Set-Based Design

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The multidisciplinary problems become more complex with multiple likely-conflicting discipline analyses, where different disciplinary problems may be undertaken by different teams of engineers. The traditional point-based design process is highly iterative and can be inefficient, particularly for multidisciplinary problems. The principles of set-based design can be used to resolve the multidisciplinary design optimization. Set-based design focuses on reduction of the design space and extraction of the mutual solutions of all multidisciplinary problems. The designers from different disciplinary teams can join in analyzing the alternatives separately and simultaneously.

According to the Toyota philosophy, Product development is not about developing cars, it is about developing knowledge about cars. Great cars will emerge from the interaction. Toyota’s success comes from efficient management of knowledge and uncertainty during the development process to master the complexity of the system. Toyota’s Set-based design focuses on the management of knowledge growth into products, however the typical point-based design manages process compliance.

Previous research efforts focus mainly on developing algorithm based on set-based approach or solving the multidisciplinary design problems. Their purposes are to design better products more efficiently and may not manage the knowledge caused by set-based approach. It is very necessary and essential to manage the knowledge, especially for multi-disciplinary problem. In addition, simulation is a cost-effective method to imitate the operation of process or system and helps to analyze and design the system. Management of simulation data and process for set-based concurrent engineering is becoming a challenging and promising topic. In order to bridge the gap, this research work concentrates on the simulation data and process management for set-based approach.