Conference Abstract

2022 5th International Conference on Circuits, Systems and Simulation

ICCSS 2022

with workshop

2022 5th International Conference on Consumer Electronics and Devices

ICCED 2022

MAY 13-15, 2022 | NANJING, CHINA

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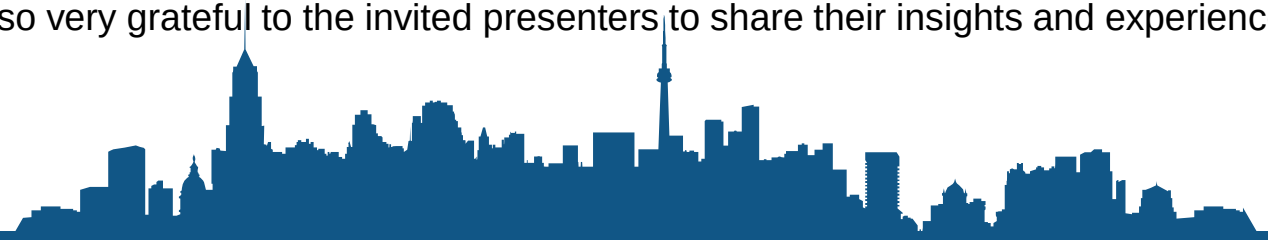
WELCOME MESSAGE

Welcome to the 2022 5th International Conference on Circuits, Systems and Simulation (ICCSS 2022), which is expected to be held on an annual basis. It delightfully welcomes all the researchers and developers to share their experiences and ideas through research talks and presentations from diverse fields and contributing an integrative approach to Circuits, Systems and Simulation. It is sponsored by Southeast University, China and Joint International Research Laboratory of Information Display and Visualization, and hosted by Joint International Research Laboratory of Information Display and Visualization.

We planned to have the conference to be held in the beautiful city -Nanjing, but due to the pervasive travel restrictions caused by COVID-19 over the world, we will hold it virtual on May 13-15, 2022.

The conference would not have been possible without the help of many people and organizational partners. Our sincere appreciation goes to all distinguished keynote speakers and invited speakers for their valuable contribution to the conference. They are: Prof. Wei Hong (IEEE Fellow) Southeast University, China; Prof. Amine Bermak (IEEE Fellow) Hamad Bin Khalifa University, Qatar; Prof. Takashi NOGUCHI, University of the Ryukyus, Japan; Prof. Mehmet Ertugrul, University Putra Malaysia (UPM), Malaysia; Prof. Mamoru Furuta, Kochi University of Technology, Japan; Prof. Min Xu, East China Normal University, China and Prof. Yang Gao, East China University of Science and Technology, China.

Last but not least, our deepest appreciation goes to all members of the Conference Committees and reviewers for their critical review of the submitted papers. We are also very grateful to the invited presenters to share their insights and experience.



Organizing Committees

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Essential Information

ZOOM Operation Manuals (Click)
Room ID: 822 8089 6617
https://us02web.zoom.us/j/82280896617
[Room B]Room ID: 836 1687 2148
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Rename

- ☑ **Author: Paper ID + Name**
- ☑ **Speaker: KN + Name**
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Time Zone

Beijing Local Time / GMT+8

◆ Tips:

1. Please join a meeting without sign in.
2. Please enter the meeting room 20 minutes and connect the audio before the conference starts.
3. Each presentation of the regular author is 15 minutes includes Q&A.
4. Presentation certificates will be sent to presenters after conference by emails.
5. An excellent presentation will be selected from each session and announced on the end of each session. The best presenter certificate will be sent after conference by email.
6. If you have any inquiry, welcome you to contact with our conference assistant.

Friday, May 13, 2022 (GMT+8)

ZOOM TEST

Conference ID: 822 8089 6617

Time	Paper ID
10:00 – 11:00	DC002, DC507, DC024, DC033, DC503, DC005, DC037-A
11:00 – 12:00	DC017, DC020, DC034, DC509, DC508, DC019, DC504, DC502
14:00 – 15:00	DC506, DC001, DC015, DC018, DC016, DC035, DC505
15:00 – 16:00	DC010, DC011, DC023, DC004, DC009, DC022, DC501
16:00 – 17:00	DC014, DC026, DC027, DC029, DC031, DC201, DC205
17:00 – 17:30	Free Arrangement

MEETING AGENDA

Saturday, May 14, 2022 (GMT+8)

Room ID: 822 8089 6617

Time	Activity	Speaker
09:00	**Online Meeting Room Start** [Please join in the meeting room before 9:15 am]	
	Host: TBA	
09:30-09:35	**Opening Remarks**	**Prof. Wei Lei (Conference Co-Chair)** Southeast University, China
09:35-10:20	**Keynote Speech I** Millimeter Wave Integrated Circuit and Its Applications in Communication and Radar Systems	**Prof. Wei Hong (IEEE Fellow)** Southeast University, China
10:20-11:05	**Keynote Speech II** Effective Crystallization of Thin Si Films for the TFTs on Panel	**Prof. Takashi NOGUCHI** University of the Ryukyus, Japan
11:05-11:30	**Online Group Photo Capture & Break Time**	
11:30-12:15	**Keynote Speech III** Energy Efficenet Wires: Ultraconductors and Covetics	**Prof. Mehmet Ertugrul** Ataturk University, Turkey & University Putra Malaysia (UPM), Malaysia
12:15-14:00	**Break Time**	

MEETING AGENDA

Saturday, May 14, 2022 (GMT+8)

Room ID: 822 8089 6617

Time	Activity	Speaker
14:00-14:45	**Keynote Speech III** TBA	**Prof. Amine Bermak (IEEE Fellow)** Hamad Bin Khalifa University, Qatar
14:45-15:15	**Break Time**	
15:15-17:00	**Session 1--Modern Electronics and Sensing Technology**	DC506, DC001, DC015,DC018, DC016, DC028, DC505
[Parallel Session in Room B] **Room ID: 836 1687 2148 / Zoom Link: https://us02web.zoom.us/j/83616872148**		
15:15-17:00	**Session 2--Electronic Materials and Devices**	DC017, DC020, DC034, DC509, DC508, DC019, DC504

MEETING AGENDA

Sunday, May 15, 2022 (GMT+8)

Room ID: 822 8089 6617

Time	Activity	Speaker
09:30	**Online Meeting Room Start** [Please join in the meeting room before 9:45 am]	
	Host: Prof. Takashi NOGUCHI	
09:30-10:15	**Keynote Speech IV** Metal oxide semiconductor thin-film transistor technologies for display applications	**Prof. Mamoru Furuta** Kochi University of Technology, Japan
10:15-10:50	**Invited Speech I** Multifunctional Hydrogel Based Flexible Sensor	**Prof. Min Xu** East China Normal University, China
10:50-11:20	**Break Time**	
11:20-11:55	**Invited Speech II** Laser Microfabrication of Flexible Sensors	**Prof. Yang Gao** East China University of Science and Technology, China
11:55-14:00	**Break Time**	

MEETING AGENDA

Sunday, May 15, 2022 (GMT+8)

Room ID: 822 8089 6617

Time	Activity	Speaker
14:00-15:30	**Session 3--Circuit and System**	DC002, DC507, DC024, DC033, DC503, DC005
15:30-16:00	**Break Time**	
16:00-17:30	**Session 5--Computer and Electronic Engineering**	DC014, DC026, DC027, DC029, DC031, DC201
17:45-18:10	**Announcements for Best Presentation Awards & Closing Remarks**	**Prof. Tayeb Mohammed-Brahim** University of Rennes 1, France; Southeast University, China
[Parallel Sessions in Room B] **Room ID: 836 1687 2148 / Zoom Link: https://us02web.zoom.us/j/83616872148**		
14:00-15:30	**Session 4--Electronics and Communication Engineering**	DC010, DC011, DC023, DC004, DC009, DC022
15:30-16:00	**Break Time**	
16:00-17:30	**Session 6--Artificial Intelligence and Control Systems**	DC205, DC037-A, DC206-A, DC502, DC035, DC501

INTRODUCTION FOR KEYNOTE SPEAKER

Report Time: 09:35-10:20 (GMT+8), May 14, 2022

Prof. Wei Hong (IEEE Fellow)

Southeast University, China

Biography: Wei Hong received the B.S. degree from the University of Information Engineering, Zhengzhou, China, in 1982, and the M.S. and PhD degrees from Southeast University, Nanjing, China, in 1985 and 1988, respectively, all in radio engineering.

