1 March 2021, Vol. 51, No. 3

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From: Xiang Chen <<u>shawn.xiang.chen@gmail.com</u>>

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Contributing author: Shaoshan Liu <<u>shaoshan.liu@perceptin.io</u>> From: Wanli Chang <<u>wanli.chang@york.ac.uk</u>>

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Comments from the Editors

Dear ACM/SIGDA members,

We are excited to present to you March E-Newsletter. We encourage you to invite your students and colleagues to be a part of the SIGDA newsletter. The newsletter covers a wide range of information from the upcoming conferences and hot research topics to technical news and activities from our community. Get involved and contact us if you want to contribute an article or announcement.

The newsletter is evolving. Please let us know what you think.

Happy reading!

Debjit Sinha, Keni Qiu, Editors-in-Chief, SIGDA E-News

To renew your ACM SIGDA membership, please visit http://www.acm.org/renew or call between the hours of 8:30am to 4:30pm EST at +1-212-626-0500 (Global), or 1-800-342-6626 (US and Canada). For any questions, contact acmhelp@acm.org.

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Ying Wang, E-Newsletter Associate Editor for SIGDA Technical activities column

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SIGDA News

(1) "Executive Order Paves Way for \$37bn to Boost U.S. Chip Capacity" [https://www.eetimes.com/executive-order-paves-way-for-37bn-to-boost-u-s-chip-cap...]

President Biden on Wednesday signed, as expected, an executive order that paves the way for allocation of \$37 billion federal government investment to address the chip supply shortfall.

(2) "Congress Creates a Focal Point for Optics, Photonics" [https://www.eetimes.com/congress-creates-a-focal-point-for-optics-photonics/]

A congressional optics and photonics caucus launched this week seeks to revive U.S. manufacturing capabilities while addressing a skills gap that backers of the technology say is stymying innovation.

(3) "Chip Sales Remain Strong in Challenging Year"
[https://www.eetimes.com/chip-sales-remain-strong-in-challenging-year/]

Chip sales have remained strong in this challenging year, but we at the Semiconductor Industry Association believe that federal manufacturing and research investments present a crucial opportunity.

(4) "Chipmakers Halt Production in Texas After Power Outages" [https://www.eetimes.com/chipmakers-halt-production-in-texas-after-power-outages/]

Samsung, NXP, and Infineon have stopped operations at chip fabs in Texas after a surprise cold wave caused power outages in the US state that is a major energy supplier.

(5) "ISSCC: Focus on the SoC" [https://www.eetimes.com/isscc-focus-on-the-soc/]

With a nasty winter storm wreaking havoc across much of the US this week, a fully virtualized ISSCC was a less compelling reason for not leaving the house. But for remote attendees in Texas at least, they likely had to postpone their content consumption for at least a few days while dealing with more pressing issues during rolling blackouts.

(6) "IBM Brings 8-Bit Al Training to Hardware" [https://www.eetimes.com/ibm-brings-8-bit-ai-training-to-hardware/]

At ISSCC, IBM Research presented a test chip that represents the hardware manifestation of its years of work on low-precision AI training and inference algorithms. The 7nm chip supports 16-bit and 8-bit training, as well as 4-bit and 2-bit inference (32-bit or 16-bit training and 8-bit inference are the industry standard today).

(7) "AMD, TSMC & Imec Show Their Chiplet Playbooks at ISSCC" [https://www.eetimes.com/amd-tsmc-imec-show-their-chiplet-playbooks-at-isscc/]

A lot has been said about the shift from a system-on-chip integration of functionality to a technology integrating each IP block as a physically distinct chiplet. Perhaps the emergence of this new paradigm is most aptly represented by the devotion of a full forum session to chiplets at the International Solid-State Circuits Conference. The virtual conference just wrapped up.

(8) " 'Critical' year ahead for haptics market"
[https://www.eetimes.com/critical-year-ahead-for-haptics-market/]

The market for haptics technology is growing exponentially and is set to be worth almost \$5 billion in 2025, according to a report published Tuesday (February 23rd) by Cambridge, UK-based consultancy firm IDTechEx Research.

(9) "2021 Perspectives: What BEVs, Connected Cars & Software Will Become" [https://www.eetimes.com/2021-perspectives-what-bevs-connected-cars-software-will...]

