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論 文 要 旨

THESIS SUMMARY

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要旨（英文 300 語程度）
Thesis Summary（approx.300 English Words ）

The development of accurate and robust numerical models for compressible multi-components flows has been one of the most active research areas in CFD (computational fluid dynamics) community for past decades, which has been constantly driven by the great demand of applications from a broad engineering areas. However, the complicated flow structures in compressible multi-components flows, such as moving interfaces and reaction fronts pose great challenges to most of existing numerical methods. The inherent numerical dissipation errors in so-called high resolution methods may smear out fine flow structures, which even leads to wrong numerical solutions. Thus, in this work we construct high fidelity numerical model by devising new reconstruction schemes with boundary variation diminishing (BVD) principles. We firstly propose the BVD algorithm which serves as a new guideline for reconstruction processes. The concept of this algorithm is to determine reconstruction function from several candidates thus to minimize numerical dissipation errors. Then, several effective formulations of BVD algorithm are designed. With these algorithms, new reconstruction schemes can be built under the BVD principle. The numerical tests show that the resultant scheme can achieve high order accuracy in smooth region and resolve sharp discontinuities without substantially improved solution quality regarding both numerical oscillation and numerical dissipation in comparison with other existing schemes. High order accuracy will be realized with finite volume multi-moment method, with which we extend our method to unstructured grids. The newly proposed schemes are applied to solve the five-equation model for interfacial two phase flows. The scheme is implemented to the volume fraction and other state variables under the same finite volume framework, which realizes the consistency among volume fraction and other physical variables. The superior performance of proposed method is verified through numerical tests.

備考 ： 論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。
Note : Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1copy of 800 Words (English).

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