Hosei University International Colloquium on
Integrated Science and Technology

Advanced Research on Integrated Science and Technology at Tsinghua and Hosei Universities

法政大学 IIST 国際コロキウム

法政・清華大学における先進総合理工学研究

This colloquium is to introduce current research development on integrated science and engineering at both in Tsinghua and Hosei University. The colloquium is to understand the research strength of both institutions and to explores the possible opportunity of research collaboration. Outstanding graduate students and faculties are invited to give their works. The colloquium is open to public. Interested researchers of other institutions and citizens are welcome to participate.

本コロキウムは法政大学と清華大学の総合理工学分野における最新の研究成果を共有し、両大学の研究の強みを理解するとともに、共同研究の機会を探ることを目的としています。本コロキウムにおける両大学の大学院生、教員による研究内容の紹介は、興味をもつ他研究機関の研究者、一般の方にも公開されます。

Date: 13:00- 15:30 Jan 12th, 2017
日時: 2017 年 1 月 12 日 13:00-15:30

Venue: Multimedia Hall, B1F Building West, Hosei University Koganei Campus
3-7-2 Kajino cho, Koganei City, Tokyo 184-8584 JAPAN
会場: 法政大学,小金井キャンパス, 西館地下 1F マルチメディアホール
〒184-8584 東京都小金井市梶野町 3-7-2

Host: Hosei University IIST: Institute of Integrated Science and Technology
主催: 法政大学・ IIST (総合理工学インスティチュート)

法政大学
HOSEI University

PROGRAM (プログラム)

13:00-13:05 OPENING MESSAGE (開会の辞)

Prof. Kazuo Yana, Vice President, Hosei University

Mr. XIA Guangzhi, Associate Dean of the Tsinghua Univ. Graduate School at Shenzhen

SESSION 1（第一部）

13:05-13:15 Yanqin Chen (2nd Year Ph. D. Student, Control Sci. and Eng., Tsinghua Univ.)

Absolute Distance Estimation for Light Field Images using Ray Tracing

【レイトレーシングによる光照射野の絶対距離測定】

13:15-13:25 Ryo Ito (2nd Year Master Student, Medical Imaging Technology, Hosei Univ.),

Estimation of an Atomic Density with a Singular Value Decomposition Method Using a Photon-Counting X-ray CT

【フォトンカウンティング形 X 線 CT を用いた原子密度推定】

13:25-13:35 Guo Ao (1st year Ph.D. student, IIST, Hosei University)

A Context-Aware Scheduling Mechanism for Smartphone-based Personal Data Collection from Multiple Wearable Devices

【ウェアラブルデバイス群によるパーソナルデータ収集における コンテンツ依存スケジューリングについて】

13:35-13:45 Sun Zhiyan (3rd Year Ph. D. Student, Material Science, Tsinghua Univ.)

Ultrasonic Surface Rolling Process (USRP) is a Novel Surface

【超音波表面回転プロセス(USRP): 新しい表面加工技術】

13:45-13:55 Jianxu Zeng (2nd Year Master Student, Microelectronics Eng., Tsinghua Univ.)

Power Management for Wireless Power Transfer

【無線電力伝送における電力制御について】

13:55-14:25 INTERMISSION (休憩)

SESSION 2（第二部）

14:25-14:45 Prof. Jinjia Zhou,(IIST, Hosei University)

A 4Gpixel/s 8/10b H.265/HEVC Video Decoder Chip for 8K Ultra HD Applications

【8K 超高解像度 H265/HEVC ビデオデコーディングチップ】

14:45-15:05 Prof. Xin Jin (Graduate School at Shenzhen, Tsinghua Univ.)

Light field processing and compression

【ライトフィールド画像信号処理と情報圧縮 】

15:05-15:25 Prof. Genci Capi, (Robotics Eng., Hosei Univ.)

Intelligent Assistive Robots Operating in Real Environments (Video Presentation)

【知的福祉ロボットの実用化例】

15:25-15:30 CLOSING REMARKS (閉会の辞)

Prof. Lei Li, Dean of the Faculty of Sci. & Eng., Hosei Univ. 理工学部長 李磊教授

13:05-13:15 Yanqin Chen (2nd Year Ph. D. Student, Control Sci. and Eng., Tsinghua Univ.)

