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Visualization of Vortex Shedding in the Turbulent Flow Over A Surface Mounted Obstacle[1] NIKOLAOS MALAMATARIS, George Mason University — The three dimensional turbulent flow over a surface mounted obstacle is studied as a numerical experiment that takes place in a wind tunnel. The transient Navier Stokes equations are solved directly with Galerkin finite elements. The Reynolds number defined with respect to the height of the wind tunnel is 12518. Instantaneous streamline patterns are shown, that give a complete picture of the flow phenomena which include the vortex shedding phenomenon and the flapping of the recirculation bubble downstream the obstacle. Both phenomena are considered as inherent unsteady features of separated flows and have not been visualized before apart from one attempt in a two-dimensional simulation of the same flow by the same author. A movie is going to be shown where the motion of the vortical structures is demonstrated. The energy spectrum yields the -5/3 law dependence with respect to the frequency. Mean values of velocities and root mean square fluctuations are compared with available experimental results. Other statistical characteristics of turbulence such as Eulerian autocorrelation coefficients, longitudinal and lateral coefficients are also computed. Finally, oscillation diagrams of computed velocity fluctuations yield the chaotic behavior of turbulence. The computer code developed for this work is a parallel program written in Fortran 90 that uses the MPI-paradigm and runs in distributed memory systems.

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