

Program pro řešení PDR parabolického typu explicitní metodou

```
function u = PDEParabExpl(n,m,k,a,b,g,e,f,alpha1,alpha2,beta1,beta2,gamma1,gamma2,phi)
% Reseni parcialni diferencialni rovnice parabolickeho typu metodou siti.
% Explicitni metoda
% n...pocet kroku v prostoru
% m...pocet kroku v case
% k...casovy krok
% reseni u(x,t) = u(j,i), j = 0,...,m; i = 0,...,n;
% alpha1,alpha2,beta1,beta2,gamma1,gamma2 ... okrajove podminky

h = (b-a)/n; % krok site
u = zeros(m+1,n+1);
x = a:h:b ;
t = (0:k:m*k)';

alpha = k/(h*h);
beta = k/(2*h);

% pocatecni podminka
u(1,:) = phi(x);

for j = 1:m
% vypocet reseni na (j+1)-ni casove vrstve
    for i = 2:n
        d1 = alpha*g(x(i),t(j)) - beta*e(x(i),t(j));
        d2 = 1 - 2*alpha*g(x(i),t(j));
        d3 = alpha*g(x(i),t(j)) + beta*e(x(i),t(j));
        u(j+1,i) = d1*u(j,i-1) + d2*u(j,i) + d3*u(j,i+1) + k*f(x(i),t(j),u(j,i));
    end

% okrajove podminky na (j+1)-ni casove vrstve
    u(j+1,1) = (gamma1(t(j+1)) - beta1(t(j+1))/(2*h)*(4*u(j+1,2) - u(j+1,3))) / (alpha1 - 3/
(2*h)*beta1(t(j+1)));
    u(j+1,n+1) = (gamma2(t(j+1)) + beta2(t(j+1))/(2*h)*(4*u(j+1,n) - u(j+1,n-1))) / (alpha2 +
3/(2*h)*beta2(t(j+1)));

end

end
```

Použití programu PDEParabExpl

```
% du/dt = d2u/dx2
% u(0,t) = 0, u(1,t) = 0
% u(x,0) = sin(pi*x)

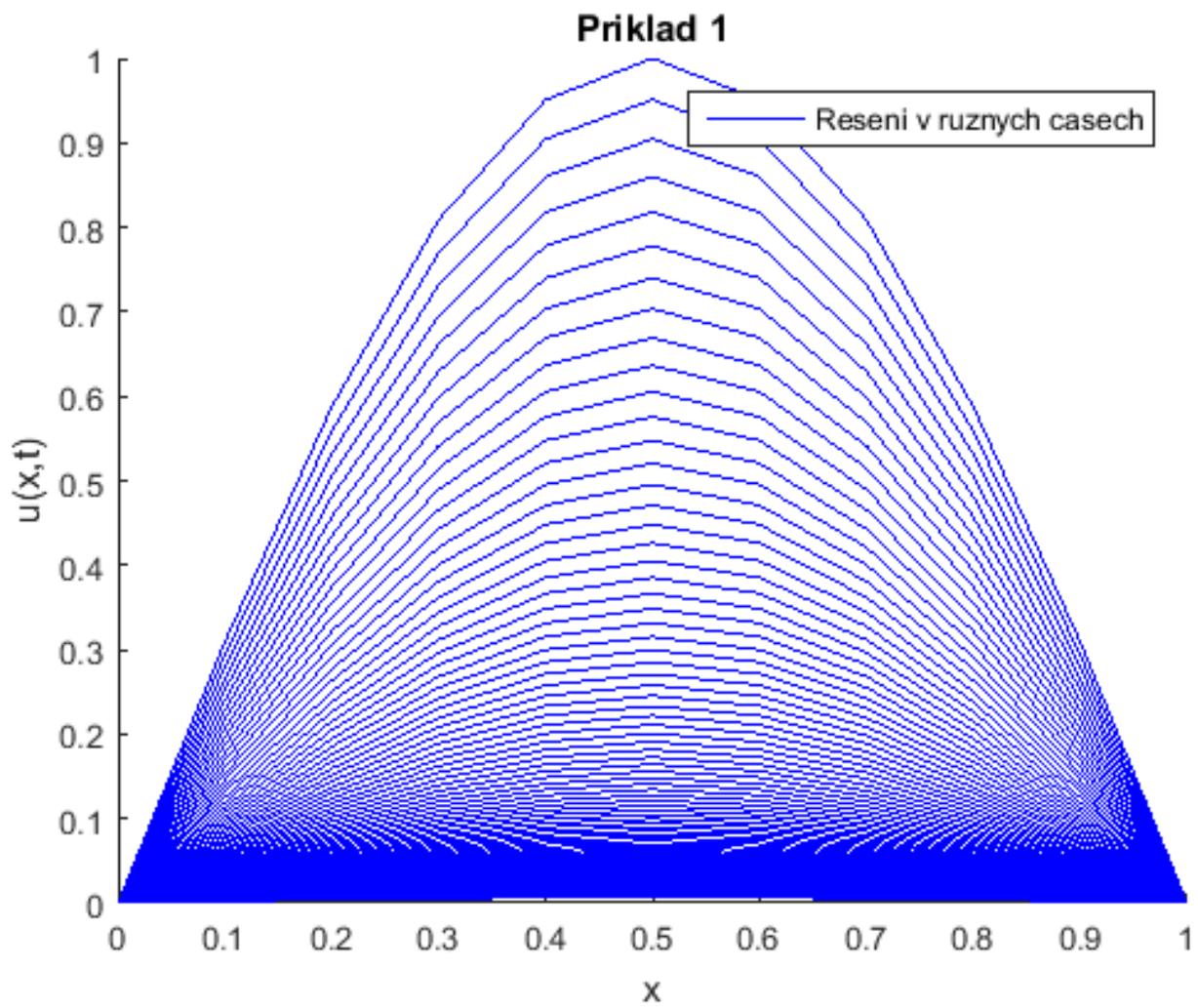
a = 0;
b = 1;
n = 10;
h = (b-a)/n;
m = 100;
k = 0.005;
g = inline('1','x','t');
e = inline('0','x','t');
f = inline('0','x','t','u');
alpha1 = 1;
beta1 = inline('0','t');
gamma1 = inline('0','t');
alpha2 = 2;
beta2 = inline('0','t');
gamma2 = inline('0','t');
phi = inline('sin(pi*x)','x');

u = PDEParabExpl(n,m,k,a,b,g,e,f,alpha1,alpha2,beta1,beta2,gamma1,gamma2,phi);

figure;
hold on;
x = a:h:b;
for j = 1:m+1
    plot(x,u(j,:), 'b');
end
title('Příklad 1');
xlabel('x');
ylabel('u(x,t)');
legend('Reseni v ruznych casech');
hold off;
hold off;

figure;
x = a:h:b;
t = (0:k:m*k)';
surf(x,t,u);
shading interp;
colorbar;
xlabel('x');
ylabel('t');
```

```
zlabel('u(x,t)');  
title('Příklad 1');
```



Příklad 1