Absolute Distance Estimation for Light Field Images using Ray Tracing

ABSTRACT: In this talk, we propose a geometric optical model to estimate the absolute distances of objects in an image captured by a hand-held light field camera. The proposed geometric optical model consists of two sub-models based on ray tracing: 1) Light rays emitting from object space propagate into the main lens and refract inside the main lens following refraction theorem; 2) Light rays exit from some out off positions on the main lens after another refraction and subsequently impinge on the sensor plane with different imaging diameters. We investigate the relationships between light rays' imaging diameters and their corresponding out off positions on the main lens utilizing refocusing and similar triangle principle. By combining the two sub-models and tracing light rays back into object space, we figure out the relationships between imaging diameters and absolute distances of objects. Experimental results demonstrate that the proposed model can outperform the existing approaches in terms of estimation accuracy and efficiency.

BIOSKETCH: Yanqin Chen received the B.E. degree from the School of Mechanical and Automotive Engineering, South China University of Technology, Guangdong, China in 2015. She is currently pursuing the Ph.D. degree in Department of Automation at Tsinghua University, Beijing, China. She joined the IEEE and became a student member in 2016. Her current research interests include computational photography and computer vision.

13:15-13:25 Ryo Ito (2nd Year Master Student, Medical Imaging Technology, Hosei Univ.),

Estimation of an Atomic Density with a Singular Value Decomposition Method Using a Photon-Counting X-ray CT

ABSTRACT: In the treatment planning of a heavy ion radiation therapy, an accurate density distribution of each atom in a human body is required. However, it is very difficult to obtain this distribution, and so the distribution of the electron density is estimated with the x-ray CT number of an electron density phantom. The purpose of our research is to measure the density distribution of a specified atom in compounds in a human body. The paper proposed a new method to obtain the density distribution of an atom with the singular value decomposition method using a photon counting detector. We conducted simulation using two phantoms that were composed of water, ethanol and benzene, and

we calculated the density distribution of hydrogen, carbon and oxygen. The simulation results of a phantom including several compounds showed the feasibility of our proposed method.

BIOSKETCH: Ryo Ito received BS degree in Applied Informatics from Hosei University, in 2015. He is currently a master's student at the Graduate School of Science and Engineering, Hosei University. He is developing a new X-ray CT imaging systems, especially photon-counting X-ray CT for material decomposition and density estimation. He is a climber reached the top of Mt. Fuji twice. He presented his papers at IEEE Nuclear Science Symposium and Medical Imaging Conference 2015 and 2016.

13:25-13:35 Ao Guo (1st year Ph.D. student, IIST, Hosei University)

A Context-Aware Scheduling Mechanism for Smartphone-based Personal Data Collection from Multiple Wearable Devices

ABSTRACT: Due to rapid progresses of smartphone and various wearable devices, it becomes feasible to collect rich personal data that can be used for activity recognition, user modeling and better personalized services. Because of the popularity and high accessibility, a smartphone becomes not only an effective terminal in personal data collection but also a gateway to connect wearable devices and gather various kinds of personal data from these wearables. In the most of current applications, the wearables work for data collection according to a fixed schedule often preset manually by a user. The main problems in the data collection with following such fixed scheduling are weak adaptiveness to wearables' state change, big redundancy in collected data, and possible mismatch to dynamic precision requirements in data capture. Therefore, we propose a context-aware scheduling mechanism that is able to dynamically adjust the data collection schedule based on varying situations of wearable condition, network availability, computing resource and user state. This talk presents the details of this context-aware scheduling mechanism, and a corresponding smartphone-based system to collect personal data from multiple wearables and upload the gathered data to a server. The efficiency and effectiveness of the proposed scheduling mechanism have been verified by the actual data collection using the developed system.

BIOSKETCH: Ao Guo received M.E. degree from Huazhong University of Science and Technology, China, in 2016. He is currently working toward the Ph.D. degree at Hosei University, Japan. He received the best paper award at the 2016 IEEE International Conference on Cyber, Physical, and Social Computing (CPSCom 2016). His research interests lie in the intersection of human-computer interaction and ubiquitous computing, including context-aware data collection system and personality analysis.

13:35-13:45 Sun Zhiyan (3rd Year Ph. D. Student, Material Science, Tsinghua Univ.)