Since 1988, he has been with the State Key Laboratory of Millimeter Waves (SKLMMW) and serves for the director of the lab during 2003-2021, and is currently a professor of the School of Information Science and Engineering, Southeast University. In 1993, 1995, 1996, 1997 and 1998, he was a short-term visiting scholar with the University of California at Berkeley and at Santa Cruz, respectively. He has been engaged in numerical methods for electromagnetic problems, millimeter wave theory and technology, antennas, RF technology for wireless communications etc. He has authored and co-authored over 300 technical publications and two books. He twice awarded the National Natural Prizes, four times awarded the first-class Science and Technology Progress Prizes issued by the Ministry of Education of China and Jiangsu Province Government etc. Besides, he also received the Foundations for China Distinguished Young Investigators and for “Innovation Group” issued by NSF of China.

Dr. Hong is a Fellow of IEEE, Fellow of CIE, the vice presidents of the CIE Microwave Society and Antenna Society, the Chair of the IEEE MTT-S/AP-S/EMC-S Joint Nanjing Chapter, and was an elected IEEE MTT-S AdCom Member during 2014-2016. He served as the Associate Editor of the IEEE Trans. on MTT from 2007 to 2010.

Speech Title: Millimeter Wave Integrated Circuit and Its Applications in Communication and Radar Systems

Abstract: In this talk, the recent advances in millimeter wave (mmWave) integrated circuit (mmWave ICs or Chips) and its applications in 5G and beyond communication systems and automotive radar systems in the State Key Laboratory of Millimeter Waves (SKLMMW) and cooperative enterprises are reviewed.

INTRODUCTION FOR KEYNOTE SPEAKER

Report Time: 10:20-11:05,(GMT+8), May 14, 2022

Prof. Takashi NOGUCHI

University of the Ryukyus, Japan

Biography: Takashi Noguchi received M.S. degree in 1979 and Ph.D. in 1992 from Doshisha University. In 1979, he joined Sony Corp., and contributed in R&D on Si MOS LSIs as well as Si TFTs (LTPS). In1994, he stayed in MIT as a visiting scientist. In 1998, he managed a research on novel Si devices in Sony Research Center. In 2001, he moved to France as a research scientist of CNRS in Universite Paris-Sud. In 2002, he moved to Korea and he managed two research projects as an executive member in SAIT, and also contributed in SungKyunKwan University. After 2006, he has contributed as a professor in University of the Ryukyus in Japan. After April 2019, he is a professor emeritus in Univ. of the Ryukyus.

Speech Title: Effective Crystallization of Thin Si Films for the TFTs on Panel

Abstract: Currently, thin Si devices are important for AM (active matrix) FPDs. For the glass panel of large and medium size, hydrogenated amorphous (a-Si:H) Si TFT is used to drive LC or OLED. And, high performance poly-crystalline (poly Si) TFT is important for small panels such as smart-phone etc.. To produce the poly Si TFTs both for n-type and p-type of CMOS integration, effective crystallization techniques have been extensively studied so far, and widely adopted. To realize high performance TFT with functional devices on panels, the attractive crystallization and devices are described. Also, the technical issues of crystallization techniques and the possibility in the future and are presented.

INTRODUCTION FOR PLENARY SPEAKER

Report Time: 11:30-12:15, (GMT+8), May 14, 2022

Prof. Mehmet Ertugrul

Ataturk University, Turkey & University Putra Malaysia (UPM), Malaysia

Biography: Prof. Dr. Mehmet Ertugrul was born in Trabzon, Turkey, in 1966. He received the B.Sc. degree from the Department of Physics, in 1986, and the M.Sc. and Ph.D. degrees in physics, in 1990 and 1994, respectively. From 1994 to 1996, 1996 to 2001, and 2001—2002, he was, respectively, an Assistant Professor, an Associate Professor, and a Full Professor at the Department of Physics, Ataturk University, where he has been a Full Professor at the Department of Electrical and Electronics Engineering since 2003. He is the author or co-author of more than 250 papers published in international journals and over 200 publications in national and international conference proceedings.

Speech Title: Energy Efficenet Wires: Ultraconductors and Covetics

Abstract: Energy-saving and increasing the efficiency of power transmission lines, electrical machines and transformers are important as much as diversity and renewability of energy resources. Considering the increasing power need it would be impossible to transmit dozens of GW power using the existing transmission lines due to the current carrying limitation of the metals used in transmission lines. Hence, it is a must to develop new materials for power transmission lines. The studies on energy-efficient materials, which can be alternative to superconductors and normal conductors, especially for applications of daily life are continued due to these disadvantages. It is known that new generation electrical materials on which the studies have been heavily performed in recent years have demonstrated close or better performances than superconductors in certain aspects even though they are not superconductors. One potential approach for decreasing metals electrical resistivity is the incorporation of carbon nanotubes into metal. In present work, we developed a unique method to obtain metal-CNT composite to get ultraconductive wire.

INTRODUCTION FOR INVITED SPEAKER

Report Time: 14:00-14:45, (GMT+8), May 14, 2022

Prof. Amine Bermak (IEEE Fellow)

Hamad Bin Khalifa University, Qatar

Biography: Prof. Amine Bermak received the Masters and PhD degrees, both in electrical and electronic engineering (microelectronics and Microsystems), from Paul Sabatier University, Toulouse, France in 1994 and 1998, respectively. During his PhD, he was part of the Microsystems and Microstructures Research Group at the French National Research Centre LAAS-CNRS, where he developed a 3D VLSI chip for artificial neural network classification and detection applications in a project funded by Motorola. While finalizing his PhD, he was offered a Post-doc position at the Advanced Computer Architecture group at York University – England, to work on VLSI implementation of CMM neural network for vision applications in a project funded by British Aerospace.

Prof. Bermak was nominated for the 2013 Hong Kong UGC best teacher award (for all HK Universities). He is the recipient of the 2011 University Michael G. Gale Medal for distinguished teaching (Highest University-wide Teaching Award). This gold medal is established to recognize excellence in teaching and only one recipient/year (out-of over 550 faculty) is honored for his/her contribution. Prof. Bermak is also a two-time recipient of the “Engineering School Teaching Excellence Award" in HKUST for 2004 and 2009, respectively.

Prof. Bermak has received many distinguished awards, including the 2016 DAC best design context award, the “Best paper award” at IEEE International Symposium on Circuits and systems ISCAS 2010; the 2004 “IEEE Chester Sall Award”; the IEEE Service Award from IEEE Computer Society and the “Best Paper Award” at the 2005 International Workshop on System-On-Chip for Real-Time Applications. He has published over 250 articles in journals, book chapters and conference proceedings and designed over 50 chips. He has supervised 25 PhD and 16 MPhil students. He has served on the editorial board of IEEE Transactions on Very Large Scale Integration (VLSI) Systems and IEEE Transactions on Circuits and Systems II. He is also currently serving on the editorial board of IEEE Transactions on Biomedical Circuits and Systems; IEEE Transactions on Electron Devices and Nature Scientific Reports. He is the guest editor of the November 2010 special issue in IEEE Transactions on Biomedical Circuits and Systems. Prof. Bermak is a Fellow of IEEE and IEEE distinguished Lecturer. He was the co-director of MIT-HKUST Consortium.