This column looks at key technology and business trends in other segments of automotive electronics — namely, BEVs (battery electric vehicles), connected cars and software. The following table summarizes these trends with additional perspectives below. I have used a lot of data from IHS Markit and links to these data sources are included towards the end of the column.

(10) "Flash Wearout Drives Tesla Recall" [https://www.eetimes.com/flash-wearout-drives-tesla-recall/]

Tesla's latest recall due to NAND flash wearing out in an eMMC device may be a reflection that the company thinks more like a software company than automaker.

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"What is" Column

What is Robotic Computing on FPGAs?

Dr. Shaoshan Liu CEO, PerceptIn

The commercialization of autonomous robots and vehicles is a thriving sector, and likely to be the next major computing demand driver, after PC, cloud computing, and mobile computing. After examining various compute substrates for robotic computing [1, 2], I argue that FPGAs are currently the best compute substrate for robotic applications for several reasons: first, robotic algorithms are still evolving rapidly, and thus any ASIC-based accelerators will be months or even years behind the state-of-the-art algorithms; on the other hand, FPGAs can be dynamically updated as needed. Second, robotic workloads are highly diverse, thus it is difficult for any ASIC-based robotic computing accelerator to reach economies of scale in the near future; on the other hand, FPGAs are a cost effective and energy-effective alternative before one type of accelerator reaches economies of scale. Third, compared to SoCs that have reached economies of scale, e.g. mobile SoCs, FPGAs deliver a significant performance advantage [3].

FPGAs require little power and are often built into small systems with less memory. They have the ability to parallel computations massively and makes use of the properties of perception, localization, and planning kernels to remove additional logic and simplify the implementation. Taking into account hardware characteristics, several algorithms are proposed which can be run in a hardware-friendly way and achieve similar software performance. Therefore, FPGAs are possible to meet real-

time requirements while achieving high energy efficiency compared to CPUs and GPUs [4]. In addition, through Partial Reconfiguration [5], FPGA technology provides the flexibility of runtime programming and re-programming without going through re-fabrication with a modified design. Due to the advantages over other compute substrates, FPGAs have been successfully utilized in commercial autonomous vehicles and robots [6,7].

Unfortunately, robotic computing on FPGAs is mainly constrained by the available tools and infrastructure supports. For instance, Robot Operating System (ROS) is the most widely used operating system for autonomous machines and robots [8]. ROS provides the essential operating system services, including hardware abstraction, low-level device control, implementation of commonly-used functionality, message-passing between processes, and package management. FPGAs are not officially supported by ROS. Although there exist limited efforts to bridge ROS and FPGAs [9], to enable more robotic workloads on FPGAs, ROS needs to treat FPGAs as first-class citizens like CPUs and GPUs.

In addition, programming FPGAs is extremely challenging for engineers with limited hardware background, such as robotic engineers. A FPGA programming infrastructure for robotic engineers is imperative. One recent effort, HeteroCL targets this exact challenge [10]. HeteroCL is comprised of a Python-based domain-specific language (DSL) and a compilation flow, potentially allowing programmers to port their robotic workloads onto FPGAs. It would be great to have programming infrastructures like HeteroCL officially integrated into FPGA development toolchains.

In summary, FPGAs are more cost and energy efficient, as well as more flexible compared to other compute solutions for robotic workloads. Before robotic ASICs reach economies of scale, FPGAs are currently the best compute substrate for robotic applications. However, robotic computing on FPGAs has not reached large-scale adoption due to the lack of tools and infrastructure supports.

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- [2] Liu, Shaoshan, Liangkai Liu, Jie Tang, Bo Yu, Yifan Wang, and Weisong Shi. "Edge computing for autonomous driving: Opportunities and challenges." Proceedings of the IEEE 107, no. 8 (2019): 1697-1716.
- [3] Wan, Zishen, Bo Yu, Thomas Yuang Li, Jie Tang, Yuhao Zhu, Yu Wang, Arijit Raychowdhury, and Shaoshan Liu. "A Survey of FPGA-Based Robotic Computing." arXiv preprint arXiv:2009.06034 (2020). [4] Liu, Shaoshan, Zishen Wan, Bo Yu, and Yu Wang. "Robotic Computing on FPGAs" Synthesis Lectures on Computer Architecture, Morgan & Claypool (2021).
- [5] Liu, Shaoshan, Richard Neil Pittman, Alessandro Forin, and Jean-Luc Gaudiot. "Achieving energy efficiency through runtime partial reconfiguration on reconfigurable systems." ACM Transactions on Embedded Computing Systems (TECS) 12, no. 3 (2013): 1-21.
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Paper Submission Deadlines

