



50th IEEE International Symposium on Multiple-Valued Logic

ISMVL 2020

Nov. 9 – 11, 2020, Hotel Merieges, Miyazaki, Japan

Final Program



Sponsored by:



IEEE



IEEE computer society



Supported by:



Tateisi Science and Technology Foundation



公益財団法人
セコム科学技術振興財団
SECOM Science and Technology Foundation



公益財団法人
電気通信普及財団
The Telecommunications Advancement Foundation

公益財団法人
鹿島学術振興財団
THE KAJIMA FOUNDATION

Sunday, Nov. 8, 2020 (JST)

18:00 Welcome Reception

Monday, Nov. 9, 2020 (JST)

| | |
|-------|---|
| 09:00 | Opening Symposium Chair: <i>Y. Hata</i> and Program Chair: <i>Y. Yuminaka</i> |
| 09:15 | [Keynote Address I] Chair: <i>Y. Hata</i> Quantum Annealing and Its Application to Real World <i>Masayuki Ohzeki (Tohoku University, Tokyo Institute of Technology, Japan)</i> |
| 10:00 | Coffee/Tea Break |
| | [Session 1A: Special Session, Medical & Healthcare Systems I] Chair: <i>Y. Iguchi</i> |
| 10:15 | On Detection of Stenosis-Type Sections in Fallopian Tubal Models Using Support Vector Machines <i>N. Kamiura, T. Isokawa, and T. Yumoto</i> |
| 10:25 | Automated Diagnosis of the Frequency of Uterine Peristalsis for Female Infertility <i>R. Nishihara, H. Matsubayashi, T. Ishikawa, and Y. Hata</i> |
| 10:35 | Ultrasonic Diagnosis for Bone Fracture Healing Process <i>S. Kimura, K. Oe, Y. Kumabe, T. Fukui, T. Niikura, R. Kuroda, N. Yagi, and Y. Hata</i> |
| 10:45 | Automatic Teeth Recognition in Dental X-Ray Images Using Transfer Learning Based Faster R-CNN <i>F. P. Mahdi, N. Yagi, and S. Kobashi</i> |
| 10:55 | Coffee/Tea Break |
| | [Session 1B: Optimization & Minimization] Chair: <i>K. Smith</i> |
| 11:10 | Reducing T-count When Decomposing Many MPMCT Gates Simultaneously <i>S. Esaki and S. Yamashita</i> |
| 11:20 | Symbolic Algorithms for Token Swapping <i>B. Schmitt, M. Soeken, and G. De Micheli</i> |
| 11:30 | Approximate Ternary Quantum Error Correcting Code with Low Circuit Cost <i>R. Majumdar and S. Sur-Kolay</i> |
| 11:40 | Efficient Implementation of Nearest Neighbor Quantum Circuits Using Clustering with Genetic Algorithm <i>A. Bhattacharjee, C. Bandyopadhyay, A. Mukherjee, R. Wille, R. Drechsler, and H. Rahaman</i> |
| 11:50 | Lunch (Symposium & Executive Committee Meeting) |

Monday, Nov. 9, 2020 (JST, continued)