Speech Title: TBA

Abstract: TBA

INTRODUCTION FOR KEYNOTE SPEAKER

Report Time: 09:30-10:15, (GMT+8), May 15, 2022

Prof. Mamoru Furuta

Kochi University of Technology, Japan

Biography: Mamoru Furuta is a Professor at Department of Environmental Science and Engineering of Kochi University of Technology, Japan. His current research interests are metal oxide semiconductors for TFTs and their application to imaging devices. In 1988-2004, he worked in the Central Research Laboratory of Panasonic, and Toshiba Matsushita Display Technology Co. , Ltd.. He had wide variety of job experiences in company not only the R & D but also a mass production including a start up of the polycrystalline silicon (LTPS) TFT factory in Singapore. Since 2005, he joined Kochi University of Technology, and has been working on the research of metal oxide semiconductors for TFT. In 2006, he demonstrated a pioneer ing work of the metal oxide TFT which was the worlds' first LCD driven by ZnO TFT at the conference of the Society for Information Display (SID'06) which was held at San Francisco, USA. He received the Distinguished Paper Award from the SID in 2006, the Outstanding Poster Award from the International Display Workshop (IDW) in 2006, 2013 and 2016, and the Niwa-Takayanagi Paper Award from the Institute of Image Information and Television Engineers (ITE, Japan) in 2011. He is a member of editorial board of Applied Physics Express (APEX) and Japanese Journal of Applied Physics (JJAP), Japan Society of Applied Physics, and a senior member of the IEEE.

Speech Title: Metal oxide semiconductor thin-film transistor technologies for display applications

Abstract: Transparent metal oxide semiconductors (OSs) have been extensively investigated for use as the active channel layer of thin film transistors (TFTs) for next-generation flat-panel displays (FPDs). Among OSs, the amorphous In–Ga–Zn–O (IGZO) has attracted particular attention for TFT applications owing to its high field effect mobility of more than 10 cm2V−1s−1, steep subthreshold swing (S.S.), extremely low off-state current, large-area uniformity, and good bias stress stability. Although the field effect mobility of an IGZO TFT is more than one order of magnitude higher than that of an amorphous Si TFT, further improvement of the mobility in OS TFTs is required to expand their range of applications. In this presentation, current status and future prospect in the oxide TFTs will be discussed for FPDs including Title:the flxible device application.

INTRODUCTION FOR INVITED SPEAKER

Report Time: 10:15-10:50, (GMT+8), May 15, 2022

Prof. Min Xu

East China Normal University, China

Biography: Professor Min Xu of East China Normal University (ECNU) is currently the Vice Dean of school of physics and electronic sciences. She received her PhD in chemistry from Nanjing University. Then she worked as a Postdoc in ECNU, and then be associate professor, professor of ECNU. She also worked as research fellow in Nanyang technological university (2004-2006) and visiting scholar in the University of Akron (2016-2017). She is now the editorial board member of “functional polymer materials”, committee member of polymer characterization council of Chinese Chemistry Society (CCS) and Cellulose council of CCS. Her research focus on polymer composite materials, especially natural polymer composite materials, including adsorption materials, multi-functional hydrogels, natural polymer based smart sensors and supercapacitors applied for flexible and wearable devices. Besides, she is skilled in mechanism study with solid-state NMR.

Speech Title: Multifunctional Hydrogel Based Flexible Sensor

Abstract: In this paper, a multifunctional flexible strain sensor basing on hydrogel was reported. A double network was designed by in-situ polymerization of [2-(methacryloyloxy) ethyl] dimethyl-(3-sulfopropyl) ammonium hydroxide (SBMA) in bacterial cellulose nanofibers (BCN) aqueous dispersion. Due to the whole biomass based materials, the obtained hydrogel PSBMA@BCN shows excellent biocompatibility. Benefiting from the numerous zwitterionic functional groups, the PSBMA@BCN hydrogel also shows great anti-swelling and self-adhesion performance. The resistance of PSBMA@BCN hydrogel shows almost linear dependence on the strain ranging from 0 to 150%. Based on the hydrogel sensor, an intelligent communication system is developed to achieve information transmission. The assembled PSBMA@BCN flexible wearable device can precisely respond to target movement and output signals in real time so that the hydrogel can play a role in monitoring and identifying different target movement. More significantly, the anti-swelling properties make the wearable electronic device can be applied even in underwater condition, the hydrogel sensor can not only realize real-time monitoring and identification of target movement, but can also achieve intelligently underwater communication through the combination of computer programming and circuit design. As such, the biocompatibility hydrogel sensor has broad application prospects in underwater environment, providing a promising route to promote the development of next-generation wearable devices.

INTRODUCTION FOR INVITED SPEAKER

Report Time: 11:20-11:55, (GMT+8), May 15, 2022

Prof. Yang Gao

East China University of Science and Technology, China

Biography: Prof. Yang Gao received the B.S. and the M.S. degrees from East China Normal University, Shanghai, China, in 2005 and 2008, respectively, and PhD degrees from University of Nebraska-Lincoln, USA, in 2013. From 2013 to 2014, and 2014 to 2016, he is postdoctoral fellow in University of Nebraska-Lincoln and University of Houston, respectively. Since 2016, he is, respectively, an Assistant Professor and a Full Professor at School of Mechanical and Power Engineering, East China University of Science and Technology, Shanghai China. He is the author or co-author of 80 papers published in international journals.

Speech Title: Laser Microfabrication of Flexible Sensors

Abstract: In recent years, flexible sensors gain much attentions due to its capability of mimicking human skins for perceiving, distinguishing, and transmitting various external stimuli, which have promising applications in human-machine interfaces, internet of things and structural health monitoring. To accomplish the aforementioned applications, not only high sensitivity, fast response speed and mechanical robustness are demanded for the sensors, but also a highly efficient and scalable fabrication method is desired for wide adoption of the sensors. In this talk, laser-based microfabrication method was developed to fabricate flexible sensors, which has been proved to be high-throughput and scalable. Firstly, a laser direct writing technique is developed to fabricate high-performance strain sensors directly on flexible substrates including polyimide, Ecoflex film, etc.. Then, a laser microengineering method is developed to introduce microstructures into flexible pressures for enhanced sensitivity and response time. Finally, the potential applications of the sensors in status monitoring of hydrogen storage vessel for fuel cell autocycle is presented.

TECHNICAL SESSION 1

Conference ID：822 8089 6617

May 14, Saturday | 15:15-17:00 (GMT+8)

Topic: Modern Electronics and Sensing Technology

Session Chair: Prof. Tayeb Mohammed-Brahim, University of Rennes 1, France; Southeast University, China

DC506
15:15 – 15:30

Title: A Vertical Structured Solar-blind Ultraviolet Photodetector Based on the Carbon Nanodot/Graphene Heterojunction

Presenter: Taihao Chen, Southeast University, China

Abstract: The vertical structured heterojunction has been highlighted as a promising candidate for the solar-blind ultraviolet (UV) photodetector (PD) due to the control of its channel length and the strong electric field induced high carrier mobility. Meanwhile, carbon nanodots (CNDs) have drawn great attention to be playing an essential role in the active layer of the PD. However, CND based solar-blind UV PDs, independent from sophisticated manufacturing method and extreme process conditions, has yet to be well developed. Herein, for the very first time, a vertical structured CNDs/graphene heterojunction type solar-blind UV PD is introduced, in which the CNDs is used as the photosensitive layer and the graphene is used as the transparent electrode, implemented with a low-cost and low-complexity fabrication strategy of CNDs. The device exhibits extraordinary responsivity of 25.49 mA/W, normalized detectivity of $\mathbf{2.21 \times 1010}$ Jones and on/off ratio of 342 at low bias voltage of -5V under the illumination of 1.5 $\mathbf{mW/cm2}$ by 254 nm wavelength. The results show that this work has unlocked the critical bottleneck of developing a solar-blind UV PD with higher non-solar-blind ultraviolet signals rejection ratio, higher responsivity, and detectivity, unveiling the potential for missile warning, flame detection, and other areas of interest.