LCTES' 21 – ACM Int' I Conference on Languages Compilers, Tools and Theory of Embedded

Systems

Virtual conference Deadline: Mar 8, 2021 Jun 20-25, 2021

https://pldi21.sigplan.org/home/LCTES-2021

DAC' 21 – Design Automation Conference

San Francisco

Deadline: Mar 5, 2021 (Late Breaking Results)

Jul 11–15, 2021 http://www.dac.com/

ISVLSI' 21 – IEEE Computer Society Annual Symposium on VLSI

Tampa, Florida

Deadline: March 14, 2021 (Extended)

Jul 7-9, 2021

http://www.ieee-isvlsi.org

ISLPED' 21 – ACM/IEEE Int' | I Symposium on Low Power Electronics and Design

Hybrid Zoom/Boston, MA

Deadline: Mar 15, 2021 (Abstracts due: Mar 8, 2021)

Jul 26-28, 2021

http://www.islped.org

MDTS'21 – IEEE Microelectronics Design & Test Symposium

Virtual workshop Deadline: Mar 30, 2021 May 19-21, 2021 http://natw.ieee.org

ESWEEK'21 - Embedded Systems Week (CASES, CODES+ISSS, and EMSOFT)

Virtual Conference

Deadline: Apr 9, 2021 (Abstracts due: Apr 2, 2021)

Oct 10-15, 2021

http://www.esweek.org

PACT'21 - Int'l Conference on Parallel Architectures and Compilation Techniques

Virtual Conference

Deadline: Apr 19, 2021 (Abstracts due: Apr 15, 2021)

Sept 26-28, 2021

http://www.pactconf.org

ISED' 21 – 10th Int' I Symposium on Embedded Computing & System Design

Kollam, India

Deadline: Apr 25, 2021

Jul 16-18, 2021 http://isedconf.org

VLSI-SoC' 21 – IFIP/IEEE Int' I Conference on Very Large Scale Integration

Singapore

Deadline: Apr 26, 2021 (Abstracts due: Apr 19, 2021)

Oct 5-7, 2021

http://www.vlsi-soc.com

MICRO' 21 – IEEE/ACM Int'l Symposium on Microarchitecture

Athens, Greece

Deadline: to be announced

Oct 16-20, 2021

http://www.microarch.org/micro54

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Upcoming Conferences and Symposia

DATE'21 - Design Automation and Test in Europe Grenoble, France Feb 1-5, 2021

http://www.date-conference.com

ISSCC'21 – IEEE Int'l Solid-State Circuits Conference San Francisco, CA Feb 14-18, 2021 http://isscc.org

VLSID'21 – International Conference on VLSI Design & International Conference on Embedded Systems

Virtual Conference

Feb 20-24, 2021

http://embeddedandvlsidesignconference.org/

FPGA' 21 – ACM/SIGDA Int' I Symposium on Field-Programmable Gate Arrays Virtual Conference Feb 28-Mar 2, 2021 http://www.isfpga.org

ISPD' 21 – ACM Int' I Symposium on Physical Design Mar 21-24, 2021 http://www.ispd.cc

ISQED'21 - Int'l Symposium on Quality Electronic Design Virtual Conference Apr 7-8, 2021 http://www.isqed.org

TAU' 21 – ACM Int' I Workshop on Timing Issues in the Specification and Synthesis of Digital Systems

Monterey, CA

Apr 8-9, 2021

http://www.tauworkshop.com

FCCM' 21 - The 29th IEEE International Symposium On Field-Programmable Custom Computing Machines
Orlando, FL
May 9 – May 12, 2021

https://www.fccm.org/

RTAS'21 – 27th IEEE Real-Time and Embedded Technology and Applications Symposium

Nashville, USA May 18-21, 2021 http://2021.rtas.org

ISCA' 21 – Int' I Symposium on Computer Architecture Valencia, Spain
May 22 – 26, 2021
https://iscaconf.org/isca2021/

ISCAS'21 – IEEE Int'l Symposium on Circuits and Systems Daegu, Korea May 23-26, 2021 http://iscas2021.org

GLSVLSI' 21 – ACM Great Lakes Symposium on VLSI Virtual Conference Jun 22-25, 2021 http://www.glsvlsi.org

