Interactive Smith Chart in Java

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Introduction:

My project is on Interactive Smith Chart. The purpose of this project is to make Microwaves easy for any student to learn. So, I start with the most basic concept-The Smith Chart. I have developed a Java Application which makes it easy to learn and experiment with Smith Chart with just a click. I have designed it in such a way that it is Interactive and Interesting to use.

Why Java?

Since it is in Java, it can be used by anyone who has a computer. I did not use MATLAB because the size is very big (almost 4GB), it cannot be ported and is not cross platform. But, Java is very small, my application is only 50KB. The same application can be used on any Operating System (Windows, Ios, Linux, etc.) unlike MATLAB. This .jar file can run on any computer which has a JDK. The small size makes Uploading and Downloading easy.

My application has three parts:

1. The Mouse-over functionality:

   In the first part the user can select the type of chart. It also contains a Mouse-over functionality. This means that if the user hovers the mouse over any point inside the chart, the real and imaginary part of the Impedance (Normalized with Z0 = 50 ohms) will be displayed in the menu. This way any student can just move the pointer to learn how the Chart works. In the Image below, the mouse is placed at the center of the chart, which corresponds to (1, 0).
2. VSWR and Reflection Coefficient:

The second part allows the user to calculate VSWR for the given Load and Zo value. The values are displayed on the menu. The user also has the option to plot the VSWR circle by clicking the Plot button. The plot appears on the Chart window as a blue circle. Also, the user can directly enter a known value of VSWR and plot to see how it works.

In the figure above for a load of, ZL = 98 +j 55 ohms and Zo = 50 ohms, VSWR = 2.7198. The mouse pointer can be placed at the intersection of the VSWR circle and the i=0 axis to verify the value of VSWR.

In the above figure for VSWR= 3.88, the circle is plotted without the knowledge of ZL and Zo.
3. First order Network:

The Block diagram of the first order network is shown in the Menu. The users can choose the value of each element and the type of each element (R in ohms, C in nF, L in nH). The user also gives the frequency of operation in KHz. The user can calculate the input impedance for the given network and can also plot that impedance on the cart. The input impedance is Normalized with Zo = 50 ohms before plotting.

The plot of the calculated input impedance is shown as small blue filled circle. The mouse-over can be used to verify the value. The plot for a different set of values is shown below.
Conclusion:

The simplicity of this application makes it easy for anyone to understand the Smith Chart completely. Smith Chart can no more be confusing for beginners. This Application can also be extended to support other concepts of Microwaves like Stub Matching, Filter design, etc. so, it can be distributed like a complete package for Microwaves covering all the important concepts.

THANK YOU