DC001
15:30 – 15:45

Title: A wide-input-range multi-phase clock generator design for CMOS image sensors

Presenter: Timin Li, Tsinghua University, China

Abstract: This paper proposes a novel phase-interpolator-based multi-phase clock generator, which could be applied in the single slope ADCs of the CMOS image systems. To widen the input range of the multi-phase clock generator, a fast reset method for the phase interpolator is proposed. Besides that an improvement using RC-based phase interpolator is also provided to deal with the deviation of the power supply voltage. The simulation results in CMOS 55nm process show that the duty cycle distortion of the proposed design is within ±3% when the input frequency ranges from 100MHz to 250MHz and the supply voltage ranges from 1V to 1.4V.

DC015
15:45 – 16:00

Title: A Pseudo-Differential High-Speed Sensing Scheme for Phase-Change Memory

Presenter: Myeong-Su Shin, Sungkyunkwan University, Korea

Abstract: Phase-change memory (PCM) has been thought to be a promising candidate as the storage-class memory (SCM) because of its non-volatility, low cost, and superior scalability. However, long read latency and low sensing margin degrade read performance of PCM. To deal with these issues, a novel pseudo-differential high-speed sensing scheme has been proposed. By isolating the sensing nodes from bit-lines and using a differential latch-type sense amplifier, a high read-sensing speed satisfying a given read access yield has been achieved. The sensing time using the proposed sensing scheme is estimated to be 9 ns, which is as much as 52.6% improvement as compared to the conventional sensing scheme. With the proposed sensing scheme, the read energy per bit is also improved up to 43.7%.

DC018
16:00 – 16:15

Title: Hand Gesture Recognition System Using the Dynamic Vision Sensor

Presenter: Yu Hu, National University of Defense Technology, China

Abstract: With the rapid development of computer vision and artificial intelligence, human-computer interaction has become an inevitable part of people's lives. Gestures can bring more natural, comfortable, and effective communication between people and machines. However, in some complex scenarios, such as rooms with looming lighting, the robustness and universality of hand gesture recognition based on traditional cameras are insufficient, and the supporting algorithms tend to underperform in real-time, especially for embedded devices. This article explores methods of implementing gesture recognition based on Dynamic Vision Sensor (DVS). We obtained frame data by event-based accumulation and time-based accumulation. Then we apply preprocessing techniques such as sub-time window and overlapping frame to achieve higher accuracy on hand gesture recognition with the DVS. In this paper, we built a DVS-based gesture recognition system with the advantages of efficient data preprocessing, low memory cost, low latency, and competitive recognition ability in interaction scenarios. The recognition accuracy reaches 94.6%.

DC016
16:15 – 16:30

Title: A Simplified Flop MTBF Extraction Methodology

Presenter: Ang Boon Chong, Intel, Malaysia

Abstract: When asynchronous data is registered by a clocked flop, there is a probability of metastability failure. In applications such as synchronization or data recovery, the circuit is susceptible to metastability failure due to the asynchronous nature of the data input to the flop. As the performance of chip increases with shrinking technology node as well as increasing complexity of the clock network of the chip to cater for multiple clock domains transfer, the mean time between failure (MTBF) requirement for a metaharden flops is getting higher and tougher to meet. Metaharden flops design involves tradeoff between flop mean time between failure (MTBF) requirement with the flip-flop's area, power, and performance. This paper will share a simplified flop's mean time between failure (MTBF) extraction methodology that will reduce the pessimism in the flop's MTBF derivation and the flop's MTBF extraction effort. Hopefully, audience will benefit from the sharing.

DC028
16:30 – 16:45

Title: A Novel Compact LC-Based Balun Combiner with 2nd and 3rd Harmonic Suppression

Presenter: Wei Ma, Nankai University, China

Abstract: This paper presents a novel compact balun combiner based on lumped inductors and capacitors. In addition to the functions of harmonic reducing, power combining, and impedance matching, the new structure accomplishes both the 2nd and the 3rd harmonic suppression by constructing band-stop filters and cancellation pathways. The proposed topology is studied theoretically and demonstrated on an FR4 printed circuit board with the size of 2 cm×4 cm. Experiment results show that differential power combination is achieved with around 0.7-dB loss for each path when all three ports are loaded to 50 ohms at 1 GHz. The 2nd harmonic suppression is more than 28-dB at 2 GHz and the 3rd harmonic can be largely canceled out with equal amplitudes while opposite phase at 3 GHz. Furthermore, the topology can be applied in not only printed circuit boards but also monolithic microwave integrated circuits.

DC505
16:30 – 16:45

Title: Design and performance of flexible solar-blind Ultraviolet photodetectors based on carbon dots

Presenter: Liang Wang, Southeast University, China

Abstract: Solar-blind Ultravilet (UV) photodetectors based on wide-bandgap semiconductors are one of the current research hotspots. However, most solar-blind UV photodetectors are based on rigid substrates, which cannot be bent and folded. Flexible UV photodetectors are attracting more and more attention due to its flexibility and portability. Its advantages of mechanical flexibility and impact resistance lay the foundation for the next generation of flexible and compatible optoelectronic devices. In this paper, planar and vertical flexible solar-blind UV photodetectors were fabricated based on carbon dots with strong absorption in the solar-blind UV region. Under 254nm UV illumination, the on/off ratio and the responsivity of the planar device is 1.15 and 0.018 mAW-1, respectively. The on/off ratio and the responsivity of the vertical device is 1.37 and 7.3 mAW-1, respectively. Under bending strains of 0.2%, 0.3% and 0.6%, the responsivity of the planar device is 0.019 mAW-1, 0.016 mAW-1,0.015 mAW-1, and under 0.2% bending strain, the responsivity of the vertical device is 3.7mAW-1. This has great application potential in flexible electronic devices and other fields, and provide some reference for the development of high performance flexible solar-blind deep-ultraviolet photodetectors

TECHNICAL SESSION 2

Conference ID：836 1687 2148

May 14, Saturday | 15:15-17:00 (GMT+8)

Topic: Electronic Materials and Devices

Session Chair: To be added

DC017
15:15 – 15:30

Title: Thermal-aware IC chip design by combining high thermal conductivity materials and GAA MOSFET

Presenter: Young Suh Song, Seoul National University, Korea

Abstract: The high integration of integrated circuit (IC) chip design has made thermal-aware design as one of the first priorities of the modern IC chip industry. Even though the modern IC chip technologies have aimed to achieve thermal stability by optimizing circuit design, the rapidly growing integration requires thermal-aware design not only in circuit level but also in transistor level. Such thermal-aware design with bottom-up (from the transistor level to the packaging level) can be used to reliable IC chips. Moreover, since aluminum oxide (Al2O3, also known as alumina) is compatible with CMOS fabrication process and has excellent thermal conductivity, it is possible to efficiently accomplish the improved thermal-aware design. Specifically, Al2O3 has 59 times thermal conductivity compared to HfO2, and 19 times thermal conductivity compared to SiO2. In this paper, considering the outstanding thermal characteristics of Al2O3, we propose a comprehensive improvement including thermal characteristics by combining Al2O3 and GAA MOSFET. As a result, the maximum lattice temperature (Tmax) in transistor has been significantly improved from 624 K to 518 K. In addition, capacitance of transistor could be also decreased, which will give benefits to inverter delay and three-stage ring oscillator (RO3) delay in IC chip.