ISVLSI' 21 – IEEE Computer Society Annual Symposium on VLSI Tampa, Florida Jul 7-9, 2021 http://www.ieee-isvlsi.org

DAC' 21 – Design Automation Conference San Francisco Jul 11 - 15, 2021 http://www.dac.com/

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SIGDA Awards

Best Paper Awards at ICCAD 2020: International Conference On Computer Aided Design, https://iccad.com/index.php

Front-End: "HyperFuzzing for SoC Security Validation" by Sujit Kumar Muduli, Gourav Takhar and Pramod Subramanayan - Indian Institute of Technology Kanpur.

Back-End: "Electromigration Checking Using a Stochastic Effective Current Model" by Adam Issa (University of Toronto), Valeriy Sukharev (Mentor, A Siemens Business) and Farid N. Najm (University of Toronto).

Ten Year Retrospective Most Influential Paper Award: "3D-ICE: Fast Compact Transient Thermal Modeling for 3D ICs with Inter-Tier Liquid Cooling" by Arvind Sridhar, Alessandro Vincenzi, Martino Ruggiero, Thomas Brunschwiler and David Atienza, 2010.

ACM/SIGDA Calls for Service Awards (deadline March 15, 2021)

SIGDA gives two annual service awards

1) Distinguished Service Award: The SIGDA Distinguished Service Award is given to individuals who have dedicated many years of their career in extraordinary services to promoting, leading, or creating ACM/SIGDA programs or events.

2) Meritorious Service Award: The SIGDA Meritorious Service Award is given to individuals who have performed professional services above and beyond traditional service to promoting, leading, or creating ACM/SIGDA programs or events.

At any given year, the number of Distinguished Service Award will be up to 2, and the number of Meritorious Service Award will be up to 4.

Nominations should consist of:

- 1) Award type being nominated.
- 2) Name, address, phone number and email of person making the nomination.
- 3) Name, affiliation, address, email, and telephone number of the nominee for whom the award is recommended.
- 4) A statement (between 200 and 500 words long) explaining why the nominee deserves the award. Note that the award is given for service that goes above and beyond traditional services.
- 5) Up to 2 additional letters of support. Include the name, affiliation, email address, and telephone number of the letter writer(s). Supporters of multiple candidates are strongly encouraged to compare the candidates in their letters.

Note that the nominator and reference shall come from active SIGDA volunteers. "Deadline of the nomination every year: March 15".

Please send all your nomination materials as one pdf file to SIGDA-Award@acm.org before the deadline, with the subject "ACM/SIGDA Service Award Nomination".

The recipients of previous awards are available here: https://www.sigda.org/awards/service/.

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Technical Activities

1. "ISSCC 2021: Focus on the SoCs"

There were three papers with impact on SoC technology: one on AI vision, one on nanosheets, one looking at power management of complex ICs...

[https://www.eetasia.com/isscc-2021-focus-on-the-socs/]

2. "How Intel Gets Out of Manufacturing"

It won't be easy, but it could be done. This is How Intel Gets Out of Manufacturing... [https://www.eetasia.com/how-intel-gets-out-of-manufacturing/]

3. "Quantum Computers: IBM Outlines its Development Roadmap"

As the world of Internet of Things technologies continues to grow and expand, we are Quantum computing is at a pivotal point. The decisive quantum leap could be coming. IBM has outlined its quantum computing development roadmap that will begin with the release of the Qiskit Runtime open-source software in 2021...

[https://www.eetimes.eu/quantum-computers-ibm-outlines-its-development-roadmap/]

4. "Interview: Talking with Arm's Chet Babla about the future of the automotive industry"

In a new installment of EETimes On Air, global editor Junko Yoshida spoke with Chet Babla, the vice president of the automotive business at Arm...

[https://iot.eetimes.com/interview-talking-with-arms-chet-babla-about-the-future-...]

