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Project 4: Numerical Integration

For the final project, we designed a Matlab app with a graphical user interface that calculates the integral of a function given an arbitrary number of points.

The app takes 5 inputs:

- Values of x
- Values of fx
- Value of n
- Value of h
- The method with which the integral will be calculated

The output shows the calculated integral value of the function given by points. If any points are missing, (which we can know, because x should be incremented by h every point) a Lagrange.m function is called, which finds a point at that specific value of x using the two given matrices.

The Lagrange file was taken from moodle.

The other work was split very evenly between me and my project partner. We agreed to take the functions that we worked on during the semester and modify them so they fit the designed app.

I contributed the code for the Composite Simpson's rule of integration:

```
function res = simp(fx,x,n,h)
    s=fx(1);
    size = length(x);
    for k = 1 : (n/2)-1
        fxx = Lagrange(x, fx, (x(1) + (2*k)*h));
        s = s + 2*fxx;
    end
    for k = 1 : n/2
        fxx = Lagrange(x, fx, (x(1) + ((2*k-1)*h)));
        s = s + 4*fxx;
    end
    s = s + fx(size);
    res = h/3 * s;
end
```

And Evan contributed the Trapezoidal rule function:

```
function res = trap(fx,x,n,h)
    s=fx(1);
    size = length(x);
    for i = 2 : n
        fxx = Lagrange(x, fx, x(1) + (i-1)*h);
        s = s + 2*fxx;
    end
    s = s + fx(size);
    res = h*s/2;
end
```

Finally, we got together and wrote the GUI part of the code together.

The way the code behind the GUI works is pretty simple.

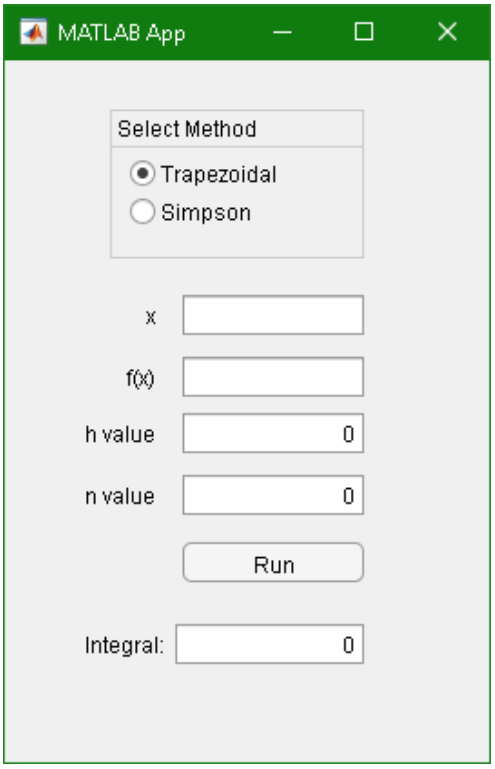
First, the inputs are taken from the buttons and edit fields.

The select method is checked, and according to the choice, either the simpson or the trapezoid function is called.

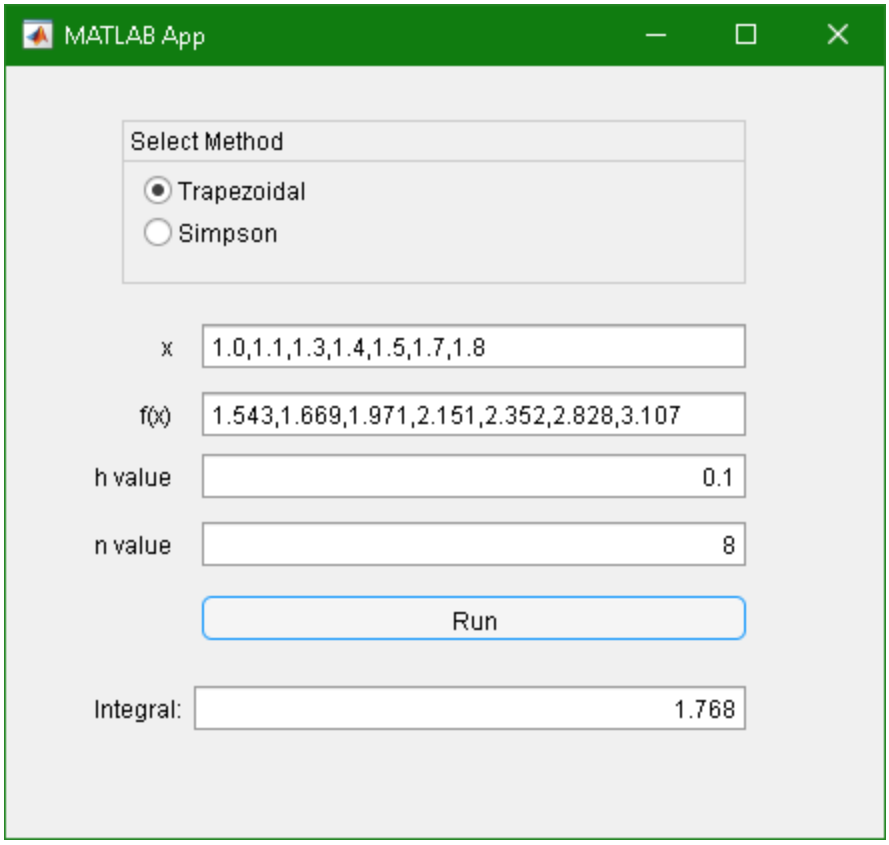
The values are taken and assigned to variables.

x and fx are taken as strings and then put into a variable after splitting.

Finally, after calculating the integral value, it is shown in the bottom edit field.



The result is shown below. The values of the input are taken from Homework #10.


MATLAB App
Select Method
Trapezoidal
Simpson
x
1.0,1.1,1.3,1.4,1.5,1.7,1.8
f(x)
1.543,1.669,1.971,2.151,2.352,2.828,3.107
h value
0.1
n value
8
Run
Integral:
1.768