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# HYBRID CMS METHODS WITH MODEL REDUCTION FOR ASSEMBLY OF STRUCTURES

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Future on-orbit structures will be designed and built in several stages, each with specific control requirements. Therefore there must be a methodology which can predict the dynamic characteristics of the assembled structure, based on the dynamic characteristics of the subassemblies and their interfaces. The methodology developed by CSC to address this issue is Hybrid Component Mode Synthesis (HCMS). HCMS distinguishes itself from standard component mode synthesis algorithms in the following features: (a) it does not require the subcomponents to have displacement compatible models, which makes it ideal for analyzing the deployment of heterogeneous flexible multibody systems, (b) it incorporates a second-level model reduction scheme at the interface, which makes it much faster than other algorithms and therefore suitable for control purposes, and (c) it does answer specific questions such as "how does the global fundamental frequency vary if I change the physical parameters of substructure k by a specified amount?". Because it is based on an energy principle rather than displacement compatibility, this methodology can also help the designer to define an assembly process. Current and future efforts are devoted to applying the HCMS method to design and analyze docking and berthing procedures in orbital construction.

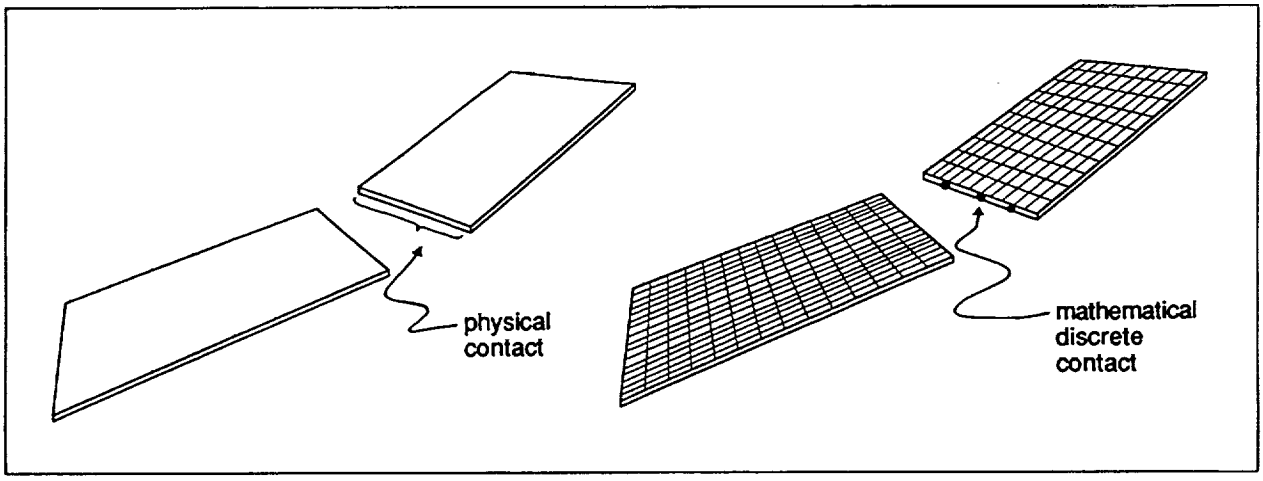


*Fig. 2.1 Example of a plate*

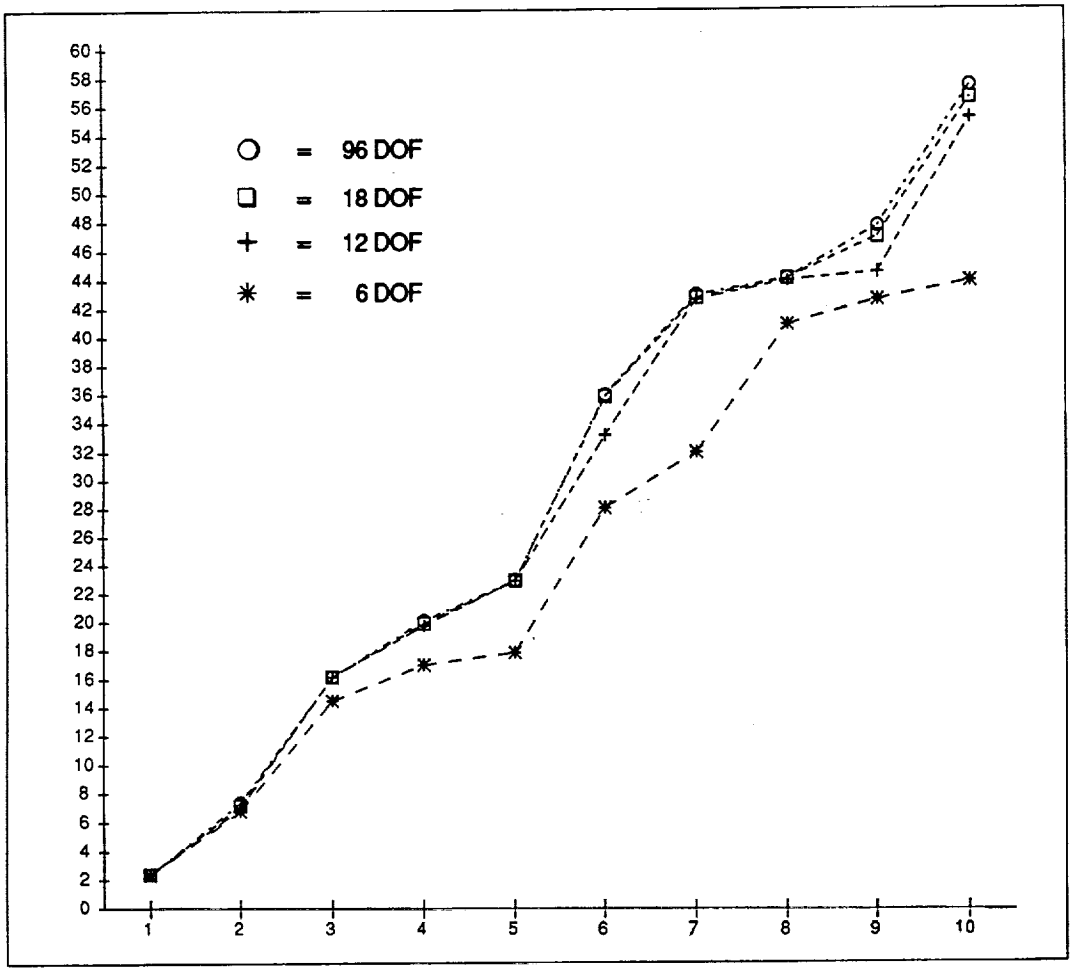


*Fig. 2.2 Prediction accuracy with polynomials of varying degrees of freedom*