DC020
15:30 – 15:45

Title: TCAD Simulation Research of the Single Event Burnout And Hardening in Power LDMOS Transistors

Presenter: Yibo Lei, University of Electronic Science and Technology of China, China,

Abstract: In this paper, the Single-event burnout (SEB) triggering mechanism for LDMOS devices is numerically studied by using the 2D technology computer-aided design device simulator, simultaneously, a hardened LDMOS with an N-type doped plug inserting in the drain region is proposed for the first time. The SEB triggering mechanisms contain the amplification bipolar effect and following impact ionization in the high field region. By comparing the simulation results from conventional LDMOS and proposed NDP LDMOS, the carriers induced by heavy ion can be quickly absorbed to drain and source electrode through NDP layer, so that the proposed NDP LDMOS can achieve better SEB performance than conventional one. With a heavy ion having the linear energy transfer value of 0.2pC/μm striking vertically, SEB threshold voltage obtained in conventional LDMOS and hardened NDP LDMOS is 197V and 291V, respectively.

DC034
15:45 – 16:00

Title: A High Linearity and Low Load Regulation LDO with SATEC and TIR compensation

Presenter: Sen Bu, Xi'an University of Posts and Telecommunications, China

Abstract: A high linearity and low load regulation LDO with SATEC and TIR compensation is proposed in this paper. The sub-amplifier transconductance-enhancement compensation (SATEC) and transistor impedance regulation (TIR) structures are proposed to improve the linearity and load regulation. The LDO loop gain and phase margin (PM) are enhanced mainly by compensating and increasing the transconductance. The verification of design is completed under a standard 0.18μm CMOS process. The simulation results show that within the scope of output voltage ranges from 1.0V to 1.6V and input ranges from 1.2V to 1.8V. The proposed LDO structure has linear regulation rate of 0.301mV/V and load regulation rate of 0.000023mV/A, with withstands load current transients up to 120mA and remain over 60dB PSR at 10kHz.

DC509
16:00 – 16:15

Title: Anti-solvent treatment of all Inorganic Perovskite CsPbBr3 Quantum Dot-Based Inverted Light Emitting Diodes

Presenter: Fawad Saeed, Southeast University, China

Abstract: Owing to superb photophysical properties and utilization in quantum dot light-emitting diodes (QLEDs), perovskite-based cesium lead bromide (CsPbBr3) quantum dots have gained significant research attention. Solvent engineering can improve the QDs film and thus increase the efficiency of PeLED. The QDs film was post-treated with solvent to enhance surface morphology and photoluminance while simultaneously passivating surface structure and minimizing exciton quenching. Using IPA as a solvent treatment lowered the device turn-on voltage VT (1 cd m−2) from 2.6 V to 2.2 V. Moreover, Invert structure devices showed 2557 cd m−2 luminance and 10.7 cd A−1 current efficiency. These findings suggest that PeLED QDs-based devices can be used to design next-generation lighting and displays.

DC508
16:15 – 16:30

Title: A cross-shaped vertical vacuum channel transistor

Presenter: Zhao Jin, Southeast University, China

Abstract: Vertical channel vacuum transistors are concerned due to high electron mobility, environmental resistance and compatibility with semiconductor processes. A new cross-shaped vertical channel vacuum transistor is proposed in this paper. The structure can effectively reduce gate leakage current and inter-electrode capacitance. Compared to previous structures of this type of device, cross-shaped structure has better emission efficiency and high-frequency performance.

DC019
16:30 – 16:45

Title: TCAD Simulation of Single-event Transient and Hardening in 700V LDMOS Transistors

Presenter: Yibo Lei, University of Electronic Science and Technology of China, China

Abstract: This paper presents single-event transient (SET) simulation results for 700V LDMOS, simultaneously, a hardened LDMOS with buried oxide in the drift region is proposed and the saturation characteristic of SET effect is discussed for the first time. Charge collection is used to reveal the response mechanism of SET. By comparing the simulation results from the conventional LDMOS and proposed hardened NiN-LDMOS, the NiN-LDMOS has a lower charge collection of the drain electrode and shorter transient response time. A corresponding comparison was also made according to the different positions of BOX. Results show that with a heavy ion having the linear energy transfer (LET) value of 0.8pC/μm striking vertically into 60μm, the pulse width of the SET signal can be reduced from 24ns of the conventional LDMOS to 4ns of the NiN-LDMOS. Therefore, the hardened NiN-LDMOS can achieve better SET performance than the conventional one under different LET values.

DC504
16:30 – 16:45

Title: Inverted transparent quantum dots-based light emitting diodes (QLED) with efficient stability with all solution processed using gold nanowires (AuNWs) as top electrode

Presenter: Ahmad Raza, Southeast University, China

Abstract: Research towards quantum dots (QDs) derived from CdS/ZnS has attracted worldwide attention because of its exceptional optoelectronic properties and use in quantum dots-based light emitting diodes. Usually, a highly conductive electron-transport layer along with hole-transporting layers (HTLs) having low-mobility, and a vacuum-deposited opaque metal electrode are used in the inverted CdSe/ZnS-based QLED. Because of this structure, unbalanced charge injection into the emissive layer occurs, affecting the device's output luminance and stability. Additionally, the fabrication process is more challenging, costly, and time-consuming when using the vacuum-deposition approach. In order to address all of these issues, we used a non-vacuum technique for fabricating an all-solution processable double-sided emitting inverted QLED with a cascade structure and a transparent gold nanowire (AuNW) electrode to obtain emission at the top-side. According to the results, the fabricated QLED had a low turn-on voltage of 2.2 V, luminance of 3905 cd m-2, high current efficiency of 5.9 cd A-1 and a 3.4 % external quantum efficiency. Double-sided QLED devices with AuNW electrode might lead to new lighting and display technologies, according to the findings of this study.

TECHNICAL SESSION 3

Conference ID：822 8089 6617

May 15, Sunday | 14:00 – 15:30 (GMT+8)

Topic: Circuit and System

Session Chair: To Be Added

DC002
14:00 – 14:15

Title: Fault injection model of SRAM memory circuit based on hybrid modeling

Presenter: Xin-Sheng Wang, Harbin Institute of Technology (Weihai), China

Abstract: As one of the important parts of the space system, the reliability of the SRAM storage circuit always affects the safety of the spacecraft. The harsh environment full of radiation and extreme temperature in space brings radiation effect and aging effect to the circuit, which causes accidental damage and life reduction of the device, and in serious cases, circuit error and system failure. In this paper, from the perspective of fault model and fault injection, the hybrid modeling method of device level and circuit level is adopted to establish the fault model. At the same time, the sensitive area and the randomness of the fault are considered, and the switching factor is introduced to comprehensively consider the fault injection to improve the accuracy of the model. A device-level Metal-Oxide-Semiconductor Field-Effect Transistor (MOSFET) simulation model is established in Technology Computer-Aided Design (TCAD), and the process calibration of the established MOSFET model is carried out through the process library file, to better approximate the actual model. Combined with the established MOSFET device model, the failure mechanism of single-particle effect in radiation effect and negative bias temperature instability effect in aging effect was studied. Based on the physical mechanism of the device level, the fault is mapped to the circuit level and the corresponding hybrid model is established. Combined with the advantages of the Veriloga language, the current source, and voltage source models are established, and the fault sensitive area and the randomness of fault occurrence are considered, and the switching factor is introduced into the fault model. Then, the established fault model is injected into the SRAM storage circuit in the form of fault devices for fault simulation, and the power current data is collected and compared with the fault model without a switching factor. Taking the measured data as a reference, the data errors of the two are compared. Experimental results show that the proposed fault model fits the actual data better and has higher accuracy.

