NEW INSIGHTS INTO AUTONOMOUS ROBOTS, EMBEDDED SYSTEMS, AND INTELLIGENT CONTROL

Nowadays, computational intelligence and machine learning techniques play an increasingly important role in electrical engineering, electronic systems engineering technology, and mechatronics engineering technology including robotics, control, automation, and embedded systems. In this research, computational intelligence and machine learning methodologies are developed for a variety of real-world applications such as autonomous vehicle systems, mobile robot control, intelligent control, and embedded systems.

A sequence of novel neural dynamics, evolutionary computation, swarm intelligence, and deep reinforcement learning techniques, associated with numerical and heuristic methods, for embedded systems, intelligent vehicle motion control, and tracking control are developed. Various innovative biologically-inspired neural networks (BINN) algorithms are developed for motion control, navigation, robot vision, mapping and tracking control motivated through biological neural systems as most of the biological neural networks are bounded and stable.

Automobile accidents account for nearly 34,000 accidental deaths, unfortunately, in the United States yearly; that number is expected to rise by 65% over the next 20 years. The objective of Advanced Driver Assistance Systems (ADAS) is to support drivers through a warning to reduce the risk exposure, triggering the protection cycles to prevent accidents. Sensor fusion, system modeling, and development for ADAS are performed and addressed as well.

Comparative studies and actual experiments have successfully validated robustness, feasibility, and efficiency of the proposed real-time motion control, intelligent control, navigation, localization, vision, and map building models of the autonomous mobile robots. A series of intelligent mobile robots equipped with various sensors have been developed to validate effectiveness and efficiency of the proposed intelligent methodologies.
Dr. Chaomin Luo

Dr. Chaomin Luo received his Ph.D. degree in Electrical and Computer Engineering, in the Department of Electrical and Computer Engineering at the University of Waterloo, Waterloo, Ontario, Canada in 2008; M.Sc. degree in Engineering Systems and Computing at the University of Guelph, Guelph, Ontario, Canada; and his B.Eng. Degree in Electrical Engineering from the Southeast University, Nanjing, China. He was a Research Scientist in the Department of Electrical and Computer Engineering, at McMaster University, Canada in 2003. After he received his Ph.D., he was an Assistant Professor in the Graduate Institute of Electrical Engineering, College of Electrical Engineering and Computer Science, at the National Taipei University, in 2008. He is currently a tenured Associate Professor, in the Department of Electrical and Computer Engineering, at the University of Detroit Mercy, Michigan, USA.

Dr. Luo’s research interests, of cross-disciplinary and multi-disciplinary, lie in two areas. One is in Mobile Robotics, Autonomous and Unmanned Vehicle Systems, Robot Swarms, Control and Automation, and Applied Machine Learning and Intelligent Systems for Autonomous Systems. The other is in Embedded Systems for Robotics, VLSI, and FPGA CAD.

Dr. Luo has extensive industry experience in Canada, Singapore, and China in Embedded Systems, Intelligent Instrument, Automation, Control, and Mechatronics. His industry experience includes working as an R&D Electronics Engineer, Hardware Designer and a Director of the Embedded Systems and Intelligent Instrument Lab.

He was a pioneer to apply Semi-definite Programming and Second Order Cone Programming into VLSI optimization design. He was the first researcher to successfully develop biologically-inspired neural dynamics models for complete coverage motion planning. He was awarded Faculty Research Awards in 2009, 2010, 2014, 2015 and 2016 at the University of Detroit Mercy.

Dr. Luo was the General Co-Chair of the 1st IEEE International Workshop on Computational Intelligence in Smart Technologies (IEEE-CIST 2015), and Journal Special Issues Chair, IEEE 2016 International Conference on Smart Technologies (IEEE-SmarTech), Cleveland, OH, USA. He was the Publicity Chair in the 2012 IEEE International Conference on Automation and Logistics. Also, he was Chair, and Vice Chair of IEEE SEM - Computational Intelligence Chapter and is currently a Chair of IEEE SEM - Computational Intelligence Chapter and Chair of Education Committee of IEEE SEM. Dr. Luo serves as some editorships, such as Journal of Industrial Electronics and Applications, and International Journal of Complex Systems – Computing, Sensing and Control, Associate Editor of International Journal of Robotics and Automation, and Associate Editor of International Journal of Swarm Intelligence Research (IJSIR). He has organized and chaired several special sessions on topics of Intelligent Vehicle Systems and Bio-inspired Intelligence in IEEE reputed international conferences such as IJCNN, IEEE-SSCI, WCCI, etc.

He received the Best Paper Award at the 2017 IEEE International Conference on Information and Automation (IEEE ICIA’2017), and Best Student Paper Presentation Award at the SWORD’2007 Conference. He was the Panelist in the Department of Defense, USA, 2016, 2017, and 2018 NDSEG Fellowship program, and Panelist in 2017 NSF GRFP Panelist program.