

Lab 6-7

Problem 3

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clear all; close all; clc;

tnow=datestr(now,30);

%Input parameters-----
N=10000;
E_limit=1e-4;
dx=0.5;
X=20;
Y=10;
BCT1=0;
BCT2=150;
BCT3=100;
BCT4=100;
%-----

x=0:dx:X;
y=0:dx:Y; y=fliplr(y); y=y';

s1=size(x,2);
s2=size(y,1);

T=zeros(s2,s1); T=T+80;
E=zeros(N,1);

T(1,:)=linspace(BCT1,BCT2,s1);
T(end,:)=linspace(BCT3,BCT4,s1);
T(:,1)=linspace(BCT1,BCT3,s2);
T(:,end)=linspace(BCT2,BCT4,s2);

TT=T;
it=1;
E_act=1;

while E_act>E_limit,

    if it>N,
        STOP='maximum number of iterations reached'
        break
    end

    for n=2:s1-1,
        for m=2:s2-1,
            TT(m,n)=(T(m+1,n)+T(m-1,n)+T(m,n+1)+T(m,n-1))/4;
        end
    end

    E(it)=max(max(abs(T-TT)));
    E_act=E(it);
    T=TT;
    it=it+1;

end

% Plotting-----
[XX,YY]=meshgrid(x,y);

h1=figure(1);
contour(XX,YY,T,20);
xlabel('x, mm');
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ylabel('y, mm');
xlabel('T, °C');
colorbar;
grid on;

h2=figure(2);
semilogy(E);
xlabel('Number of iterations');
ylabel('Maximum error, °C');
grid on;

h3=figure();
plot(x,T(round(s2/2),:));
legend(['y=' num2str(y(round(s2/2),1)) ' mm']);
xlabel('x, mm');
ylabel('T, °C');
grid on;

h4=figure(4);
surf(XX,YY,T);
xlabel('x, mm');
ylabel('y, mm');
zlabel('T, °C');
grid on;
%-----

%Saving-----
saveas(h1,[ tnow '_temp_contour']);
saveas(h2,[ tnow '_error']);
saveas(h3,[ tnow '_T_x']);
saveas(h4,[ tnow '_temp_surf']);

p3.IN.X=X;
p3.IN.Y=Y;
p3.IN.dx=dx;
p3.IN.BCT1=BCT1;
p3.IN.BCT2=BCT2;
p3.IN.BCT3=BCT3;
p3.IN.BCT4=BCT4;
p3.IN.N=N;
p3.IN.E_limit=E_limit;

p3.OUT.T=T;
p3.OUT.x=x;
p3.OUT.y=y;
p3.OUT.E=E;
p3.OUT.it=it;

save([tnow '_p3'], 'p3');
%-----

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