The development of boundary layer separation for incompressible flow, subject to no-slip boundary conditions, is a complicated process; many small scale fluid structures are involved. In particular, a numerical study of such a separation over an irregular domain becomes even more challenging, due to the boundary complexity. In this talk, we present a numerical simulation of a driven cavity flow over a triangular domain, using a simple finite element numerical scheme based on the vorticity-stream function formulation. Such a numerical scheme decouples the Stokes solver into two Poisson-like solvers at each time stage in the Runge-Kutta temporal discretization. As a result, the LBB condition is avoided and the numerical efficiency is greatly improved. Some numerical results are also provided. (Received January 22, 2014)