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Convolutional neural network based wall modeling for large eddy simulation in a turbulent channel flow[1] NAOKI MORIYA, Keio University, KAI FUKAMI, University of California, Los Angeles, YUSUKE NABAE, MASAKI MORIMOTO, TAICHI NAKAMURA, KOJI FUKAGATA, Keio University — Large-eddy simulation (LES) has played a significant role in fluid dynamics community to deal with various aerospace and mechanical engineering designs. Especially for the LES at a practically high Reynolds numbers, a proper wall model should be required to keep the number of computational points in the regions near the walls at a reasonable level while retaining the accuracy. Although we now see a wide range of proposals for wall modeling, the quest for seeking more generalized models is still challenging. To tackle this issue, we here propose a supervised machine learning based wall model for LES considering a turbulent channel flow. The present model based on a convolutional neural network aims to predict the virtual wall-surface velocity from $x - z$ sectional fields near the wall, whose training data are prepared with a direct numerical simulation (DNS). The results in *a priori* test are in statistical agreement with the reference DNS data. The present model is then combined with an LES as *a posteriori* test. We find that the present machine learning based wall modeling can successfully augment the LES. We will also discuss the dependence of the model performance on the grid coarseness in the wall-normal direction.

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