AM23S018 PEDDI HARISH TEJA

CONVECTION-DIFFUSION EQUATION

PROBLEM STATEMENT

Solving the Convection-Diffusion Equation for Temperature T using Finite Volume Method and the system of equations are solved using TDMA and Gauss-Seidel iteration in MATLAB.

1   TEMPERATURE CONTOURS

The temperature contour for the given computational domain with the given boundary conditions. The TDMA method is used to solve the system of equations with the error tolerance of 0.001.
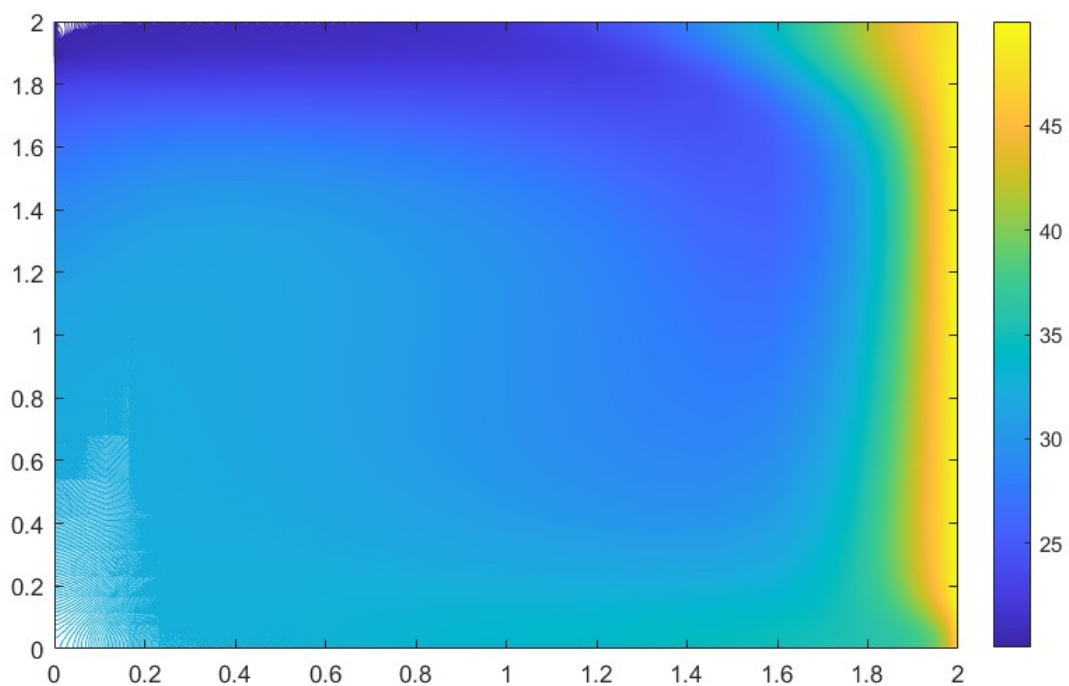

Figure 1: TEMPERATURE CONTOUR

2 SENSITIVITY TO BOUNDARY CONDITIONS

We changed the boundary condition of the left side of the domain [except at the velocity inlet.] from neumann condition to dirichilet condition of 50 degree centigrade
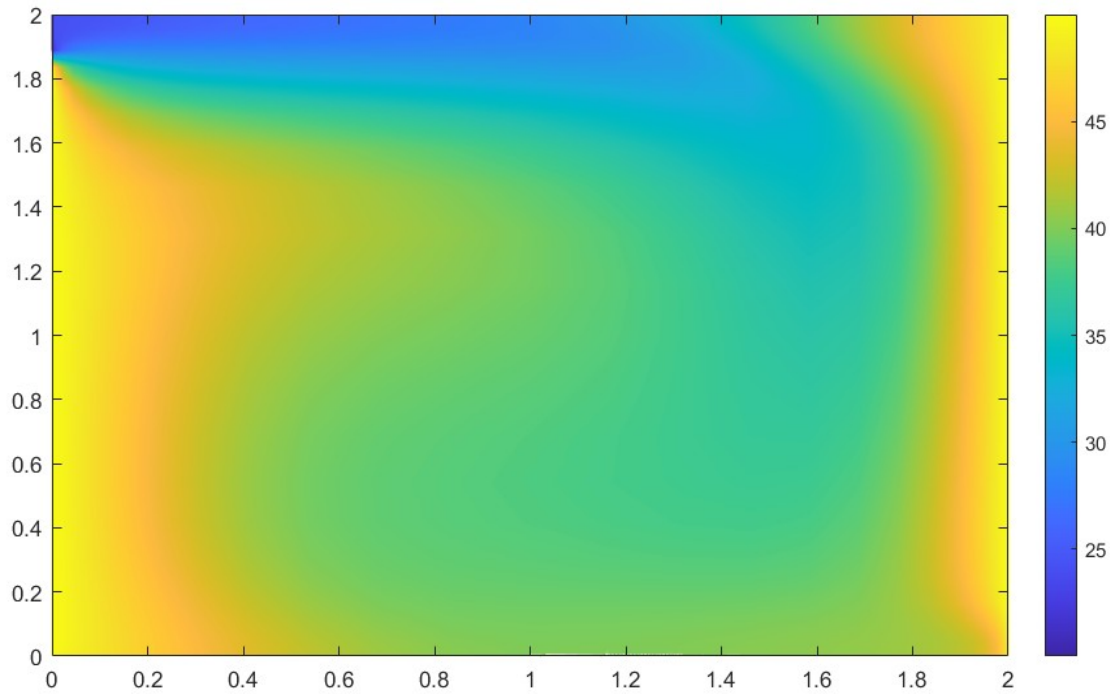

