
```

x0=0;xn=1;
y0=0;yn=2;
h=0.1;

n=(xn-x0)/h-1;

yi=zeros(n,1)+1;

A=zeros(n,n);
B=zeros(n,1);

for k=1:1000
    for i=1:n
        ai=value_a(yi,h,i);
        bi=value_b(yi,h,i);
        ci=value_c(yi,h,i);
        di=value_d(yi,h,i);
        B(i)=di;
        if i~=1
            A(i,i-1)=ai;
        end

        A(i,i)=bi;

        if i~=n
            A(i,i+1)=ci;
        end
    end

    y=thomasAlgorithm(A,B);

    yi=yi+y;

end
xs=[x0:h:xn];
ys=[y0;yi;yn];

disp('Graph for Calculated values vs Exact Solution')

plot(xs,ys,'o--');
hold on;
plot(xs,2*xs);
title('BVP with h=0.1');
legend('Calculated values','Exact Solution');
hold off;

function y=thomasAlgorithm(A,B)

    [r,~]=size(A);

    C=zeros(1,r);

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D=zeros(1,r);

C(1)=A(1,2)/A(1,1);
D(1)=B(1)/A(1,1);

for i = 2:r
    if i~=r
        C(i)=A(i,i+1)/(A(i,i)-A(i,i-1)*C(i-1));
    end
    D(i)=(B(i)-A(i,i-1)*D(i-1))/(A(i,i)-A(i,i-1)*C(i-1));
end
y=zeros(r,1);
y(r)=D(r);

for i = r-1:-1:1
    y(i)=D(i)-C(i)*y(i+1);
end
end

function y=value_a(yi,h,i)
    if i~=1
        ym=yi(i-1);
    else
        ym=0;
    end

    [n,~]=size(yi);

    if i~=n
        yp=yi(i+1);
    else
        yp=2;
    end

    yj=yi(i);

    y=yj/h^2-1/(2*h);
end

function y=value_b(yi,h,i)
    if i~=1
        ym=yi(i-1);
    else
        ym=0;
    end

    [n,~]=size(yi);

    if i~=n
        yp=yi(i+1);
    else
        yp=2 ;
    end
end

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```

        yj=yi(i);

        y=(yp-4*yj+ym)/h^2;
end

function y=value_c(yi,h,i)
    if i~=1
        ym=yi(i-1);
    else
        ym=0;
    end

    [n,~]=size(yi);

    if i~=n
        yp=yi(i+1);
    else
        yp=2;
    end

    yj=yi(i);

    y=yj/h^2+1/(2*h);
end

```

```

function y=value_d(yi,h,i)
    if i~=1
        ym=yi(i-1);
    else
        ym=0;
    end

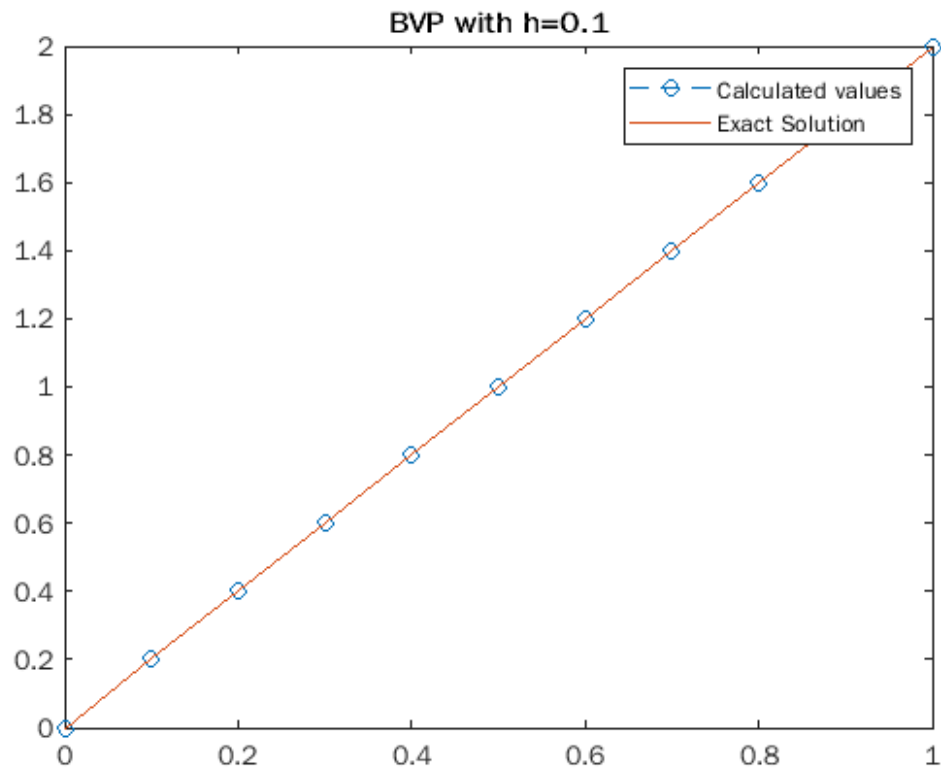
    [n,~]=size(yi);

    if i~=n
        yp=yi(i+1);
    else
        yp=2;
    end

    yj=yi(i);
    y=yj*(ym-2*yj+yp)/h^2+(yp-ym)/(2*h)-2;
    y=-y;
end

```

Graph for Calculated values vs Exact Solution



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