Job Openings:																								
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1. University of Tubingen Department of Computer Science Germany

Job Title: Full Professor of Distributed Intelligence

Description: Full Professor (W3) of Distributed Intelligence (m/f/d) The position is due to commence as soon as possible. The professorship is embedded in the research alliance Cyber Valley Baden-Württemberg, one of the leading centers for machine learning in Europe, as well as in the Cluster of Excellence "Machine Learning: New Perspectives for Science". For this competitively equipped professorship, an outstanding, internationally visible research profile and the substantial acquisition of competitive third-party funds are expected. The position is intended to bridge machine learning and practical computer science. Research therefore should focus on machine learning centered around real-world applications in one of the following areas: Distributed or federated intelligent systems and algorithms; Machine Learning Systems; Reinforcement Learning; Computer Vision Natural Language Processing. Applications with supporting documents (cover letter, Curriculum Vitae, list of publications and teaching experience, teaching statement, research statement (with intended collaboration), diplomas/certificates) and the completed "application form" (https://unituebingen.de/en/faculties/faculty-of-science/faculty/service-downloa...) should be sent by e-mail as a single PDF-file (max 10 MB) to the Deputy Dean, Prof. Dr. József Fortágh, of the Faculty of Science, University of Tübingen, Germany (career@mnf.uni-tuebingen.de). The closing date for applications is March 12, 2021. Enquiries may also be directed to this address.

2. Polytechnique Montreal, Canada

Job Title: Professor of Electrical Engineering

Description: ocated on Mount Royal, an exceptional setting in the heart of Montreal, Polytechnique is a world-renowned engineering university, excelling in cutting edge multidisciplinary and multisectoral research involved locally, nationally, and internationally, and is equally known for its top-tier training at all academic levels. An active advocate for sustainable development, Polytechnique has been certified Gold by the STARS organization. Polytechnique is known for its innovative approach, and its active role in technological, economic, and social development. The Department of Electrical Engineering counts 33 professors, one senior lecturer, 26 support staff, many postdoctoral researchers, professional researchers and research assistants, 476 undergraduate and 162 graduate students. The department leads internationally-recognized research, in close collaboration with industry, in several core areas such as: biomedical engineering, medical imaging, automation and systems, power systems and networks, microelectronics, telecommunications and microwaves, etc. The Department of Electrical Engineering is seeking exceptional candidates for one tenure track faculty position at the assistant or associate professor levels. The Department is seeking candidates able to conduct innovative research in emerging fields related to telecommunications and microwaves, particularly in the areas of electromagnetic metamaterials and metasurfaces, and of terahertz technologies (devices and circuits). Exceptional applications in any other field relevant to electrical engineering are strongly encouraged. To apply, please follow this link at: https://rita.illicohodes.com/go/6011c0713d24a92ea32dcbd9/5cf6bec9ee044c05afe6f4b... Examination of the applications will begin as soon as possible and will continue until the position is filled. We encourage all qualified candidates to apply, particularly women, members of visible and ethnic minorities, Aboriginal people and persons with disabilities. However, in accordance with immigration requirements, Canadians and permanent residents will be given priority.

3. Purdue University School of Aviation and Transportation Technology, United States

Job Title: Assistant Professor Aeronautical Engineering Technology

Description: Purdue University in West Lafayette, Indiana, is accepting applications for an Assistant Professor position beginning in fall 2021. This faculty appointment is in the School of Aviation & Transportation Technology, the Purdue Polytechnic Institute. Essential job duties include the following: (1) Develop and teach undergraduate and graduate courses in aeronautical engineering technology and related areas; (2) collaborate with other academic units at Purdue, as well as, other organizations externally, to engage with government and industry to obtain externally-funded applied research; (3) serve on curriculum committees; (4) perform customary faculty assignments and student mentoring; and (5) demonstrate a commitment to inclusion and transformational education. The ideal candidate should have a record of academic teaching, curriculum development, scholarly publications, and conference presentations. Once selected, all candidates must demonstrate plans for success with teaching, discovery, and engagement with community and industry. The process of reviewing applications begins December 1, 2020, and continues until the position is filled. The proposed date of hire is for fall 2021. Purdue Polytechnic is committed to advancing diversity in all areas of faculty effort, including scholarship, instruction, and engagement. Candidates are expected to address at least one of those areas in a cover letter, indicating how their past experiences, current interests and activities, and/or future goals could promote a work climate that values inclusion. To apply, submit the following letter of application; curriculum vitae; a letter addressing commitment to diversity; and a list of five references (with contact information) via Success Factors at https://careers.purdue.edu/. Click on "Faculty" in the Careers by Area section and select this position from a list of all the currently open faculty positions. In case you need guidance, contact Emily Birge via email: ebirge@purdue.edu. A background check is required for employment in this position.

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Circulation: 2,700

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