# Web Based Laboratories for Teaching Electromagnetics for TEMPUS eLab Project



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# Objectives

## Development of:

• Web-Based Experiment ⇒ eLab\*

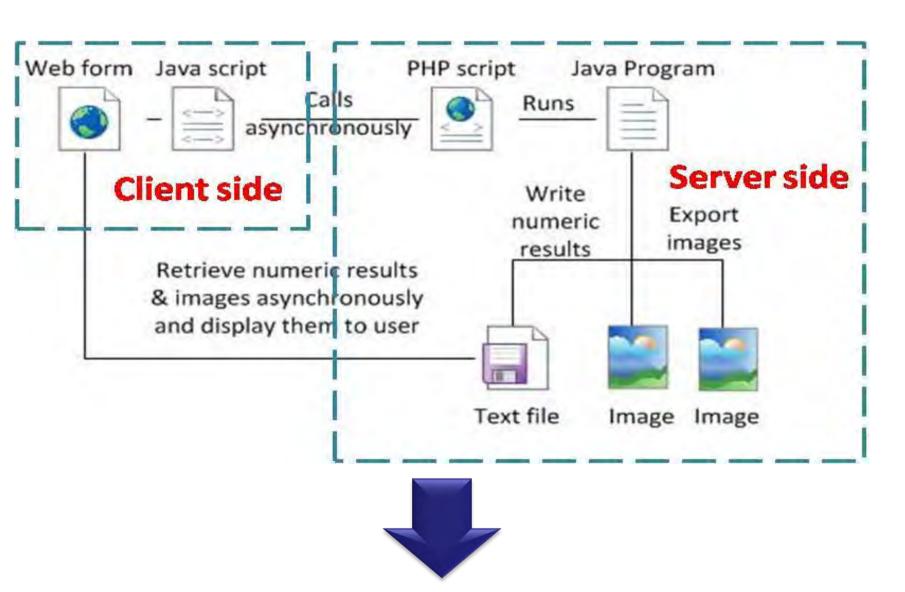
#### Challenging Issues

- Experiment should be remotely accessible through the internet using any browser
- No COMSOL installed on student's computer
- Should not require a student's experience in using COMSOL

#### Implementation

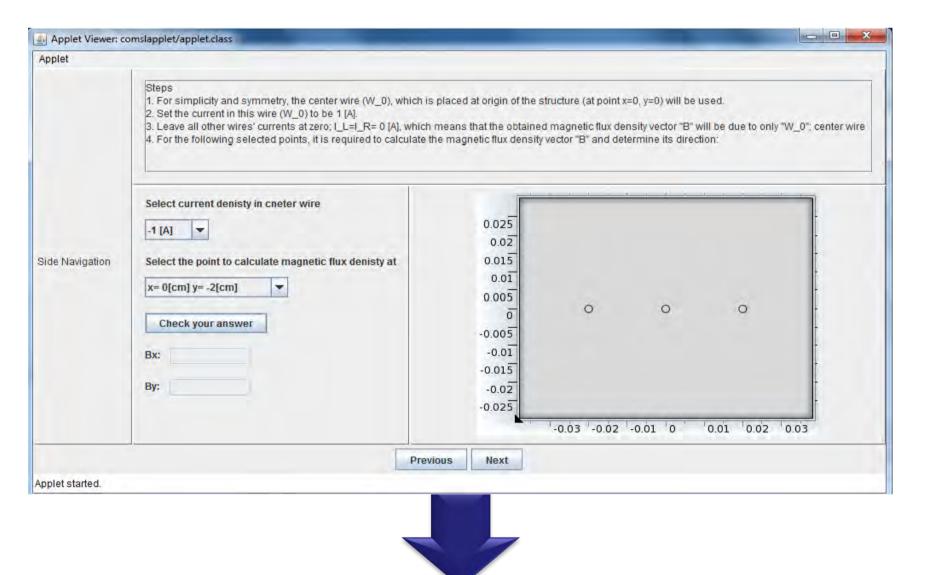
- Test experiment: "Magnetic Field due to Parallel Current Carrying conductors"
  - Each task is packed into a Java applet
- Different interfaces corresponding to experiment's tasks and expected output

