

Innovation Design and Applications of Robotic Manipulators in Intelligent Manufacturing System

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Due to the potential high rigidity, high accuracy, and high loading capacities of parallel manipulators, research and development of various parallel mechanism applications in engineering are now being performed more and more actively in every industrial field, and it is considered a key technology of robot applications in industry in the future. However, the parallel manipulators haven't widely been adopted by industry due to the limitations of their existing performance capabilities, including (1) the small orientation workspaces; (2) the singular configurations in kinematic chains; (3) the change of the overall stiffness.

In this presentation, the rational of using parallel robots for parallel robotic machines will be discussed and explained. A comparative study will be carried out on some successful parallel robotic machines and conventional machine tools. The research activities on parallel manipulator and its innovative design in the Laboratory of Advanced Robotics and Mechatronics at York University will be introduced, they are: Innovation Design for Parallel Robots; Performance Improvement of Parallel Robots by Structure Construction; Reconfigurable Robotic Systems; and the applications of parallel manipulators.

The new design methodologies and technologies for next-generation high performance Generalized Parallel Manipulators (GPMs) will be introduced. These new GPMs will effectively overcome the limitations of conventional parallel manipulators and be used for manufacturing applications including high precision assembly, fast product handling, milling and surface finishing as well as applications in other industries. This will enable technology transfer of these techniques to industry applications by focusing on the critical technology gaps and rigorous experiments.