Abstract

Today, computer-aided engineering is an integral part of industrial product developement. Rather than only learning from real-life experiments to improve a product during development, the use of computer simulations helps to understand and optimize the product prior to the experimental process. Simulating multiple configurations, designs and situations can be done in significantly less time and at lower cost than the corresponding experiments. Systems of equations with millions of unknowns have to be solved in the simulation process. This requires a considerable amount of computing power and generates large bulks of data. While computing power and memory are factors for the simulation itself, storage and data transfer become an obstacle for handling solution data.

The problems of dealing with extremely large solution data can be overcome with the application of data compression. In this thesis two methods for the compression of result data from computational fluid dynamics (CFD) are presented. They are suitable to compress numerical data on irregular volumetric grids with non-unique cell types, as these grids are often used in CFD. Both methods are based on the same general lossy compression scheme and differ from each other in the decorrelation techniques that are applied. One of the two follows a prediction scheme, while the other one is based on a transformation method. Both methods are evaluated on the basis of CFD data and compared in regard to compression and performance measures. It is shown that both methods yield good compression results, while the prediction-based method achieves a significantly higher data throughput.