DC507
14:15 – 14:30

Title: Liquid Crystal Display Device with Tunable Surface Wettability Alignment Layer of ZnO Using Magnetron Sputtering

Presenter: Zhen Long, Southeast University, China

Abstract: Inorganic alignment technology has gradually become a research focus of liquid crystal (LC) alignment. In this paper, Zinc oxide (ZnO) inorganic films as an alternative alignment layer for liquid crystal displays were deposited at fixed oblique angles on indium tin oxide (ITO) glass using magnetron sputtering. By controlling the wettability of the ZnO film through annealing, the alignment states of Liquid crystal molecules can be manipulated. The results showed that the transmittance of the specially treated ZnO film substrate met the need of LCD panels in the visible light band. The LCD cells fabricated using ZnO-based substrates have the similar transmittance-voltage curves as the one with electronically controlled birefringent (ECB) mode based on mechanically rubbed polyimide, and that the ZnO-based LCD cell has a lower threshold voltage due to the slightly higher pretilt angle of the liquid crystal molecules. In addition, the ZnO-based liquid crystal cell has a nearly half faster response time than the PI-based cell.

DC024
14:30 – 14:45

Title: A New Approach to Increase the Operating Frequency and the Cycle-Duty Range of High-Speed Level Shifter in 600V Gate Driver

Presenter: Fang jian, University of Electronic Science and Technology of China, China

Abstract: High speed and high voltage level shifter using cross-coupled circuits in GaN FET driver, has potential capability to achieve exceeding 200V/ns slew immunities and sub-ns propagation delay. However, it can be found that output of the level shifter is incorrect when the input signal pulse width is smaller than the trigger pulse width. It means that although it has smaller propagation delay, the level shifter cannot work correctly in wild range of input signal duty cycle. This paper presents a novel approach to achieve wilder range of duty cycle. Based on 0.8μm 600V BCD process, simulation results of the proposed circuit show that minimum width of signal pulse is less than 1ns with the floating ground from zero to 600V. The duty-cycle range can be extended from 60% to 96% when signal frequency is 20MHz and triggered pulse width is 10ns. At the same time, the level shifter's propagation delay is 5.9ns, power rail slew immunities over 200V/ns and power consumption of the proposed level shifter almost equals to that of traditional circuit.

DC033
14:45 – 15:00

Title: Research on Comprehensive Evaluation and Prediction of Power Quality in Low Voltage Area

Presenter: Meng Ming, State Grid Information&Telecomunication Group Co.,Ltd， China

Abstract: The results of comprehensive evaluation of power quality are clearly time-series and nonlinear, making it feasible to study future trends based on historical data. In this paper, the comprehensive evaluation and prediction of power quality are linked, and the purpose is to predict the overall change trend of the power quality in a period of time in the future while evaluating it of the low voltage areas. In our scheme, we first use DS-AHP(Dempster-Shafer Analytic Hierarchy Process, DS-AHP)) to calculate the weight of the indicator to reduce the error caused by subjectivity. Secondly, the power quality is analyzed based on the radar chart, and the sample set is constructed with the comprehensive evaluation score obtained. Finally, we use PSO(Particle Swarm Optimization, PSO) to optimize the parameters of SVM(Support Vector Machine, SVM), and establish an optimal prediction model that can reflect the change trend of power quality. Experiments show that the scheme for evaluating and predicting power quality proposed in this paper has good effectiveness and accuracy, and it can provide strong technical support for grasping the variation law of power quality in low voltage areas.

DC503
15:00 – 15:15

Title: Resistive Switching Device Based on Core-shell Ag@SiO2 Nanowire Networks

Presenter: Muen Wang, Southeast University, China

Abstract: Resistive switching (RS) devices based on core-shell-nanowire networks are promising candidates for future low-cost memory applications. In this work, an Ag@SiO2 core−shell structure was successfully prepared to realize a RS device. The Ag nanowires (NWs) were synthesized by polyol process and Ag@SiO2 core-shell NWs were then formed by the hydrolysis and polymerization of tetraethyl orthosilicate (TEOS). The microstructure was observed with transmission electron microscopy (TEM) and scanning electron microscopy (SEM). And the ultraviolet-visible (UV-vis) absorption spectra were determined by UV-vis spectrometer. Resistive devices were fabricated by drop coating the NWs solution on the substrate. The electrical properties of the devices are characterized. The result displays that it has volatile threshold resistance switching characteristics, and an on/off ratio of ∼104 was achieved. By changing the device fabrication method, the conclusion that devices with high area density NWs have lower threshold voltages is demonstrated. The results can be used to fabricate RS devices with low power consumption

DC005
15:15 – 15:30

Title: A Simulation Study of Interface Traps Effects of Magnetic Sensitivity in Sectorial SD-MAGFET

Presenter: Zhenyi Yang, Peking University, China

Abstract: This paper investigates the impact of Si/SiO2 interface traps on the boundary of a sectorial SD-MAGFET in detail. Ionized acceptor traps act like negative oxide charges, depleting the device's conduction channel, whereas ionized donor traps act like positive oxide charges, weakening the magnetic sensing by inducing a parasitic channel at the boundary. The larger the influence on magnetic sensitivity, in particular, the higher the density of acceptor or donor traps. Furthermore, trap energy also has an influence on sensitivity, with larger effect for traps lying closer to the valence or conduction band. The impacts of interface traps were numerically simulated using the TCAD simulator - Silvaco Atlas.

TECHNICAL SESSION 4

Conference ID：836 1687 2148

May 15, Sunday | 14:00 – 15:30 (GMT+8)

Topic: Electronics and Communication Engineering

Session Chair: To Be Added

DC010
14:00 – 14:15

Title: Design and Verification of Joint Simulation Prototype System of Operations and Communications

Presenter: Huang Jingping, PLA Troops of 63896, China

Abstract: Starting from the demand of communication combat effectiveness simulation research, this paper designs the architecture of joint simulation system on the basis of analyzing the structure and information interaction of joint simulation system, analyzes the data interaction problems in the process of joint simulation, such as combat simulation data acquisition, data transmission and combat simulation manual intervention, and develops network middleware as a data interaction solution based on the interface of combat simulation engine and socket technology. Through a simple case, the designed joint simulation prototype system is simulated and verified. The results show that it is feasible to use the joint simulation system architecture and data interaction solution proposed in this paper for joint simulation, and it can be used to solve complex simulation problems that can not be completed by a single simulation platform.

DC011
14:15 – 14:30

Title: Simulation Modeling of Joint Tactical Communication System

Presenter: Huang Jingping, PLA Troops of 63896, China

Abstract: The joint tactical communication system is a public, flat communication platform under maneuvering conditions, which aims at realizing integrated joint operations support. Because of the complex operating environment, dynamic and self-organizing, it is impossible to obtain a closed mathematical analytical solution, and it is impossible to obtain an objective and scientific evaluation of its performance through mathematical model or technical analysis. Therefore, it is necessary to establish a simulation system to simulate the joint tactical communication system and its related factors. In the process of establishing the simulation system, the most basic and key link is to complete the design of the modeling framework of the simulation model. In this paper, the research work is carried out from three aspects: the overall framework design, the model system and modeling content, and the model relationship analysis, and the corresponding research results are obtained, which lays a foundation for the concrete establishment process of the simulation model of the joint tactical communication system.

DC023
14:30 – 14:45

Title: Li-Rong Tan, Cheng Yanhuan, Weijia Duan, Zhengquan Li

Presenter: Li-Rong Tan, Nanjing Vocational College of Information Technology, China

Abstract: A coplanar waveguide fed roof-shaped multiband antenna is proposed for Wireless Personal Area Network applications. To operate effectively at the desired multi bands, the antenna consists of a roof-shaped radiation unit, a right microstrip radiation unit, a left microstrip radiation unit and an independent inverted L-shaped microstrip radiation unit. The roof-shaped radiation unit is connected with the coplanar waveguide feed. There are two symmetrical antennae on the top of the roof-shaped radiation unit to play the role of coupling. The right independent inverted L-shape microstrip unit is the main radiation unit at 900 MHz , which is composed of two mutually perpendicularly connected microstrip lines. The left microstrip radiation unit connected with the roof-shaped radiation unit is the main radiation unit at 500 MHz. The measured results prove the antenna operates at multiple frequency bands of 500/900/1500/2400 MHz.

