Project-

Obtaining the steady state temperature distribution on a two-dimensional rectangular plate as shown in Figure below. The imposed boundary conditions are:

𝑦𝑦 = 0 𝑇𝑇 = 𝑇𝑇1 𝑦𝑦 = 𝐻𝐻 𝑇𝑇 = 𝑇𝑇3

𝑥𝑥 = 0 𝑇𝑇 = 𝑇𝑇2 𝑋𝑋 = 𝐿𝐿 𝑇𝑇 = 𝑇𝑇4

The plate has dimensions of 𝐿𝐿 = 1 m and 𝐻𝐻 = 2m. The temperatures at the boundaries are specified as 𝑇𝑇 = 𝑇𝑇1 and 𝑇𝑇2 = 𝑇𝑇3 = 𝑇𝑇4 = 0. The governing equation for steady, 2-d heat conduction is

𝜕𝜕

2

𝑇𝑇

𝜕𝜕𝑥𝑥

2

+

𝜕𝜕

2

𝑇𝑇

𝜕𝜕𝑦𝑦

2

=

0 (1)

1

2

X=0 X=L

i=1 i=

j=1

j=

Y=H

Y=0

T2 T4

T3

T1

The above stated problem has been solved by the following methods:

1. The Point Gauss-Seidel (PGS)
2. The Point Sucessive Over-relaxation (PSOR)
3. The Line Sucessive Over-relaxation (LSOR)

Constant ∆x=∆y=0.05 and a grid of NX=21 and NY=41 grid points. Initial guess of 𝑇𝑇𝑖𝑖𝑖𝑖 = 0 and solved until convergence is reached. The imposed convergence criterion is that *E E* max where 𝐸𝐸𝑚𝑚𝑚𝑚𝑚𝑚 = 10−5 and the error*E* at the (k+1)th iteration is defined as:

Graphical user interface, text, application

Description automatically generated