Figure 2: CHANGE OF BOUNDARY CONDITION AT LEFT SIDE OF DOMAIN EXCEPT AT INLET

3 SENSITIVITY TO CONVERGENCE

We examine the sensitivity of error tolerance by changing the error from 0.01 to 0.0001.
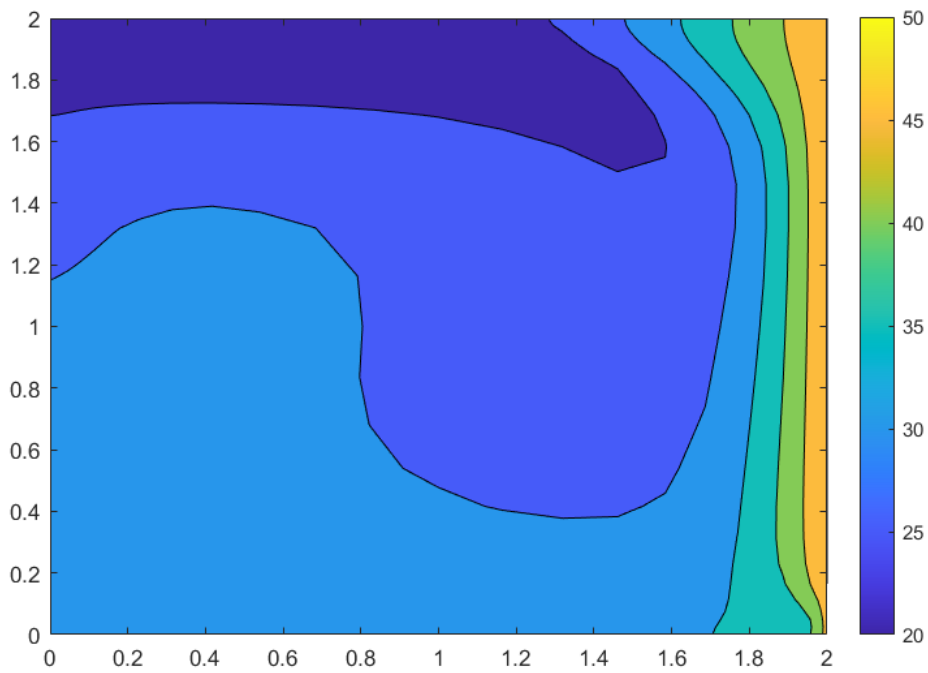

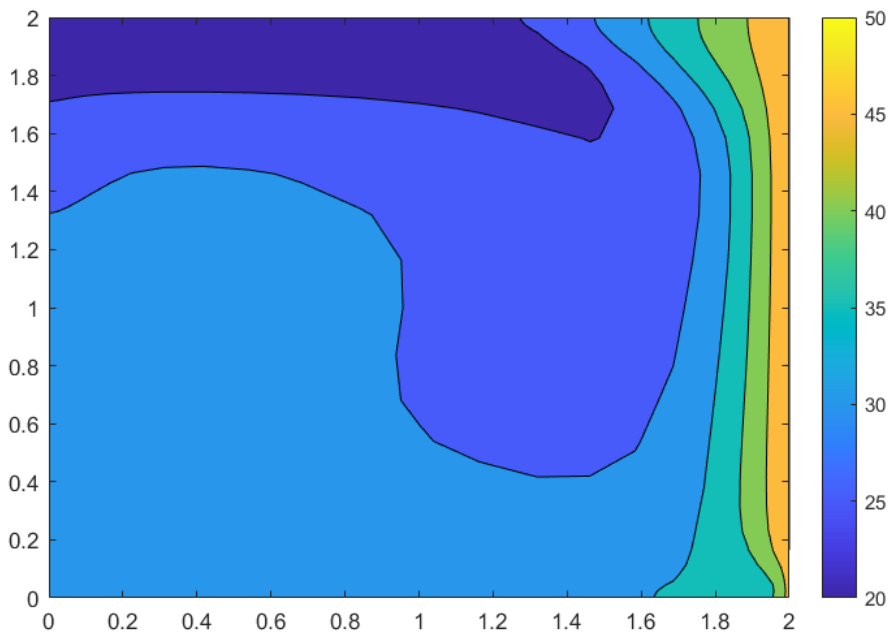Figure 3: TEMPERATURE CONTOUR FOR 0.01 ERROR TOLERANCE

Figure 4: TEMPERATURE CONTOUR FOR 0.0001 ERROR TOLERANCE

4   GLOBAL CONSERVATION

We are unable to achieve the global conservation, the heat flux through all boundaries its varying between 1 to 3.

NODE POSITION	ERROR OF 0.01	ERROR OF 0.0001
(22,27)	49.539	49.544
(23,27)	49.214	49.223
(24,27)	48.957	48.969
(25,27)	48.789	48.803
(26,27)	48.912	48.924
(27,27)	48.912	48.924

Table 1: Sensitivity of temperature with the error tolerance

OUTLET TEMPERATURES FOR THE ERROR SENSITIVITY