Report Summary

A solution approach has been developed to investigate pressure, velocity fields around a cylindrical structure based on Finite Element Method. A total of four grids are given and each grid consists of 2 different phi fields. In this solution only grid 0 and phi 0.1 and phi 0.0 is investigated.

$V = \blacktriangledown \Phi$
Φ (x,y) is defined in an unstructured grid.
Grid used: grid0
Phi used: Phi 0.0, Phi 0.1
P_0=0 Pa.
ρ = 1 kg/m^3

Velocity and Pressure fields are obtained using Finite Element Method with lumped mass matrix.

The code has been checked for analytical correctness with Φ (x,y) = x in 4 node and 2 element (triangle) rectangular domain. For this field the solution will be V= x. Hence, values of V will come as Vx=[1; 1 ;1; 1] and Vy=[0;0;0;0]. The code produced result of Vx=[1.002; 1 ;1; 1.002] and Vy=[0;0;0;0].

Highest pressure: grid 0 phi 0.0 highest pressure at point 417 value 1.7703 Pa
grid 0 phi 0.1 highest pressure has not been obtained due to instability.
Lowest pressure: grid 0 phi 0.0 lowest pressure at point 548 value 0.02296 Pa
grid 0 phi 0.1 highest pressure has not been obtained due to instability

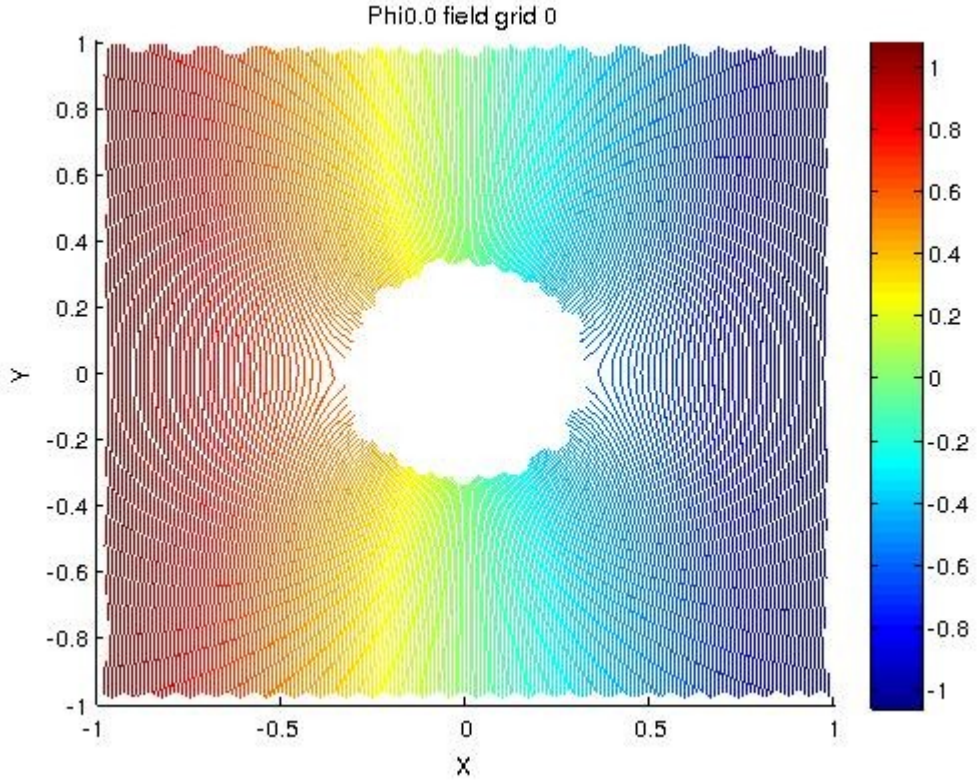

Figure 1. Phi field for grid 0 phi 0.0

