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%2D heat conduction in flat plate having Dirichlet-Neumann boundary condition
using FDM
% Parameters
Lx = 25; % Length of the plate in x-direction (in cm)
Ly = 20; % Length of the plate in y-direction (in cm)
Nx = 75; % Number of grid points in x-direction
Ny = 75; % Number of grid points in y-direction
dx = Lx / (Nx - 1); % Grid spacing in x-direction
dy = Ly / (Ny - 1); % Grid spacing in y-direction
tol = 1e-6; % Tolerance for convergence
maxIter = 100000; % Maximum number of iterations

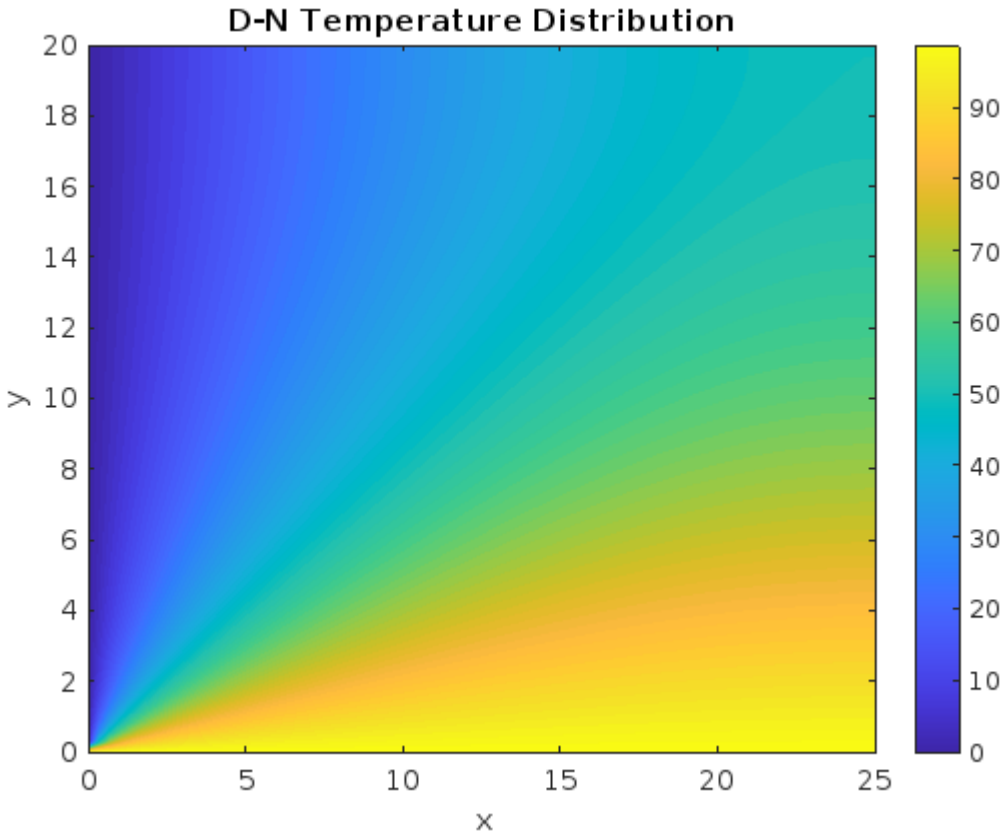
% Initialization
T = zeros(Nx, Ny); %Temperature matrix
T(:, 1) = 100; % Dirichlet
T(:, end) = 0; % Dirichlet
T(1, :) = T(2, :); % Neumann
T(end, :) = T(end-1, :); %Neumann
Tnew = T; % New temperature matrix

% Iterative solver
for iter = 1:maxIter
    T = Tnew;
    for i = 2:Nx-1
        for j = 2:Ny-1
            Tnew(i, j) = (T(i+1, j) + T(i-1, j) + T(i, j+1) + T(i, j-1)) / 4;
% Central difference scheme
        end
    end
    % Neumann boundary conditions (zero-gradient)
    Tnew(:, end) = Tnew(:, end-1); % Right boundary
    Tnew(end, :) = Tnew(end-1, :); % Top boundary

    % Check convergence
    if max(abs(Tnew(:) - T(:))) < tol
        disp(['Converged at iteration ', num2str(iter)]);
        break;
    end
end

% Plotting
[X, Y] = meshgrid(linspace(0, Lx, Nx), linspace(0, Ly, Ny));
contourf(X, Y, Tnew', 75 , 'LineColor', 'none');
colorbar;
xlabel('x');
ylabel('y');
title('D-N Temperature Distribution');
```

Converged at iteration 43025



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