Reconfiguration analysis and type synthesis of multi-mode parallel mechanisms

Speaker: Xianwen Kong

Abstract: A novel class of reconfigurable mechanisms, multi-mode parallel mechanisms (PMs), can seamlessly switch among different operation modes without the need for disconnection and reassembly. In this talk, I will delve into two fundamental issues related to multi-mode PMs: reconfiguration analysis and type synthesis. Firstly, I will illustrate several multi-mode PMs and present a method for the reconfiguration analysis. By leveraging Euler parameter quaternions and prime decomposition of ideals, we can determine all the motion modes and transition configurations of a multi-mode PM in just three steps. Next, I'll introduce a method for the type synthesis. Using tools for solving parametric polynomial systems and computing prime decomposition of ideals, we can obtain all the types of multi-mode PMs with a specified architecture in four steps. As an example, this approach yields 13 distinct types of multi-mode parallel mechanisms. Finally, I'll touch upon some limitations and open issues in the field of research on multi-mode PMs.