Editorial

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Biographical notes: Maki K. Habib obtained his PhD-Eng in Intelligent and Autonomous Robots, University of Tsukuba-Japan. He was with RIKEN Japan, RISO Laboratories-Japan, and visiting researcher at EPFL-Switzerland. He was visiting expert under Asian Development Bank, Associate Professor at UTM-Malaysia, and a Senior Manager at MCRIA, Malaysia. He was senior research scientist with GMD-Japan, Associate Professor with Monash University. Then, appointed as full Professor at Swinburne University. He was Invited Professor at KAIST, Korea. Currently, Visiting Professor at Saga University, Japan, and full Professor at AUC, Egypt. He edited three books, and has more than 180 papers published in internationally recognised journals and conferences. His research interests: human adaptive and friendly mechatronics, autonomous navigation, humanitarian demining, intelligent control, telecooperation, distributed teleoperation and collaborative control, wireless sensor networks and ambient intelligence, biomemtic robots.

Mechatronics became and remains as a significant synergetic design trend, which influence the nature of product development process and technological changes, both in effect as well as pace. Mechatronics represents a unifying interdisciplinary and intelligent engineering science paradigm, which synergistically fuses, permeates and comprehends modern engineering science and technologies. Mechatronics concentrates on achieving optimum functional synergy from the earliest conceptual stages of the design process. In addition, it allows creating, designing and supporting of new concepts for realising intelligent human oriented machines that coordinate and cooperate intelligently with their human users. The main goals of Mechatronics are to bring out novel possibilities of synergising and fusing different disciplines and technologies, and to develop products, processes and systems that exhibit quality performance, such as reliability, precision, smartness, efficiency, flexibility, adaptability, robustness, environment friendly, ease of use and economical features.

In this Special Issue, there are nine full papers. These papers offer recognisable contributions from active and enthusiastic researchers whom are aiming to initiate new research frontier and develop advanced Mechatronics devices, processes and systems. Such contributions are highlighted through the development of sensors, algorithms,

techniques and Mechatronics technologies that help to progress the field of Mechatronics in general and human adaptive and friendly Mechatronics in specific with focus on industry and manufacturing sector. The contributed papers are divided into two groups.

The first group includes six papers and they are focused in developing new industrial, manufacturing and sensing technologies. Nagata et al. presented a position-based impedance control approach using an inner servo system for industrial manipulators. The proposed impedance model is derived from the concept of the position-based impedance control, and it has been applied to a desktop NC machine tool to enhance it with compliance control capability. In addition, a hybrid position and force controller featured by compliance controllability has been proposed for the NC machine tool. Then, a profiling control experiment of a plastic lens mould with axis-asymmetric surface has been conducted to evaluate the characteristics of position and force control. Radkhah et al. introduced self-calibration method for industrial robots using extended forward kinematic model incorporating both geometric and nongeometric parameters. This work shows better accuracy while it lays the foundations for a cost-minimal and effective realisation of robots as measuring instruments. Kim et al. developed a profile measurement sensor which is used as a seam tracker of the robotic laser welding system. In addition, a simple and efficient control scheme of the whole system is presented along with experiments and operational evaluation. Itoh presented a control technique that is based on a model-based control with a rotational speed sensor, and aims to eliminate the transient vibration generated in a dies-driving spindle of a form rolling machine. The performance of this control method in the velocity control loop is examined by simulations and experiments. Buddhika et al. proposed a method for learning and controlling an industrial robot manipulator through Fuzzy Voice Commands (FVCs) guided by visual motor coordination and Supported by Self-Organising Map (SSOM). The proposed approach was demonstrated successfully on a PA-10 industrial manipulator to navigate it within its 3D working space as instructed by the voice commands. Wakaumi developed a six-line ternary barcode with a six-mirror facet raster scanner detection system employing a dual threshold detection method to investigate the possibility of realising multi-line scanners. The demonstration of the developed system shows that it can provide wide detection range of over 3.5 cm at a scanning speed of over eight times that of conventional CCD cameras.

The second group includes three papers and they are focused in developing techniques for humanoids and related technologies. Aoyama et al. proposed a Passive Dynamic Autonomous Control (PDAC) approach for the control of lateral motion in bipedal walking. This approach is based on the concepts of point-contact and on virtual constraint. The authors validate the presented approach to get the desired lateral motion through experiments. Hirata et al. introduced passive wearable walking support system referred to as “Passive Wearable Walking Helper” and proposed its control algorithm by using servo brake control to support the weight of the user mainly at the knee joint during the walking. The developed approach shows effective reduction of the load around the knee joint and this was validated by measuring the EMG signals of Vastus Lateralis Muscle during the walking experiments. Choi et al. developed a technique to enhance safety with joint compliance control of pneumatic muscles. The joint compliance actuated by pneumatic muscle is actively utilised to enhance human safety during collisions. The presented method was verified by simulation and experiment using physical robot.

It is my pleasure to acknowledge the people (authors, reviewers and the editors of IJMMS) who have helped to make this successful special issue on "Human Adaptive Mechatronics: Robotics, Sensing and Intelligence" possible. Finally, I hope the readers of this special issue will enjoy reading it and find it useful to enhance their understanding about Mechatronics as engineering science discipline and its advancement in different research directions, and helps them to initiate new research in the field.