Bauhaus – Universität Weimar Fakultät Bauingenieurwesen WS 2023/24

Computer Models for Physical Processes

Project: Finite Difference Method for stationary 2D heat conduction problem

Name 01:

Name 02:

Name03:

Task:

For the shown system if a 2D heat conduction problem a numerical approximation solution shall be developed and implemented into maple / matlab or octave script.

a) Establish an appropriate finite difference term for the differential equation (2D heat conduction equation) derived in the lectures.

b) Implement the finite difference term for variable increments Δx und Δy for a rectangular region (size 2.0m x 1.0m), in order to solve the stationary heat conduction problem.

c) Investigate the temperature field in the shown rectangular region with prescribed boundary conditions using your maple / matlab or octave code. Plot the temperature distribution in the region using colour contour plots.

d) Write a short report about your solution, showing how you construct the finite difference term. All software code has to be submitted as electronic files.

e) Material parameters heat conductivity c = 50 W / (mK)

thickness of plate h = 0.15 m

f) Boundary conditions:

$T_1 = 30\ ^\circ C$
$T_2 = 10\ ^\circ C$
$Q_1 = -420$ W/m**2 (heat output)
$Q_2 = 0$ W/m**2