Cybernetic and Autonomous Science and Engineering for Intelligent Control: SEE²H₃O + AIR²IST + LaSEE²CiSEE

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CASE, control and automatic science engineering, cybernetics and automation science engineering, or convergence and autonomous science engineering, has been proposed to integrate and evolve traditional basic courses in mathematics, physics, chemistry, biology, literature, and social sciences into new fundamental courses at all levels of education from kindergarten to post-graduate programs, i.e., the new K21 educational system. Our goal is to build a future intelligent ecosystem through three major sociotechnical transformations: from AIR (automation, intelligence, and robotics) to IST (intelligent science and technology), LaSEE (low-altitude space economy and ecology) to CiSEE (circular *in situ* economy and ecology), and finally, SEE (sleeping well, eating well, and exercising well) to H₃O (happy, health, and help organized, operated, and optimized) for a new humanity with advanced AI. *IJICS* will play a major role in this important process.

Welcome to *IJICS* and its First Issue of Volume 30, and happy 30th anniversary to *IJICS*!

As Confucius said in *The Analects*: "Thirty and established", i.e., at thirty, one should stand firm. As an academic journal, *IJICS* should grounded firmly in the field of intelligent control and systems with its 30th volume. But this is not the case, instead, this volume will mark the beginning of its new journey for its next "thirty and established" and the academic journal version of "At sixty, one's ear was attuned to truth", as Confucius had hoped.

IJICS was officially launched in 1996 as "the first technical journal specialized in intelligent control and intelligent systems" [1]. Actually, the effort and action for *IJICS* started in 1993 at the Robotics and Automation Laboratory of the University of Arizona with the help of George N. Saridis and Alexander M. Meystel. Since then, especially with the recent advances in AI, the field of intelligent control and intelligent systems had undergone tremendous changes, and is currently experiencing a new and deep transformation into the new area of intelligent science and technology.

At *IJICS*, we have to think about the new format or model of academic papers, academic journals, publishing platforms, publishing organizations, and the whole ecological system of knowledge dissemination and utilization. What would they look like in the future? We have to modify and redesign the objective and operation for *IJICS* accordingly.

To jump start the process for our authors, readers, and editorial board, I would like to share some of our discussions on projects "CASE" and "PIE" over the last few years.

(1) Make a case for CASE as a new fundamental course

AI, as indicated by its current techniques represented by large language models (LLMs) and AI agents, will replace our way to teach basic Mathematics, Physics, Chemistry, Biology, and almost all the courses from elementary schools to universities of higher learning, and those fundamental courses should be replaced by new materials of multidisciplinary, interdisciplinary, and transdisciplinary nature. Control and automatic science and engineering (CASE) offers an excellent candidate for designing such new fundamental courses for future K21 (from kindergarten to postdoctoral learning) education [2].

Traditionally, control and automation science and engineering have focused on modeling, analysis, and control (MAC) of all systems and organizations, and its key concepts are feedback and closed-loop operations [3, 4]. After Norbert Wiener's Cybernetics [5, 6] in 1943, CASE becomes cybernetics and automation engineering and science with the key concepts of circular causality and virtual-real interaction for modeling, analysis, and control of physical, biological, and social systems, where artificial intelligence, virtual reality and augmented reality and intelligence have emerged as the new powerful intelligent technology that are changing our world.

With the advancement of new IT (intelligent technology) and new AI (autonomous intelligence), CASE would inevitably evolve into the new CASE, convergence and autonomous science and engineering, that would help us to deal with complex socio-technical issues in the future through the governable and effective use of intelligent agents [7].

Therefore, we should establish a new fundamental course based on CASE for the future K12 education that would integrate all knowledge from current mathematics, physics,
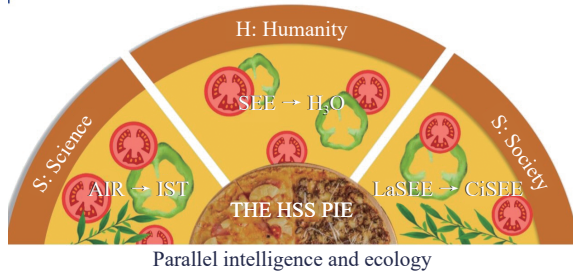
Figure 1 PIE for new human, society, and science of intelligent industry.

chemistry, biology, literature, and social sciences into one system through learning by doing and doing by learning [2].

(2) Make a big pie for all: parallel intelligence ecology for new humanities

As illustrated in Fig. 1, since 2013 we have initiated the parallel intelligence ecology (PIE) program for humanity, society, and science (HSS) at QAII for the purpose of sustainable development with new technology. The PIE program would establish the goal for CASE research and education and meet the call by UNESCO in its international decade of science for sustainable development program.

In science, we would start from automation of intelligence and robotics (AIR) and move into the new intelligent science and technology (IST), and create the new paradigm for science and technology in the era of intelligent industry.

For society, we would extend our productive space into the low-altitude air-space, and build a new low-altitude space economy and ecology (LaSEE) by providing robotic and digital agents with new workspaces, and then further into a new circular *in situ* economy and ecology (CiSEE) for all to ensure both global and local sustainability.

For humanity, we must ensure that new technology, AI or otherwise, must do good to our humanity and benefit our welfare. Our basic demand is that they have to make us sleeping well, eating well, and exercising well (SEE), and ultimately enable us to make our happiness, health, and helping organized, operated, and optimized (H_3O).

Education should be the first field for the application of the PIE program. Based on traditional well established STEM (science, technology, engineering, and mathematics) and CDIO (conceive, design, implement, and operate) educational programs, in its very beginning phase the PIE program has launched its ambitious parallel education project.

$$K21 = iSTREAMs + iCDIOs \qquad (1)$$

where R represents robotics and research, A stands for art and AI, entrepreneurship and management are added to E and M, respectively, while i signifies inspirational, innovative, interdisciplinary, intelligent, and international, and s emphasizes safety, security, sustainability, sensitivity, service, and smartness. Normally, iSTREAMs is for elementary or middle education, and iCDIOs is for higher and postgraduate education. However, in this new stage of AI impact, we believe they are for all levels of K21 learning.

At *IJICS* and with the help of Chinese Association of Automation (CAA) and Association of Global Intelligent Science and Technology (AGIST), we would make our best effort to promote academic and educational activities in CASE, PIE, and iSTREAMs and iCDIOs.

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