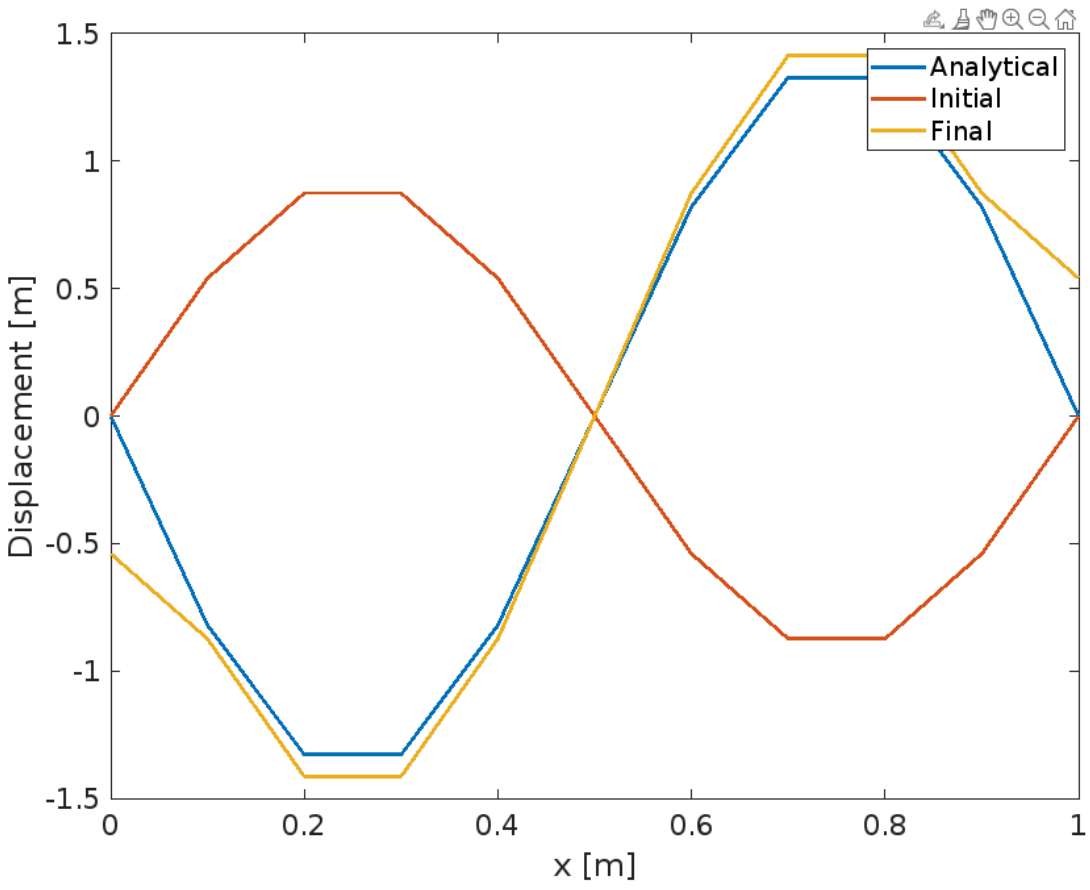
```
xstep = 0.1;
tstep = 0.05;
xstep2 = xstep*xstep;
tstep2 = tstep*tstep;
alpha = 2;
alpha2 = alpha*alpha;
lambda2 = alpha2*tstep2/xstep2;
xdomain = [0 1];
tdomain = [0 1];
nx = round((xdomain(2)-xdomain(1))/xstep);
nt = round((tdomain(2)-tdomain(1))/tstep);
xt0 = zeros((nx+1),1); % initial condition
dxdt0 = zeros((nx+1),1); % initial derivative
xold = zeros((nx+1),1); % solution at timestep k
x2old = zeros((nx+1),1); % solution at timestep k-1
xnew = zeros((nx+1),1); % solution at timestep k+1
% initial condition
pi = acos(-1.0);
for i=1:nx+1
    xi = (i-1)*xstep;

    if(xi>=0 && xi<=1)
        xt0(i) = sin(2*pi*xi);
        dxdt0(i) = alpha*pi*sin(2*pi*xi);
        xold(i) = xt0(i)+dxdt0(i)*tstep;
        xold(i) = xold(i) - 4*pi*pi*sin(2*pi*xi)*tstep2*alpha2;
    end
end
close all
syms x
t=0.3;
x=linspace(xdomain(1),xdomain(2),nx+1);
analy= sin(2*pi*x)*(sin(4*pi*t)+cos(4*pi*t));
h1=plot(x,analy,'linewidth',2);
hold on;
h2=plot(x,xold(:,end),'linewidth',2);     % Index issue in xold
hold on;
h3=plot(x,xnew(:,end),'linewidth',2);     % Index issue in xnew
hold off
legend('Analytical','Initial','Final')
xlabel('x [m]');
ylabel('Displacement [m]');
set(gca,'FontSize',16);
for k=2:nt
    time = i*tstep;
    for i=1:nx+1
        % Use periodic boundary condition, u(nx+1)=u(1)
        if(i==1)
        xnew(i) = 2*(1-lambda2)*xold(i) + lambda2*(xold(i+1)+xold(nx+1)) -
 x2old(i);
        elseif(i==nx+1)
```

```
        xnew(i) = 2*(1-lambda2)*xold(i) + lambda2*(xold(1)+xold(i-1)) -
 x2old(i);
        else
        xnew(i) = 2*(1-lambda2)*xold(i) + lambda2*(xold(i+1)+xold(i-1)) -
 x2old(i);
        end
    end

    x2old=xold;
    xold = xnew;

   if(mod(k,2)==0)
    h3.YData = xnew;
    refreshdata(h3);
    pause(0.5);
   end
end
```



Published with MATLAB® R2022b