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Compressibility Calculator

I created this GUI to be able to calculate the compressibility factor of a gas using the Van der Waals equation to find the specific volume of the gas. As a chemical engineering major, properties of gases are topics that come up frequently in class. I made this GUI to simplify the process of calculating one such property under specified conditions. This project was approved by Quinn Lanik. I took inspiration for the main callback function from code written by Dr. Bilal A. Siddiqui.

The process I used to create this GUI was to first create the callback functions necessary to calculate the correct value. First, I wrote the zCalculator function. Then, I wrote the Van der Waals function, which the zCalculator function called. After I created this backbone, I got a piece of paper and drew a simple design of what I wanted the GUI to look like. I went piece by piece, first adding the user input areas. To ensure the function was correctly inputting the data, I created temporary displays that showed the value of the inputs. When I was sure the inputs worked, the temporary displays were deleted. After the input areas came the output area. I created a pushbutton that called the main callback function and text box that displayed the output. To ensure that the function worked properly, I calculated each z value by hand along with the function to ensure they were the same. Finally, I resized and moved the elements to make the GUI intuitive.

The most difficult part about this project was taking user inputs as values that could be used in functions. A specific case that I had trouble with was the listbox that allowed the user to choose a gas. I originally wanted to use a group of radio buttons, but I couldn’t figure out a way to group them so that only one could be selected. Instead, I opted for a listbox, which listed out all available options. Because it wouldn’t be reasonable to list every possible gas in the listbox, I needed to create a general option that allowed the user to input relevant information about the gas being used in the calculations. The main difficulty in this was finding a pop-up that the user could input information into.

In the future, I may use GUIs to simply make my own functions easier to use. It wasn't particularly difficult to create a simple GUI, and it makes it significantly easier to understand the function. Even if I forget how a function works, a GUI allows me to know what my inputs and outputs mean. Additionally, having a GUI makes it easier to make small changes to input values and observing how they affect the outputs. Overall, GUIs make functions easier for the user to understand.

References:

“Critical Temperatures and Pressures for Some Common Substances.” Engineering ToolBox, 2003, [www.engineeringtoolbox.com/gas-critical-temperature-pressure-d\_161.html](http://www.engineeringtoolbox.com/gas-critical-temperature-pressure-d_161.html).

Dr. Siddiqui, Bilal A. “Compressibility Factor Calculator (Exact).” Compressibility Factor Calculator (Exact) - File Exchange - MATLAB Central, 2016, [www.mathworks.com/matlabcentral/fileexchange/59803-compressibility-factor-calculator-exact](http://www.mathworks.com/matlabcentral/fileexchange/59803-compressibility-factor-calculator-exact).