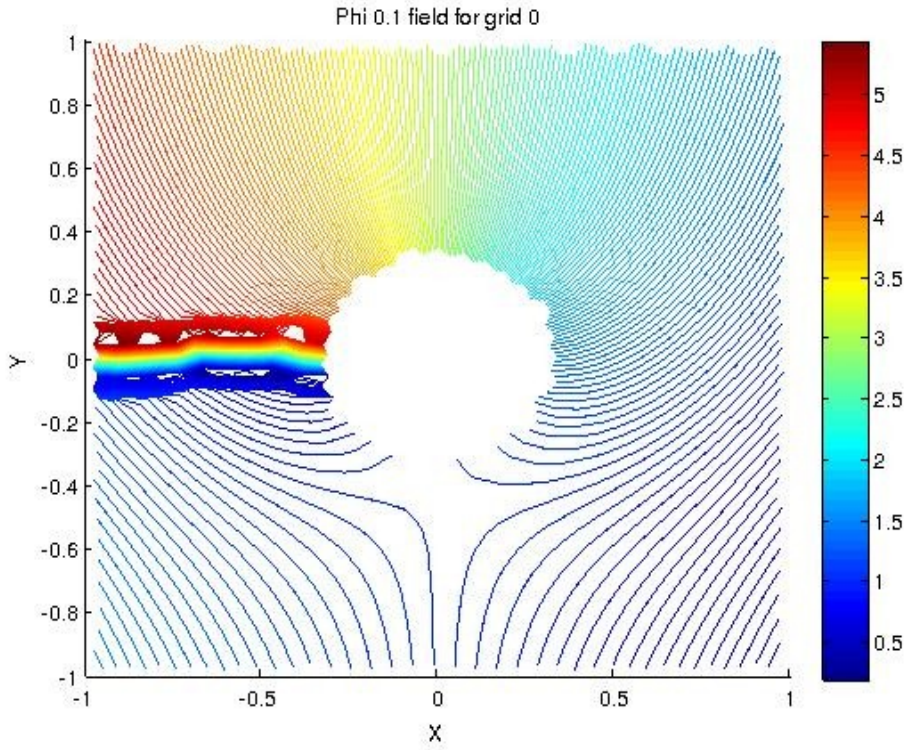

Figure 2. Phi field for grid 0 phi 0.1

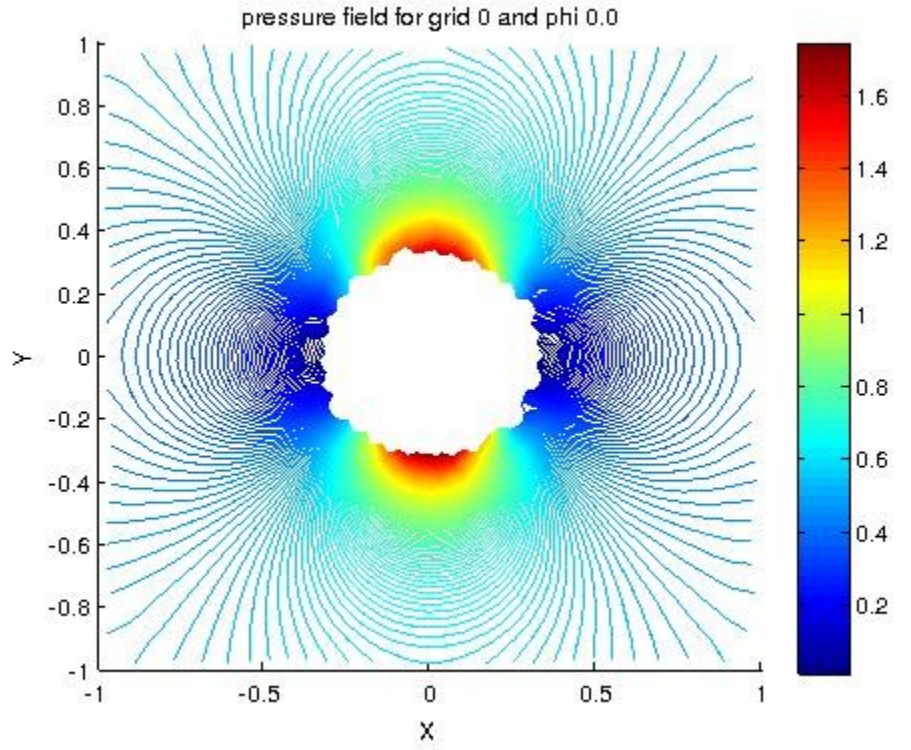

Figure 3. Pressure field for grid 0 phi 0.0

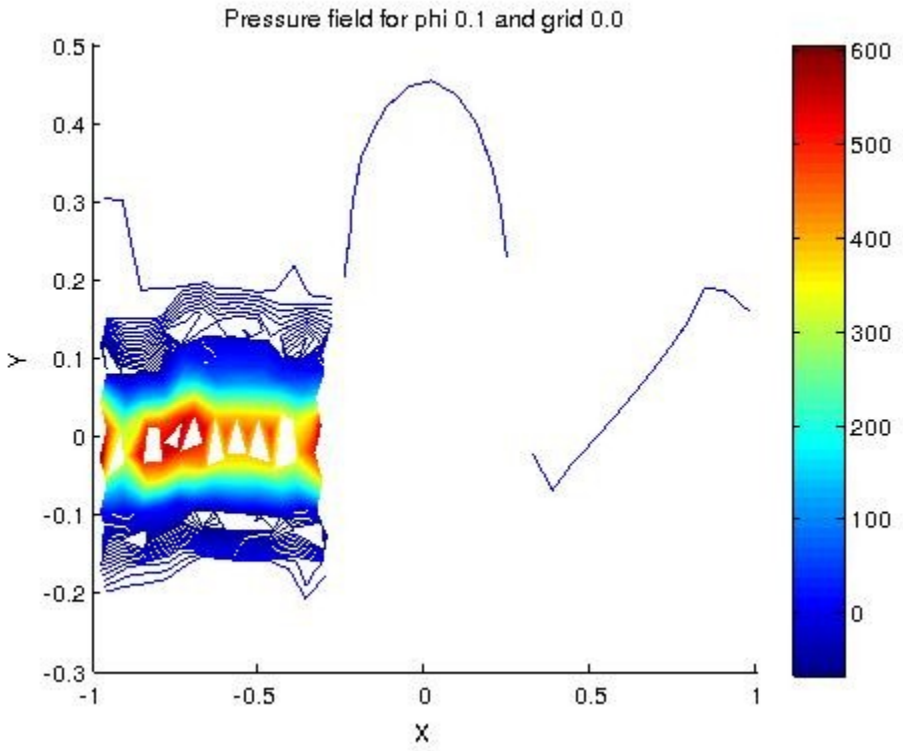

Figure 4. Pressure field for grid 0 phi 0.1

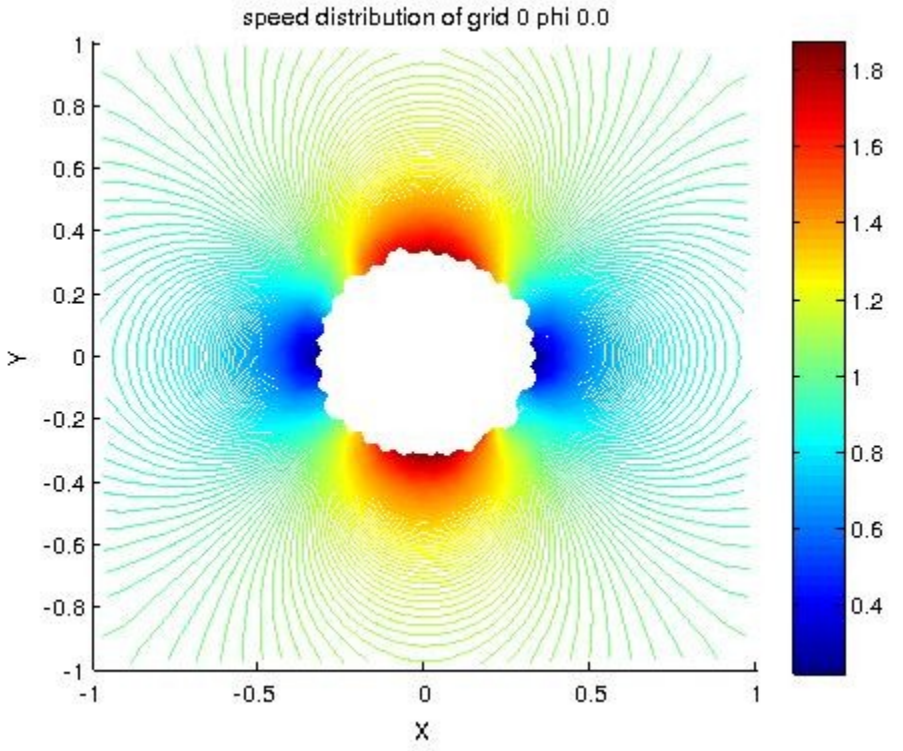

Figure 5. Velocity field for grid 0 phi 0.0

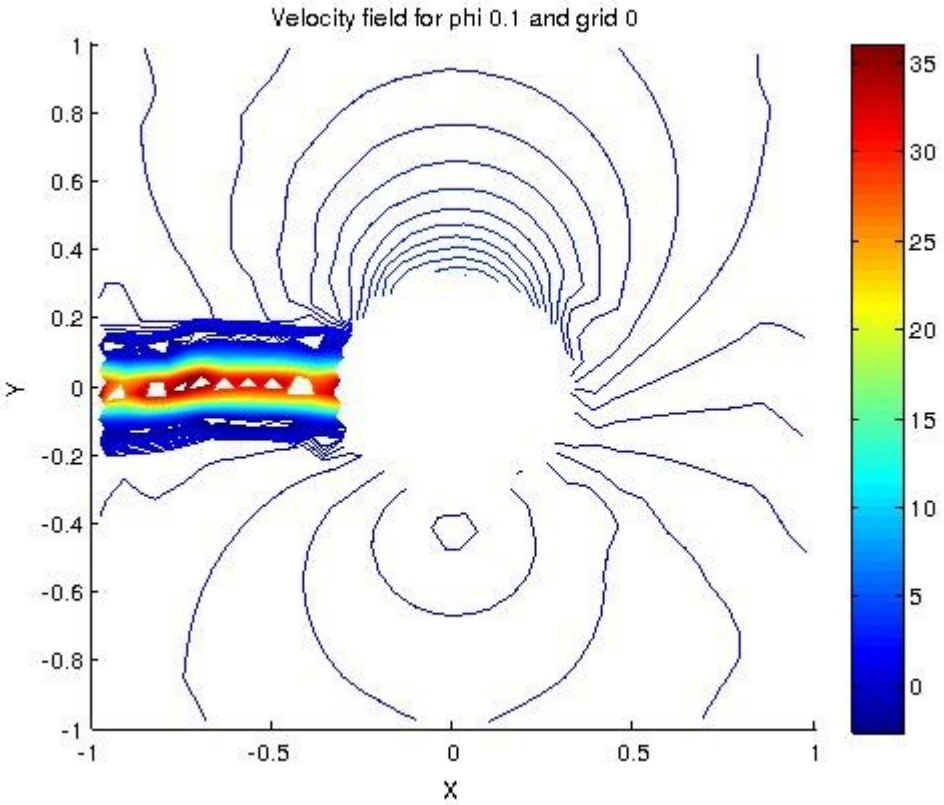

Figure 6. Velocity field for grid 0 phi 0.1