GUEST EDITORIAL PREFACE

Special Issue on Architectural Design of Advanced Swarm Robotics Systems: Part 1

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Robotics systems and corresponding design and development have played an increasingly important role in robotics research in general multiple disciplinary both academic and industry. Numerous emerging novel and challenge research areas present the cutting edge studies and integrated methods, including artificial intelligence, formal methods, software engineering, data mining, cyber security that range from hardware design, firmware development, to the human robot interaction, human behavior, psychology, and so on. Yet, no systematic design of individual and swarm robotics architectures has been performed; establishing a comprehensive list of design criteria targeted at robotics applications is desirable that can subsequently be used to compare their strengths and weaknesses. Moreover, there are no practical architectures of the usability and application of a large scale complex robotics systems that provide precise and accurate selection for researchers most suited to their needs, nor uniform middleware supports for researchers for future development.

This issue addresses the above concerns under a broad phenomenon that connects the hardware design, firmware realization, system reliability and other main challenge issues of autonomous robotics systems by selecting nine cutting edge research work in various areas. The selected works sees the growth of robotics architecture design by considering a combination of trusted system in using formal methods and computational science approach so that readers are exposed to two dimensions with a collaborative point of view of robotics design from software to hardware.

One of the most important issues of autonomous robotics system architecture is reliability, which resulted from correctness and robustness. As the nonfunctionalities are hard to address in the complex robotics systems, this issue presented a diverse overview of novel research efforts of this area.

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In this regard, the first article presented a strategic approach to addressing the problem of how to coordinate the behavior of very large numbers

of microrobots in order to assemble complex, hierarchically structured physical objects. The approach is patterned after morphogenetic processes during embryological development, in which masses of simple agents (cells) coordinate to produce complex three-dimensional structures. In order to ensure that the coordination mechanisms scale up to hundreds of thousands or millions of microrobots, the swarm is treated as a continuous mass using partial differential equations. The paper presents algorithms and simulations for assembling segmented structures (artificial spines and legs) and for routing artificial neural fiber bundles.

The second article, on the basis of computer vision and image process, introduces the methods that make a robot or more generally any moveable object. This robot is equipped with an imaging sensor, and able to process a set of captured digital images in order to find its way and get visual understanding about the geometry of its surrounding environment. A multiple-view geometry computer vision method was used in this study with a close-range photogrammetry. In order to understand the materials of this section, no specific pre-reading is required, although a background in basic mathematics and linear algebra is an asset.

The third article presented a discussion of position system that is used for the either global or local navigation of robotics. The approach of the spectral analysis of measurement errors were presented. In order to analyze variants of stationary systems stereosight working on dynamic objects in the measurement area, the task justification stereovision system parameters is simplified because there is no need to consider the problems of stabilizing the local coordinate system of stereovision. There are several findings of this study. The accuracy of positioning a pair of reference points when selecting the positioning accuracy than one landmark. The results of this study reveal that perceived usefulness, perceived ease of use, compatibility, trust, and age have significant relationships with e-government adoption. The results from this study will be useful for government in

formulating appropriate strategies to improve the adoptions of e-government applications.

The fourth and last article discussed a continuous research study on the humanoid robot architecture design and implementation in both firmware and hardware point of view. The work is implemented on a soccer game scenario with a goalie and an offender role. This work presented a various of aspects of a middle size advanced humanoid robotics system Bioloid in a fine view focusing on the embedded development process of motion planning. This project has demonstrated a successful development process of collaborative humanoid robotics on a complex research and education platform of BIOLOID using a software engineering approach.

CONCLUSION

In sum, we believe that the increase in capability of robotic architecture design and applications will soon require extensive and strategic process and infrastructure support, with expanding development of support for formal methods and autonomic computing in the future. The trusted and high confidence properties of such systems will be highly desirable and expected. Tools and techniques will be needed based on the presented approach, esp formal methods, that will be used not only for the development and debugging of robotic architectures, but also for the execution and maintenance of robotic architectures as part of application deployment. The development choice of robotics systems will be based on more than just the design strategies and approaches that support offered, but increasingly on the features it provides for the long-term operation of robotic applications. Furthermore, and perhaps more significantly, the integration of system infrastructure with the development of intelligent robotic architectures will lead to robots that display ever greater levels of autonomy.

Such discussions with great diversity and a broad scope have caused an international dialogue that merges the boundaries of aca-

demic and industry, government and civil in an interdisciplinary and multidisciplinary arena. A broad and expansive set of knowledge, skills, techniques, and approaches for workforce will be highly needed. In this sense, educational design and curriculum development can be an alternative view of robotics system study.

Achieving the above goal of robotics design in both individual and groups requires much more efforts in the technology of computer science and engineering as well as educational strategies. More collaborative studies and beyond will be desired due to the complex of swarm and individual robots and human behavior and intelligence simulation. It is one of the grand challenge of the era in the information technology and today's social life due to high benefits of swarm robots.

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