Ultrasonic Surface Rolling Process (USRP) is a Novel Surface

ABSTRACT: Ultrasonic surface rolling process (USRP) is a novel surface nanocrystallization technology based on severe plastic deformation(SPD). But the remarkable hardening of surface strengthened layer induced by SPD is also an extreme obstruct for the further plastic deformation and strengthening inside of the metal. Electropulsing, as an advanced external field processing technology for metallic material can affect its plasticity, structure evolution and so on. The introduction of electropulsing can facilitate the surface cracks healing, receive better surface roughness, and alter the cross-sectional micro-hardness gradient distribution within the surface strengthened layer. Therefore High-precision metal surfaces can be obtained during electropulsing-assisted ultrasonic surface rolling process(EP-USRP). EP-USRP is proved to be a high precision machining technology.

BIOSKETCH: Zhiyan Sun received the B.E. degree from the Department of Materials Science and Engineering, Central South University, Changsha, China in 2014. She is currently pursuing the Ph.D. degree in Department of Materials Science and Engineering at Tsinghua University, Beijing, China. Her current research interests include electropulsing-assisted turning or ultrasonic surface rolling process.

13:45-13:55 Jianxu Zeng (2nd Year Master Student, Microelectronics Eng., Tsinghua Univ.)

Power Management for Wireless Power Transfer

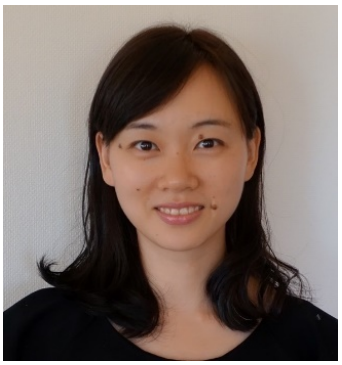
ABSTRACT: (1) The progress of wireless power transfer (WPT); (2) WPT Applications in IMD (implant medical device); (3) Energy-efficient WPT and charging circuit for implantable applications

BIOSKETCH: Jianxu Zeng received the B.S degree in microelectronics from Tianjin University, Tianjin, China, in 2015. He is currently working toward M.S degree in microelectronics from Tsinghua University, Beijing, China. His research interests focus on power management integrated circuits (PMIC).

14:25-:14:45 Assoc. Prof. Jinjia Zhou,(IIST, Hosei University)

A 4Gpixel/s 8/10b H.265/HEVC Video Decoder Chip for 8K Ultra HD Applications

【8K 超高解像度 H265/HEVC ビデオデコードチップ】



ABSTRACT: 8K Ultra HD is being promoted as the next-generation digital video format. From a communication channel perspective, the latest high-efficiency video coding standard (H.265/HEVC) greatly enhances the feasibility of 8K by doubling the compression ratio. Implementation of such codecs is a challenge, owing to ultrahigh throughput requirements and increased complexity per pixel. The former corresponds to up to 10b/pixel, 7680×4320pixels/frame and 120fps – 80× larger than 1080p HD. The latter comes from the new features of HEVC relative to its predecessor H.264/AVC. The most challenging of them is the enlarged and highly variable-size coding/prediction/transform units (CU/PU/TU), which significantly increase: 1) the requirement for on-chip memory as pipeline buffers, 2) the difficulty in maintaining pipeline utilization, and 3) the complexity of inverse transforms (IT). This talk presents an HEVC decoder chip supporting 8K Ultra HD, featuring a 16pixel/cycle true-variable-block-size system pipeline. The pipeline: 1) saves on-chip memory with a novel block-in-block-out (BIBO) queue system and a parameter delivery network, and 2) allows high design efficiency and utilization of processing components through local synchronization. Key optimizations at the component level are also presented.

BIOSKETCH: Jinjia Zhou received B.E. degree from Shanghai Jiao Tong University, China, in 2007. She received M.E. and Ph.D. degrees from Waseda University, Japan, in 2010 and 2013, respectively. From 2013 to 2016, she was a junior researcher with Waseda University, Fukuoka, Japan. Currently she is an Associate Professor with Hosei University, Tokyo, Japan. Her interests are in algorithms and VLSI architectures for multimedia signal processing, especially in low-power high-performance VLSI design for video codecs including H.265/HEVC (High Efficiency Video Coding) and H.264/AVC. Dr. Zhou received the research fellowship of the Japan Society for the Promotion of Science during 2010-2013. She is a recipient of the Chinese Government Award for Outstanding Students Abroad of 2012. Dr. Zhou received the Hibikino Best Thesis Award in 2011. She was a co-recipient of the best student paper award of VLSI Circuits Symposium 2010 and the design contest award of ACM ISLPED 2010. She participated the design of the world first 8K UHDTV video decoder chip, which was granted the 2012 Semiconductor of the Year Award of Japan. She works as a reviewer for journals including IEEE Trans. Circuits Syst. Video Tech., IEEE Trans. Circuits Syst. I, IEEE Trans. VLSI Syst., and IEEE Trans. Multimedia. This talk was given at IEEE International Solid-State Circuits Conference (ISSCC 2016). The paper related to this talk received the ISSCC 2016 Takuo Sugano Award for Outstanding Far-East Paper.

