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Computational fluid dynamics (CFD) is a powerful tool for quantitative prediction of fluid dependent properties in a finite volume. However, the complexity of solving the momentum balances and the continuity equations at each element of the discretized geometry can easily lead to an expensive computational task. Compartment modelling is a potential alternative to speed up the calculation, which is however reached at the expense of the level of accuracy. The most important factor in optimizing a compartment model (CM) concerning the accuracy and the computational time is the quality of the chosen compartments to represent the critical gradients. This work presents a new automated compartmentalization method to characterize an improved network of compartments derived from initial detailed CFD results, with a focus on cylindrical-shaped systems. This method was evaluated with a case study of a 700L stirred tank bioreactor by estimating the mixing performance and demonstrating its high efficiency.

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