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Introduction to the special issue on Design and Applications in Robotics

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It is, indeed, a pleasure to edit this special issue of *Robotica* entitled *Design and Applications*. This consists of revised and updated papers presented during the 26th International Symposium on Industrial Robots (ISIR), which was held on 4–6 October, 1995, in Singapore. The theme of the symposium was "Competitive Automation: New Frontiers, New Opportunities". Ninety-six papers were presented by authors from twenty-five countries around the world. Three keynote presentations were made by Dr. Joseph Engelberger, best known as the 'Father of Industrial Robots', Prof. Yukio Hasegawa, a world renowned professor from Japan and Mr. Walter Reis, from Germany (then the Chairman of the International Federation of Robotics).

We were glad to see that many authors have contributed their knowledge and new ideas pertaining to issues relevant to the theme of the symposium. Many papers were centered around applications and design, and others on sensor technology and theoretical aspects of robotics. This is precisely the reason why the special issue bears the title "Design and Applications".

During the preparation of this special issue, it was a difficult task to select papers amongst the 96 high-quality papers presented. Seven papers were finally selected for this special issue, as the editorial committee feels that they address various important aspects of robotics. The respective authors were also kind to revise and update their papers for this special issue.

The paper by Prof. Arai and his co-workers from Japan presents a concept of new wire-suspended manipulator, which consists of a serial link, wire suspension mechanism and a crane system. This new structure offers a larger workspace, which will enlarge the usefulness of manipulators. The paper also provides guidelines for the design of a wire-suspended manipulator.

For the transportation of bulk and liquid materials, Prof. Morecki from Poland proposes a new robot configuration and structure – Elephant Trunk Type Elastic Manipulator. In addition to the description on the construction of the robot, the paper also presents a model, based on which a computer simulation-based investigation was carried out.

To show how robots are integrated in a manufacturing environment, Prof. Feldmann from Germany demonstrates the use of sensor-guided robots for flexible manufacturing. The paper shows how a sensor-robot system is designed, and investigates the possibilities of applying the system in distance control, seam tracking and orientation guiding.

Prof. Kopacek from Austria presents a modular control system for a flexible robotized manufacturing cell to meet the growing need of small and medium size companies, where there is a great demand for flexible modular assembly. The fully object-oriented system is based on a master-slave principle between the supervisory control unit and the sub-systems at equipment level. The paper ends with an application example for the production of flashlights.

Not forgetting the safety of human beings in a robotic workcell, this special issue also includes a paper on the use of capacity sensor for safety purpose designed by Prof. Karlsson from Sweden. The sensor consists basically of two electrically conducting plates, insulated electrically from the ambient. The activity of sensor is shown to depend on the conductance between the two plates. The paper also gives details on the design and implementation of the sensor systems.

On the theoretical end of robotics, Dr. Krishnan from Singapore shares his design of force/position control laws for constrained robots, taking into account effects of joint flexibility and actuator dynamics.

Finally, with the rapid development in World Wide Web (WWW), the use of this exciting channel of communication in robotics is also fast gaining popularity. Dr. Taylor from Australia described in detail, the design and development of web to perform telerobotics. This will allow operators to carry out robotic tasks by a robot in a distant location.

The collection of the seven papers in this issue aims to cover the design and application aspects of robotics. Two of them cover the design of novel robotic structures for new applications, against the conventional design that is unable to meet the new tasks. We have also included two papers that show the application of robotics in modern manufacturing environment, and one on the safety issue of industrial robots. The paper on control of force/position of robots demonstrates that control engineering has to keep pace with the increasing demands of new applications. Finally, the proliferation and usefulness of World-Wide-Web will entrain further development of all engineering fields to make use of the new resources. We are glad that this special issue addresses also this development.

We have seen many new developments in design and development during the 26th ISIR in 1995. We are sure that more exciting development must have also taken place during the last two years. It is our sincere hope that this

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special issue will prompt more professionals to further explore the potential of robotics to meet the ever-increasing challenge in this field. One application that many researchers, whom I have had the opportunity to meet, feel lacking is the insufficient use of robots in health care and domestic environment. I share their hope to see more developments being made and reported in the future.

I wish to take this opportunity to express my most sincere gratitude to all the reviewers for their efforts and precious time, and the Editor of *Robotica*, whose support makes the preparation of this special issue possible. Finally, it has been a pleasure to edit this special issue, and we sincerely hope that you will benefit from its contents.

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