| | |
|-------|---|
| 13:30 | [Keynote Address II] Chair: <i>T. Hanyu</i> Digital Annealer: A Stochastic Search for Global Optimum <i>Ali Sheikholeslami (University of Toronto, Canada)</i> |
| 14:15 | Coffee/Tea Break |
| | [Session 2A: Security & EDA] Chair: <i>S. Nagayama</i> |
| 14:30 | Effective Formal Verification for Galois-field Arithmetic Circuits with Multiple-Valued Characteristics <i>A. Ito, R. Ueno, and N. Homma</i> |
| 14:40 | Debiasing Method for Efficient Ternary Fuzzy Extractors and Ternary Physically Unclonable Functions <i>K. Kazumori and N. Homma</i> |
| 14:50 | Multi-Source Training Deep-Learning Side-Channel Attacks <i>H. Wang, S. Forsmark, M. Brisfors, and E. Dubrova</i> |
| 15:00 | ASNet: Introducing Approximate Hardware to High-Level Synthesis of Neural Networks <i>S. Froehlich, L. Klemmer, D. Grose, and R. Drechsler</i> |
| 15:10 | Short Break |
| | [Session 2B: Bent Functions] Chair: <i>M. Miller</i> |
| 15:20 | Methods to Generate Multiple-valued Bent Functions of an Odd Number of Variables <i>C. Moraga, M. Stanković, S. Stojković, and R. S. Stanković</i> |
| 15:30 | On Ternary Symmetric Bent Functions <i>C. Moraga, M. Stanković, and R. S. Stanković</i> |
| 15:40 | Properties of Multiple-Valued Partition Functions <i>J. T. Butler, T. Sasao, and S. Nagayama</i> |
| 15:50 | Construction of Ternary Bent Functions by FFT-like Permutation Algorithms <i>R. S. Stanković, M. Stanković, C. Moraga, and J. T. Astola</i> |
| 16:00 | Coffee/Tea Break |
| | [Session 3A: Special Session, Medical & Healthcare Systems II] Chair: <i>S. Kobashi</i> |
| 16:15 | 3D Shape Understanding for the Visually Impaired by using Virtual Haptic Senses based on Fuzzy Logic <i>H. Tatsumi, Y. Murai, M. Kobayashi, I. Sekita, and M. Miyakawa</i> |
| 16:25 | Joint Position Registration between OpenPose and Motion Analysis for Rehabilitation <i>K. Otsuka, N. Yagi, Y. Yamanaka, Y. Hata, and Y. Sakai</i> |
| 16:35 | Development of Patient Information Extraction Method by Sequence Labeling using Electronic Medical Records <i>M. Kushima, Y. Hasegawa, S. Nozue, E. Okazaki, H. Koga, R. Matsuo, T. Ogawa, and K. Araki</i> |
| 16:45 | ECG Signal Processing Using Fuzzy Classification for Sudden Cardiac Death Prediction <i>Z. Abidin, L. Arya T. Jaya, P. Siwindarto, and K. Tanno</i> |
| 16:55 | Coffee/Tea Break |
| | [Session 3B: Classification & Index Generation Functions] Chair: <i>M. Soeken</i> |
| 17:05 | On the Minimization of Variables to Represent Partially Defined Classification Functions <i>T. Sasao</i> |
| 17:15 | Handwritten Digit Recognition Based on Classification Functions <i>T. Sasao, Y. Horikawa, and Y. Iguchi</i> |
| 17:25 | On Optimum Linear Decomposition of Symmetric Index Generation Functions <i>S. Nagayama, T. Sasao, and J. T. Butler</i> |
| 17:35 | Non-Disjoint Functional Decomposition of Index Generation Functions <i>T. Mazurkiewicz</i> |

Tuesday, Nov. 10, 2020 (JST)