DC004
14:45 – 15:00

Title: Design and Implementation of A High-Precision Low-Power Instrumentation Amplifier

Presenter: Xueting Zhao, Tsinghua University, China

Abstract: This paper presents a high-precision and low-power two-stage miller-compensated instrumentation amplifier for sensor readout circuits. Folded-cascode structure with complementary input differential pairs and translinear-loop-based class AB circuit are adopted as the amplifier first and second stages respectively, to achieve rail-to-rail input and output ranges. The presented instrumentation amplifier is implemented in a 0.18μm BCD technology. Measurement results show that with a load of 100pF and 100kΩ, the presented amplifier achieves 79.79dB gain, 1.35MHz gain-bandwidth product (GBW) and 92.3dB power supply rejection ratio (PSRR). The measured amplifier gain error is 0.11%; and its input offset voltage is 0.3mV. This amplifier totally consumes 0.19mW power from a 3V supply voltage.

DC009
15:00 – 15:15

Title: Design and Development of Simulation Software for Radar Jamming Exposure Area Based on Autonomy and Controllability

Presenter: Huang Jingping, PLA Troops of 63896, China

Abstract: The calculation of radar interference exposure area is of great significance to the analysis of radar interference, and can provide necessary data support for understanding the radar strength base and improving the radar defense mode. At present, the manual calculation method of radar jamming exposure area is greatly influenced by the deployment of radar or jammer, and every slight change may cause the change of jamming area, so it needs to be recalculated. Therefore, this paper designs a simulation software to solve the above problems. In order to cope with the trend of "self-control" advocated by the state and facilitate the subsequent practical application, the software designed in this paper is developed based on the domestic Kirin system. Its specific functions include: adding radar or jammer, changing the position of radar or jammer, changing the parameters of radar or jammer, and realizing the calculation of radar interference exposure area under dynamic conditions.

DC022

15:15 – 15:30

Title: A Wireless Universal Brain-Machine Interface (BMI) System for Epileptic Diseases

Presenter: Wei Ma, Nankai University, China

Abstract: This paper presents a wireless universal brain-machine interface (BMI) system. The proposed system integrates three main modules, including an electroencephalogram (EEG) signal analyzer, a neural stimulator, and a PC user interface. Its functionalities include EEG signal acquisition, digital signal processing, electrical stimulation and so on. It can continuously monitor EEG signal status in real time, quickly diagnose brain abnormal activities and correctly generate a proper stimulation if needed. In the EEG signal analyzer, the EEG signal acquisition pathway consists of a four-channel analog front-end featuring high gain and high CMRR. Under the control of an MCU, EEG data are transmitted to the PC in real time through a Bluetooth connection. Then the PC analyzes the EEG signals through the algorithm based on the new Teager energy operator and multi-scale entropy. The neural stimulator can provide both positive and negative current stimulations which have programmable pulse width and frequency. Experiment results show that the neural stimulator can generate ±1 mA stimulation current output at ±5 V supply voltage.

TECHNICAL SESSION 5

Conference ID：822 8089 6617

May 15, Sunday | 16:00-17:30 (GMT+8)

Topic: Computer and Electronic Engineering

Session Chair: To Be Added

DC014

16:00 – 16:15

Title: CNN Specific ISA Extensions Based on RISC-V Processors

Presenter: Xiang Yu, National University of Defense Technology, China

Abstract: The CNNs have achieved excellent performance in pattern recognition and target detection, which have a wide range of applications in industrial control, medical imaging, au-tonomous driving, and other fields. However, it is very inefficient to execute data-intensive CNN applications on edge devices with limited computing and power resources. It is necessary to add a domain-specific acceleration module on the edge devices to improve the performance when performing intensive calculations. In this work, we present ISA extensions based on the RISC-V ISA, including data operation instruction and data transfer instruction, aimed at boosting the computational efficiency of CNNs on edge devices. The microarchitecture supporting our proposed extensions is built on top of an open-source RISC-V core. In addition, extended instructions have been added to the GCC Binutils toolchain. To evaluate the effect of our extended instructions, we performed a set of workloads on the baseline and extended core, our proposed ISA extensions have a speed-up ratio of 1.5× when executing a CNN, and reaches 2.48×-2.82× when only performing convolution calculations. The results show that our proposed ISA extensions can effectively improve the performance of CNNs.

DC026
16:15 – 16:30

Title: Fuzzy Inference Model for Recognition of Single-Phase-to-Ground Fault Caused by Insulation Deterioration in Medium-Voltage Distribution Networks

Presenter: Yongliang Liang, Shandong University, China

Abstract: Single-phase grounding faults seriously affect the power supply reliability of medium-voltage distribution networks. Insulation deterioration is one of the important causes of single-phase grounding faults. Based on the single-phase ground fault waveform data, eight features that can reflect the type of insulation deterioration are extracted from the time domain and frequency domain. The receiver operating characteristic (ROC) is used to optimize the features, and the classification threshold of each feature is determined. A fuzzy inference system for identifying the causes of insulation deterioration in medium voltage distribution networks is established. The use of field-measured fault data verifies the necessity of feature selection and the validity of the established model.

DC027
16:30 – 16:45

Title: The RFID Acquisition and Transmission System for Warehouse Management Based on CAN Bus

Presenter: Menghua Song, Xi'an Ming de Institute of Technology, China

Abstract: Warehouse picking is the most critical and laborious link in the logistics and distribution, so the degree of automation of the picking system determines the performance of the distribution center. Since the ordinary picking methods cannot meet the requirements of large-scale distribution of goods, it is crucial to develop a warehouse information acquisition and transmission system that can significantly increase the picking efficiency and reduce the picking error rate for the purpose of adapting to the market demand. In this paper, an RFID acquisition and transmission system for warehouse management based on CAN bus is designed, which can timely and effectively acquire and transmit the information on goods, thereby efficiently solving the above problems. The system facilitates the scientific, correct, fast, real-time, and continuous management of logistics picking operations, reduces picking error rates, accelerates the picking speed, lessens labor intensity, and saves human resources.

DC029
16:45 – 17:00

Title: Research on Information Convergence Processing and Transmission Method for Virtual Power Plant

Presenter: Kun Shi, China Electric Power Research Institute Co., Ltd., China

Abstract: Aiming at the high concurrency and delay insensitive services in VPP information interaction, such as the collection and reporting of basic load data, aiming at the problem that it excessively occupies the resources of power communication system. In this paper, a method of information convergence processing and transmission on VPP platform is proposed. Simulation results show that the proposed method can effectively remove the redundancy of packets and achieve better compression and transmission performance.

DC031
17:00 – 17:15

Title: Coordination and optimization of virtual power plant based on multi-agent system

Presenter: Jing Wang, State Grid Integrated Energy Service Group Co.,Ltd, China

Abstract: Driven by the goal of carbon peak and carbon neutralization, a large number of distributed resources will be connected to the new power system in the future, and the balance of power supply and demand will be greatly tested. Virtual power plant is a bridge between users and large power grid, which can effectively solve this problem. In this paper, the multi-objective optimization of virtual power plant (VPP) is realized based on multi-agent system (MAS). Considering economy, environmental protection and network security, the comprehensive cost is obtained by normalization. Finally, the effectiveness of the model is verified by MATLAB simulation platform.