14:45-15:05 Prof. Xin Jin (Graduate School at Shenzhen, Tsinghua Univ.)

Light field processing and compression

ABSTRACT: Traditional cameras integrate light over the dimensions, such as directions, colors, temporal variations, by converting photons into electrons. The process preserves a subset of two dimensional, or some three dimensional, time varying information, while loses a huge amount of information in other plenoptic dimensions. In this talk, after a brief overview of light field acquisition together with the comparison with the conventional image acquisition, the advantages in preserving the plenoptic dimensions are demonstrated by attractive applications. Our latest research works in light field processing and compression are introduced. Starting from the distortion modeling for three dimensional free viewpoint TV to four dimensional plenoptic processing and compression are introduced. Theoretical analysis and experimental results demonstrated the effectiveness of the proposed approaches in accuracy, fidelity and computational complexity.

BIOSKETCH: Xin Jin received the B. E. degree in communication engineering, M.S. degree in communication and information system and the Ph.D. degree in information and communication engineering from Huazhong University of Science and Technology, Wuhan, China, in 1999, 2002 and 2005, respectively. From 2008 to 2012, she was a Visiting Lecturer with the Information Technology Research Organization, Waseda University, Fukouoka, Japan. Since Mar. 2012, she has been with Graduate School at Shenzhen, Tsinghua University, China, where she is currently an associate professor. Her current research interests include power-constrained video processing and compression, computational imaging and multimedia cloud computing. She has published 104 peer-reviewed conference and journal papers. She has filed more than 40 invention patents in China, of which 12 have been granted. Dr. Jin is the chair of 3D video compression standard ad-hoc group of the Audio Video Standard Workgroup of China (AVS). She received the Second Prize of National Science and Technology Progress Award in 2016, the First Prize of Guangdong Science and Technology Award in 2016, ISOCC Best Paper Award in 2010 and AVS Outstanding Contributor Award of the Year 2004. She has served on many conference committees, including as a special session chair at APSIPA2016 and PCM2015, and served as a reviewer for many transactions and international conferences, e.g., IEEE TIP, TCSVT, ICIP, ISCAS, ICME, etc.

15:05-15:25 Prof. Genci Capi, (Robotics Eng., Hosei Univ.)

Intelligent Assistive Robots Operating in Real Environments (Video Presentation)

ABSTRACT: Soon robots are expected to operate in our homes, hospitals and offices. Therefore, they have to process multiple sensors data and adapt the policy as the environment changes. In this talk, I will overview the existing efforts including our attempts at creating intelligent robots operating in everyday life environments. In particular, I will focus on remotely operating surveillance robot, robot navigation in urban environments, and assistive humanoid robot. I will show experimental results that demonstrate the effectiveness of proposed algorithms.

BIOSKETCH: Genci Capi received the Ph.D. degree from Yamagata University, in 2002. He was a Researcher at the Department of Computational Neurobiology, ATR Institute from 2002 to 2004. In 2004, he joined the Department of System Management, Fukuoka Institute of Technology, as an Assistant Professor, and in 2006, he was promoted to Associate Professor. He was a Professor in the Department of Electrical and Electronic Systems Engineering, University of Toyama up to March 2016. Now he is a Professor in the Department of Mechanical Engineering, Hosei University. His research interests include intelligent robots, BMI, multi robot systems, humanoid robots, learning and evolution. Dr. Capi is a recipient of the Excellent Paper Award of 7-th International Conference on Production Engineering, Design and Control, Alexandria, 2001; Highly Commended Award for "Real Time Generation of Humanoid Robot Optimal Gait for Going Upstars Using Intelligent Algorithms" Industrial Robot - An International Journal Vol. 28, No. 6, 2001; Best Paper Award of International Conference on Artificial Life and Robotics, 2007; Best Innovation Award of ICAME2010, 2010; Excellence in Research Journal Award of Journal of Information Technology Research, 2011. He is a leading organizer of the annual IEEE International Symposium on Robotics and Intelligent Sensors and IEEE the IEEE International Robot PRIDE Competition.