| | |
|-------|--|
| 09:00 | [Keynote Address III] Chair: <i>T. Sasao</i> Boolean Logic Networks for Machine Learning <i>Alan Mishchenko (University of California Berkeley, USA)</i> |
| 09:45 | Coffee/Tea Break |
| | [Session 4A: Circuits & Systems] Chair: <i>M. Natsui</i> |
| 10:00 | A Delta-sigma-modulator Feedforward Network for a Non-binary Analog-to-digital Converter <i>T. Waho</i> |
| 10:10 | PAM-4 Eye-Opening Monitoring Techniques Using Gaussian Mixture Model <i>Y. Iijima, K. Taya, and Y. Yuminaka</i> |
| 10:20 | Extreme Low Power Technology using Ternary Arithmetic Logic Circuits via Drastic Interconnect Length Reduction <i>K. Kim, S. Kim, Y. Lee, D. Kim, S.-Y. Kim, S. Kang, and B. H. Lee</i> |
| 10:30 | Novel Fractional-N All Digital Frequency Locked Loop with Robustness for PVT variation <i>R. Miyauchi, A. Yoshida, S. Nakano, H. Tamura, K. Tanno, Y. Fukuchi, Y. Kawamura, Y. Kodama, and Y. Sekiya</i> |
| 10:40 | Coffee/Tea Break |
| | [Session 4B: Quantum Systems] Chair: <i>M. Lukac</i> |
| 10:55 | A Quantum Photonic TRNG based on Quaternary Logic <i>K. N. Smith, D. L. MacFarlane, and M. A. Thornton</i> |
| 11:05 | Automatic Uniform Quantum State Preparation Using Decision Diagrams <i>F. Mozafari, M. Soeken, H. Riener, and G. De Micheli</i> |
| 11:15 | Arrays vs. Decision Diagrams: A Case Study on Quantum Circuit Simulators <i>T. Grurl, J. Fuß, L. Burgholzer, S. Hillmich, and R. Wille</i> |
| 11:25 | Efficient Quantum Circuit Decompositions via Intermediate Qudits <i>J. M. Baker, C. Duckering, and F. T. Chong</i> |
| 11:35 | Lunch |
| | [Session 5A: Neural Networks & Systems] Chair: <i>T. Waho</i> |
| 13:00 | Table Look-Up Based Ternary Neural Network Processor <i>Y. Suzuki, N. Soga, S. Sato, and H. Nakahara</i> |
| 13:10 | Design and Evaluation of a Synthesizable Standard-Cell-Based Nonvolatile FPGA <i>D. Suzuki and T. Hanyu</i> |
| 13:20 | 2^n+1-valued SSS-Net: Uniform Shift, Channel Sparseness, and Channel Shuffle <i>H. Nakahara</i> |
| 13:30 | Capacity Limits of Fully Binary CNN <i>K. Abdiyeva, T. Tibeyev, and M. Lukac</i> |
| 13:40 | uMemristorToolbox: Open Source Framework to Control Memristors in Unity for Ternary Applications <i>S. Bos, H. Gundersen, and F. Sanfilippo</i> |
| 13:50 | Coffee/Tea Break |
| | [Session 5B: Logics & Their Applications] Chair: <i>T. Araki</i> |
| 14:05 | Sequential Fuzzy Description Logic: Reasoning for Fuzzy Knowledge Bases with Sequential Information <i>N. Kamide</i> |
| 14:15 | Infectious Semantics and Analytic Calculi for Even More Inclusion Logics <i>C. Caleiro, S. Marcelino, and P. Filipe</i> |
| 14:25 | Shadowing in Many-Valued Nested Structures <i>B. D.-Kęplicz and A. Szalas</i> |
| 14:35 | Interpreting Propositional Fuzzy Logics via Imperfect Information Games <i>O. Majer and C. G. Fermüller</i> |
| 14:45 | Tableaux for Maximum Satisfiability in Łukasiewicz Logic <i>C. M. Li, F. Manyà, and A. Vidal</i> |
| 19:00 | Banquet |

Wednesday, Nov. 11, 2020 (JST)

| | |
|-------|---|
| 09:00 | [50th Anniversary Event] <i>Y. Hata & Y. Yuminaka</i> |
| 09:30 | Coffee/Tea Break |
| | [Session 6A: Design, Verification, & Analysis] Chair: <i>N. Homma</i> |
| 09:45 | A New Approach to Verification of Threshold Functions in Ternary Logic <i>T. Kitahashi and Y. Hata</i> |
| 09:55 | On a Realization of Multi-terminal Universal Interconnection Networks Using Contact Switches <i>T. Sasao, T. Matsubara, K. Tsuji, and Y. Koga</i> |
| 10:05 | Fast Minimization of Polynomial Decomposition Using Fixed-Polarity Pascal Transforms <i>K. N. Smith, D. M. Miller, and M. A. Thornton</i> |
| 10:15 | Multi-Valued Decision Diagrams in Importance Analysis Based on Minimal Cut Vectors <i>M. Kvassay, P. Rusnak, E. Zaitseva, and R. S. Stanković</i> |
| 10:25 | Behavior Expressions for Social and Entertainment Robots <i>M. Sunardi and M. Perkowski</i> |
| 10:35 | Coffee/Tea Break |
| | [Session 6B: Algebras & Clones] Chair: <i>N. Kamide</i> |
| 10:50 | Completeness of Subtrilattice Logic <i>N. Kamide</i> |
| 11:00 | Fleischer Po-semigroups and Quantum B-algebras <i>J. Kühn and J. Paseka</i> |
| 11:10 | Centralising Groups of Semiprojections and Near Unanimity Operations <i>M. Behrisch and R. Pöschel</i> |
| 11:20 | On Minimality of Some Binary Clones Related to Unary Functions <i>H. Machida and M. Behrisch</i> |
| 11:30 | A New Characterization of Restriction-Closed Hyperclones <i>V. Lagerkvist</i> |
| 11:40 | Short Break |
| 11:50 | Plenary Session & Closing Symposium Chair: <i>Y. Hata</i> and Program Chair: <i>Y. Yuminaka</i> |
| 13:00 | Lunch |
| 14:30 | Workshop on Post-Binary ULSI Systems Workshop Chair: <i>M. Natsui</i> |

MEMO: