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% Parameters
L = 0.75;           % Length of the rod (m)
dx = 0.025;         % Grid spacing (m)
dt = 0.00015;       % Time step (s)
k = 1;              % Thermal conductivity (W/m°C)

% Number of spatial points
N = L / dx + 1;

% Initialize temperature array
T = zeros(N, N);

% Initial condition (e.g., a step function)
T(1:round(N/2), 1) = 100; % Temperature on the left half of the rod
T(round(N/2)+1:end, 1) = 0; % Temperature on the right half of the rod

% Time steps
num_steps = 5000; % Choose the number of time steps
for step = 1:num_steps
    for i = 2:N-1
        T(i, step+1) = T(i, step) + k * dt / dx^2 * (T(i+1, step) - 2*T(i, step) + T(i-1, step));
    end
end

% Create meshgrid for plotting
x = linspace(0, L, N);
t = linspace(0, num_steps*dt, num_steps+1);

% Plotting the contour plot
contourf(x, t, T', 20, 'LineColor', 'none');
colorbar;
xlabel('Position (m)');
ylabel('Time (s)');
title('Temperature Profile of the Rod (Contour Plot)');

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