Modeling Low-Reynolds Number Physics around a NACA0012 Airfoil using Transition Models in OpenFOAM

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Abstract

The present study aims to compare the ability of transition models to predict the flow behavior at ultralow Reynolds Number and high angle of attack. A symmetrical NACA0012 airfoil was chosen and the chord based Reynolds Number was taken to be 1000. The angle of attack was fixed at ten degrees and the fluctuations in the flow was addressed using transition models such as k-kl omega and k w SSTLM(Gamma Re theta). Comparisons amongst the models were made on the basis of their ability to predict the force coefficients in addition to capturing the flow physics. It was observed that both the models was able to predict the force coefficients as well as the flow physics with a reasonable accuracy. However, the k w SSTLM was found to be more accurate in terms of force coefficient prediction.

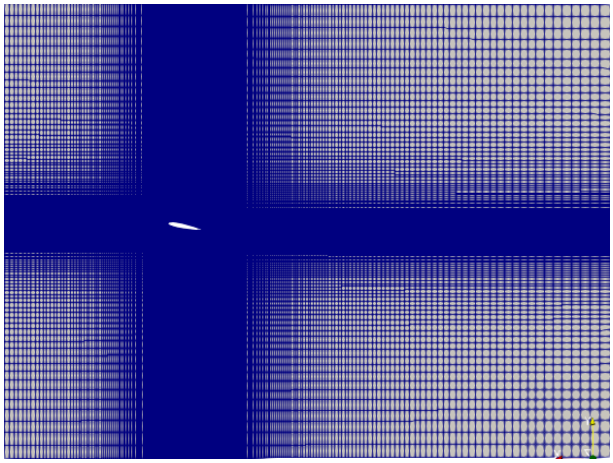

Figure 1: Computational Grid Around the NACA0012 Airfoil