DC201

17:15 – 17:30

Title: A Novel LDPC Construction Scheme for NAND Flash Memory

Presenter: Hongyuan Li, Guangdong Polytechnic of Science and Technology, China

Abstract: The storage capacity of NAND Flash memory has increased by scaling down to smaller cell size and using multi-level storage technology, but data reliability is degraded by severer retention errors. As adopting a very powerful error-correcting code gradually becomes a strategic demand for the endurance of nowadays NAND Flash memory, Low Density Parity Check (LDPC) codes are recently proposed due to their outstanding error correcting capability. Herein, a novel construction scheme of LDPC for NAND Flash memory is proposed. By using the proposed scheme, a high code-rate, high performance of bit error rate(BER), low error floor Quasi Cyclic Low Density Parity Check (QC-LDPC) code is constructed to meet the needs of NAND Flash memory. In the proposed LDPC construction scheme, iterative cycle elimination technique is introduced to ensure that the checksum matrix is cycle-4 free and has minimal cycle-6, which is beneficial to achive high performance of BER and low error floor for high code-rate LDPC. A diagonal coding structure is used in the QC-LDPC code to achieve linear-time coding and meet the high throughput requirements of NAND Flash memory. Simulation results show that NAND Flash memory can be used more 1800 times for Program/Erase (P/E) cycle by using the proposed QC-LDPC codes compared with Euclidean-Geometry LDPC codes. The error floor of the constructed QC-LDPC codes is below 10−12.

TECHNICAL SESSION 6

Conference ID：836 1687 2148

May 15, Sunday | 16:00-17:30 (GMT+8)

Topic: Artificial Intelligence and Control Systems

Session Chair: To Be Added

DC037-A
16:00 – 16:15

Title: A machine vision measurement method for plates of large size based on reference point assistance

Presenter: Ji Tianyi, Southeast University, China

Abstract: In this paper, a coordinate positioning method based on machine vision with reference point assistance is proposed to apply to the size measurement of large rectangular plate parts. This method first obtains the coordinate information of the reference point through circular detection, and uses the line detection and mean-shift clustering algorithm to fit the plate vertex information. Then the pixel coordinate relationship between the reference point and the plate vertex is used to solve the world coordinate of the plate vertex. Finally, the world coordinate of the plate vertex is used to calculate the length and width dimensions of the plate. Instead of other methods which unify coordinate system by moving cameras, this method uses reference point assistance system on measuring plate to unify the coordinate system, simplifying the difficulty of the unification of coordinate system and ensuring accuracy. Effectiveness of such method is verified by measuring rectangular plates with scales in centimeters and meters. The results showed that the measurement error could be controlled within 5 mm. In practical applications, the measurement accuracy has been much higher than the processing accuracy during the plate manufacturing, meeting the needs of size measurement.

DC205
16:15 – 16:30

Title: Deep Learning Sobriety Monitoring System in Road-driven Car Driving Risk Assessment Pipeline

Presenter: Francesco Rundo, University of Catania, Italy

Abstract: In automotive field, alcohol attentional impairment occurs before reaching a Blood Alcohol Content (BAC index) of 0.08% (0,05% under the Italian legislation), thus generating a significant impact on driving safety if the drinker is a car driver. Specifically, in such driving scenario in which the road surface is significantly dangerous, the car driver sobriety monitoring shows a key role in driving risk assessment. The authors propose a full deep pipeline for the intelligent road-surface classification combined with an intelligent electronic alcohol sensing system to proper assess the physiological status of the driver. More in detail, the authors propose an intelligent sensing system that makes a common air quality sensor selective to alcohol. A downstream Deep Residual Convolutional Neural Network architecture will be able to learn specific embedded alcohol-dynamic features in the collected sensing data coming from a prototype GHT25S air-quality sensor designed by STMicroelectronics. A parallel deep ad-hoc designed architecture identifies and classifies the segmented road-surface in driving scenario. An overall risk assessment system evaluates the sobriety of the driver combined with the corresponding road-driven risk assessment. The collected preliminary results effectiveness of the proposed approach.

DC502
16:30 – 16:45

Title: Low-cost Light-weight Scalable Soft Data Glove for VR Applications

Presenter: Shengshusn Duan, Southeast Universuty, China

Abstract: In the new coming era of metaverse, natural and continuous interactions between human and XR devices is vital. Yet, the current rigid wearable devices come with bulky occupation, heavy weight, and high cost. Herein, based on thermal transfer printing techniques, we proposed a more skin-compatible soft electronic glove with low cost (~$13.5 per unit), light weight (~25.5 g)), and scalability for mass production. Through monitoring bending states of five fingers, the electronic glove can recognize hand gesture, and, as a demonstration, control a customized VR shooting game.

DC035
16:45 – 17:00

Title: Vehicle Control System Based on Dynamic Traffic Gesture Recognition

Presenter: Enrui Shi, Beijing University of Posts and Telecommunications, China

Abstract: In view of the lack of information processing speed and road condition recognition ability suitable for complex road conditions in the current autonomous driving technology and to solve the problem of rapid and accurate dynamic recognition of “traffic police gestures” in the current unmanned driving technology, a real-time interactive vehicle control system combining hardware and software is designed in this paper. The car takes Arduino UNO micro-controller as the core, realizes one-way data transmission from the camera to the computer through RTSP. After being processed by gesture recognition model based on YOLOv5 network structure, the corresponding instructions are sent back to the car to control the car’s movement. Through the design and debugging, the information interaction between the camera, the computer and the car is completed. The car can move according to the designated traffic police gesture, which improves the degree of car automation and has certain significance to promote the further development of the auto automation industry.

DC206-A
17:00 – 17:15

Title: Design and Implementation of Intelligent- pharmaceutical-delivery-system Based on Loongson 1B

Presenter: Jinhui Li, Southeast University Chengxian College, China

Abstract: This paper introduces an intelligent-pharmaceutical-delivery system based on Loongson 1B embedded technology. It includes two physical parts: robot and PC station. Functionally, it is designed and implemented with control board, delivery unit, medicine taking unit, and Control APP. The simulation tests show the system has a high distance and position coincidence between the actual and pre-set targets.

DC501
17:15 – 17:30

Title: INTELLIGENT VISUAL DOMAIN-ENHANCED CAR DRIVING RISK -ASSESSMENT SYSTEM

Presenter: Francesco Rundo, University of Catania, Italy

Abstract: Recently, estimation of the visual saliency in car driving scenarios has received significant research interests. Visual saliency perception includes the processing of specific parts of the visual driving scene in which the subject (car driver) pays more attention (specifically the parts whose gaze is focused). This work makes further contributions to video saliency research with application on the sustainable assisted driver technologies. Ad-hoc 3D Semantic Fully Convolutional Deep Network embedding Gradient-Reversal domain adaptation layer has been implemented to process the video frames captured by a commercial low frame-rate automotive-grade camera device hosted outside the car. More in detail, the proposed pipeline provides a system of identification and segmentation of the motion salient objects on the domain adapted driving scenes, reconstructing the correlated motion dynamics. A parallel motion-magnified visual-to-physio drowsiness assessment of the car driver will complete the proposed full automotive solution. The authors designed a deep Convolutional Self-attention Long-short-Term-Memory (LSTM) network linked to a car-internal camera-device to perform a driver face-based visual reconstruction of such parts of the photoplethysmograpic signal. Ad-hoc innovative motion magnification visual-to-physio reconstruction pipeline has been designed in order to retrieve the Heart Rate Variability (HRV) index associated to attentional status of the driver. The convolutional layers embedded with the LSTM ability to learn such temporal feature-dependencies in the input data, allows the designed overall pipeline to shows very promising performance in the car driver attention monitoring. An intelligent car driver assistance system monitor performs a global driving risk assessment according to the previous visual processing outcomes. The overall system has been designed to be ported to specific automotive-grade ASIL-certified hardware platform embedding SPC5x Chorus MicroControllers (MCU) with a downstream Dual ARM Cortex-A7 STA1395 Telemaco3P SoC.

Thank You For Your Participation And Support!