COMPRESSIBLE LAMINAR FLOW TOWARDS A NUMERICAL WIND TUNNEL

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Abstract

The present paper is part of the research and development project on a numerical wind tunnel in which engineers can investigate the behaviour of the flow past an object of any shape. The numerical wind tunnel is one of the great challenges in the field of fluid dynamics and engineering applications because the flow can be studied at all speeds and the object of all sizes can be tested and analysed for design purposes. As the first step, the current work is carried out to develop the computer program for two-dimensional compressible laminar flow on a flat plate. The flow of this type is governed by the continuity, Navier-Stokes and energy equations, together with the equation of state. These equations are discretised and solved by using the MacCormack numerical technique that is based on the finite-difference method. The velocity and temperature distributions across the flow domain are obtained as the computed results and they are compared with the similarity solutions. It has been found that the computed results show the interaction of the shock layer with the velocity and thermal boundary layers.

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