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NUMERICAL VALIDATION AND VERIFICATION TECHNIQUES AND EXPERIMENTAL METHODS FOR MULTIPHASE FLOWS

800

LÁSZLÓ KÖNÖZSY*

*Centre for Computational Engineering Sciences, Cranfield University,
College Road, Cranfield, Bedfordshire, MK43 0AL, United Kingdom
E-mail address: laszlo.konozsy@cranfield.ac.uk,
URL: https://www.cranfield.ac.uk/people/dr-laszlo-konozsy-301915

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ABSTRACT

Development of numerical methods for solving complex multiphase flow problems is in the centre of interest in the field of computational engineering sciences. However, accuracy and reliability of advanced numerical techniques still remain an open question for multiphase flow problems where both computational and experimental uncertainties are present.

A few attempts were made recently to perform grid convergence studies for multiphase flow applications [1,2,3,4] to ensure reliability of the numerical solution. However, a systematic mathematical approach is still missing to report and quantify numerical errors in a uniform way in the research field of multiphase flows and their applications. Roache [5,6,7] proposed the generalized Richardson extrapolation technique along with the estimation of the grid convergence index (GCI) to report numerical errors and their sources for computational engineering applications. The validation and verification approaches developed over the past twenty-five years are often applicable only to standard benchmark problems where a simple mathematical or manufactured solution are available. Therefore, the further improvement of existing methods or the development of novel validation and verification techniques would be required for industrially relevant multiphase problems to ensure accuracy and reliability of the next generation computational fluid dynamics (CFD) codes for multiphase flow modelling.

The purpose of this Minisymposium is to seek for those multiphase flow applications where the standard verification and validation approaches might break down to encourage the scientific community to develop advanced techniques in this research field. All numerical and experimental studies for multiphase flow problems where simulation results are compared to measurement data, mesh sensitivity study, numerical error analysis and/or quantification of computational and experimental uncertainties investigated are welcome in this session.

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