### Evolution of the Development

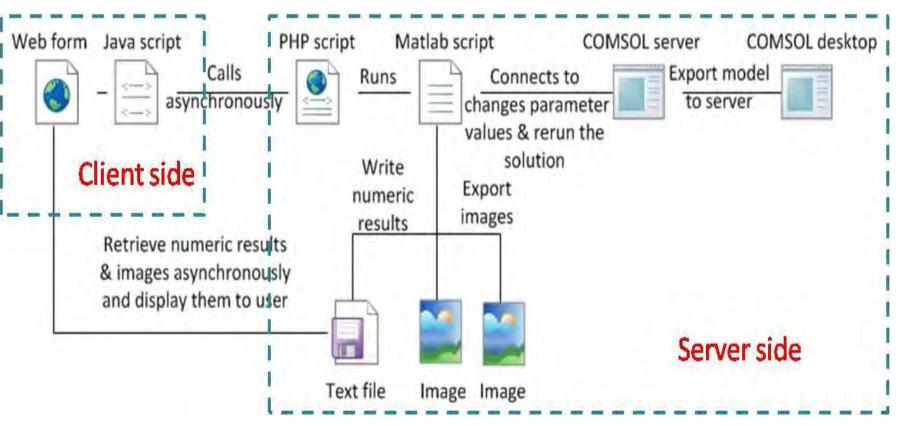


- First Approach
  Needs to initialize the model each time a parameter is tuned
- > Very long simulation time

## Snapshots of the Test Experiment



Interface of the developed Java applet



- Second Approach

  COMSOL server holds the model in memory
- > Better simulation time
- Applet Viewer comslapplet/applet.class

  Applet

  Steps
  1. For simplicity and symmetry, the center wire (W\_0), which is placed at origin of the structure (at point x=0, y=0) will be used.
  2. Set the current in this wire (W\_0) to be 1 (A),
  3. Leave all wher wires currents at zero. I\_L=R=0 (A), which means that the obtained magnetic flux density vector "B" will be due to only "W\_0" center wire
  4. For the following selected points, it is required to calculate the magnetic flux density vector "B"

  Select current denisty in cneter wire

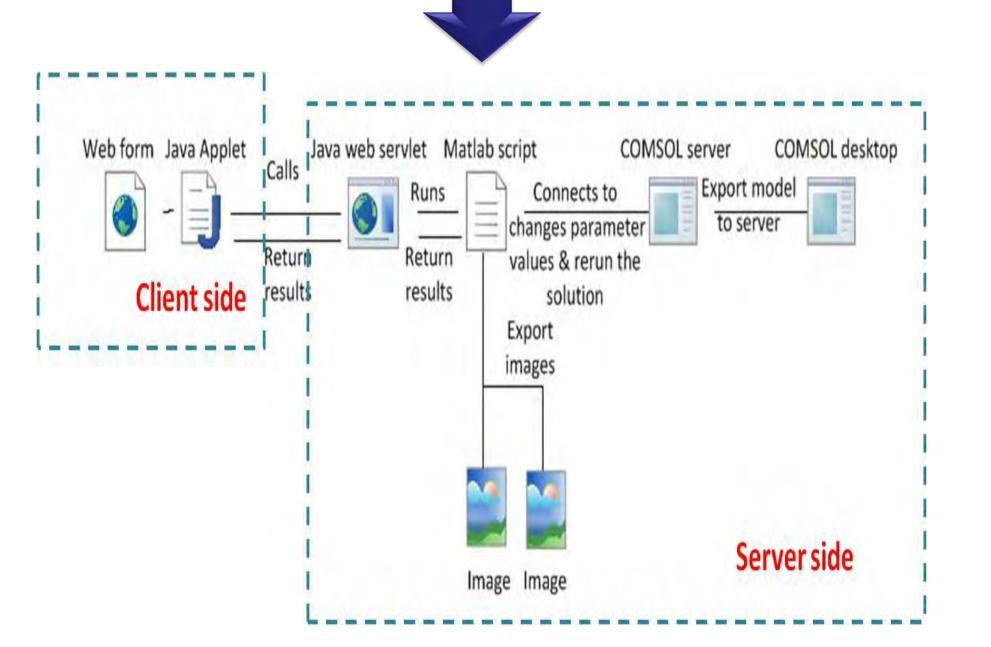
  1 [A] 

  Select the point to calculate magnetic flux denisty at x=0[cm] y=-2[cm] 

  Select the point to calculate magnetic flux denisty at x=0[cm] y=-2[cm] 

  By: -2.941e-7 [m1]

  Previous Next
- Displayed plot and numerical results for the magnetic flux density vector at a selected point



Third Approach
Better control of the flow
More robust and less error

prone

Steps
1. Similar to the previous situation, the center wire (W\_0), which is placed at origin of the structure (at point x=0, y=0) will be used
2. Set the current in this wire (W\_0) to be 1 [A]. Note, you can always change the current's direction
3. Leave all other wires' currents at zero; [L=1, R=0 [A], which means that the obtained magnetic flux density vector "B" will be due to only the center wire
4. For the following defined lines, it is required to plot the variation of the magnitude of the magnetic flux density along each selected line:

Select current denisty in cneter wire

1 [A] 
Select the magnetic flux denisty component to be plotted

X component 
Select the Line to plot magnetic flux denisty along

Line 1: (-2.5 [cm] 2.5 [cm]) & (2.5 [cm] 2.5 [cm]) 

Check your answer

Previous Next

Applet started.

Applet Viewer: comslapplet/applet.class

 Screenshot of the second task interface with the required plot displayed