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Development of Two-Phase Pipeline Hydraulic Analysis Model Based on Beggs-Brill Correlation

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Abstract. Hydraulic analysis is an important stage in a reliable pipeline design. In the implementation, fluid distribution from a source to the sinks often occurs on parallel pipeline networks. Solution for the problem is complicated because of the iterative technique requirement. Regarding its solution effectiveness, there is a need of analysis related to the model and the solution method. This study aims to investigate pipeline hydraulic analysis on distributing of two-phase fluids flow. The model uses Beggs-Brill correlation to converse mass flow rates into pressure drops. In the solution technique, the Newton-Raphson iterative method is utilized. The iterative technique is solved using a computer program. The study is carried out using a certain pipeline network. The model is validated by comparing between Beggs-Brill towards Mukherjee-Brill correlation. The result reveals that the computer program enables solving of iterative calculation on the parallel pipeline hydraulic analysis. Convergence iteration is achieved by 50 iterations. The main results of the model are mass flow rate and pressure drop. The mass flow rate is obtained in the deviation up to 2.06 %, between Beggs-Brill and Mukherjee-Brill correlation. On the other hand, the pressure gradient deviation is achieved on a higher deviation due to different approach of the two correlations. The model can be further developed in the pipeline hydraulic analysis for two-phase flow

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An Adaptive Mesh Finite Volume Method for the Euler Equations of Gas Dynamics

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Abstract. The Euler equations have been used to model gas dynamics for decades. They consist of mathematical equations for the conservation of mass, momentum, and energy of the gas. For a large time value, the solution may contain discontinuities, even when the initial condition is smooth. A standard finite volume numerical method is not able to give accurate solutions to the Euler equations around discontinuities. Therefore we solve the Euler equations using an adaptive mesh finite volume method. In this paper, we present a new construction of the adaptive mesh finite volume method with an efficient computation of the refinement indicator. The adaptive method takes action automatically at around places having inaccurate solutions. Inaccurate solutions are reconstructed to reduce the error by refining the mesh locally up to a certain level. On the other hand, if the solution is already accurate, then the mesh is coarsened up to another certain level to minimize computational efforts. We implement the numerical entropy production as the mesh refinement indicator. As a test problem, we take the Sod shock tube problem. Numerical results show that the adaptive method is more promising than the standard one in solving the Euler equations of gas dynamics.

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