ASIST is uniquely based on the cooperative educational system between Tohoku University and IT companies, and project-based group learning frameworks for obtaining practical IT skills as well as business communication skills with Japanese language (Sendai Scheme). We believe that the students benefited by our program will join the human resource bridging between Asian countries and Japan.

18:00 Adjourn