Weather Program in Java

Design and create a GUI program for a meteorologist in Java that calculates the wind chill factor and cloud base altitude for inputs of temperature in Fahrenheit, wind speed in mph, and the dew point in Fahrenheit. The inputs can be entered from the keyboard or read from a file for multiple calculations.

When the program begins, a window with three (3) buttons will allow the user to: Create Account, Login, or Cancel. Accounts require a user name and password with at least 9 characters including at least one uppercase letter, lowercase letter, and digit. After successful Login, the main GUI will be displayed and have data entry and selection controls.

When data is entered on the keyboard and the compute button is clicked, the computed results will be displayed in the main (GUI) data entry window, a column formatted data output window, and plotted as noted below. The formatting of the data in the window will include units and comma separators for thousands. The entry controls will accept input right-aligned, check for errors, and the window will have a title and a window icon. Each time a new set of data is entered on the keyboard, the main GUI will update and the data output display windows will be updated to add the new input data and results.

If data entered from the keyboard is invalid, an error dialog message will be displayed, the label text will indicate an error, the output display windows will not be updated, and the program will continue.

When file entry is selected, a file selection window will be displayed. File opening errors will be handled with exceptions and dialog boxes. If the file is valid and opened successfully, the program will read in the data, compute the results, and display the data and results in columns in a separate window created through a separate class and Java file, and plot the Temperature and Wind Chill values.

The output data display windows will have a window title and icon, a title for the data, output alignment, units, commas, decimal places, and column headers.

The program will loop when certain windows are closed or a Cancel button is clicked so that it does not have to be restarted by the user. The program should be user friendly and have icons, images, and color as appropriate.

Modularization: the project is complex and development should be modularized through the use of methods, classes and additional files as needed. The modularization of the program will be graded.

A **Design Document** (Word/pdf file) is required and will be submitted at all milestones and be presented as a part of project demonstrations. It will include implementation screen captures, descriptions, and explanations of functionality in the program, as well as the code at the end (see the sample file).

Three (3) **presentations** are required during the semester (Milestone 2, 4, and 6 - final demonstration). The Design document will be presented first during each presentation, and then the program operation will be demonstrated.

Program Milestones

Milestone #1 – Entry Selection GUI – Create Account/Login/Cancel

Download a copy of Eclipse and complete "Getting Started in Eclipse". Create your project in Eclipse and the package and class. Design and develop the Create Account/Login/Cancel window/dialog. The buttons should function and launch the appropriate window created using a class. Full functionality of create account and login is not required until the next milestone. Create the design document (Word/pdf) with descriptions, screen captures, and code at the end and submit it as Milestone #1.

Milestone #2 – User Login and Main Interface

Complete the login functionality and validation, and display the data entry GUI (Main GUI) including the labels, entry, and button controls. Update the Design document. The basic computations should be nearly operational at this point. Begin designing the algorithm, button action listeners, and methods for the operations. Update the Design document with screen captures and explanations. Present the documentation and running program in class, and submit the Design Document with code at the end.

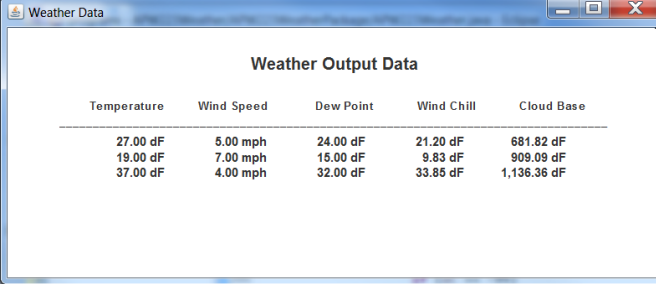## Milestone #3 – Functioning Keyboard Entry with Input Validation

Complete the keyboard entry functionality for the main GUI with label updates and test the equations. Functionality needed by other areas of the program should be in methods/classes. A separate error dialog is required when invalid data is entered or when a wind chill is not valid, and the text in the GUI will reflect the issue. Update the Design document with screen captures and explanations of operation, and submit the Design Document with the code at the end.
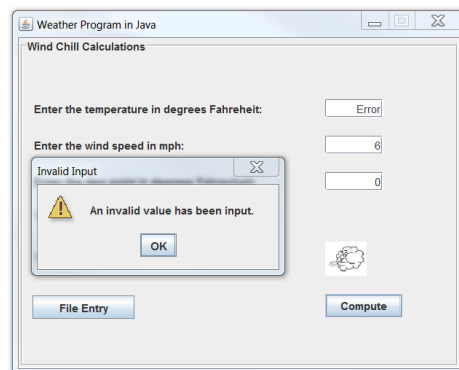
Milestone #4 – Output Display for Keyboard Entry

Create the keyboard entry data output display window, which will update each time new values are entered on the main GUI. Formatting of the data is required. Update the Design document with screen captures and explanations of operation, and submit the Design Document with the code.

The data display widow for GUI input will append each time new data is entered and will be a class.

Milestone #5 – File Chooser and File Data Output

Implement the "File Entry" selection functionality using a JFileChooser. Handle exceptions and create the output display window. The data file is provided and will require parsing out the particular values needed. A data dictionary is provided as a guide. Display the output similar to the keyboard entry implementation. Present the documentation and running program in class, and submit the Design Document with code at the end.

Milestone #6 – Plotting Keyboard Entry Data

Implement the plot functionality for temperature and wind chill when values are entered on the keyboard. A separate window is required, and a different color indicator and text will be used for temperature and wind chill. Each time a data set is entered, and the compute button is clicked, the window should be updated with the new plot graphics. Update the Design document. Prepare the documentation and program for a class demonstration. Present the documentation and running program in class, and submit the Design Document with code.
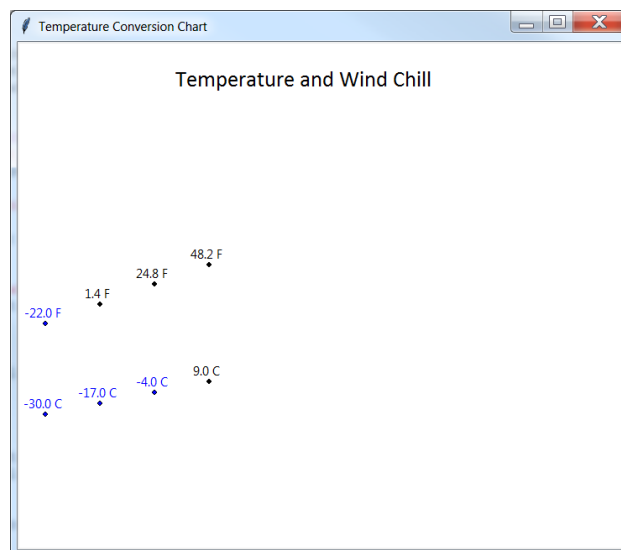
Equations

The equation for approximating the **wind chill** factor in North America is:

$$wc = 35.74 + 0.6215\ T_a - 35.75V^{+0.16} + 0.4275\ T_a\ V^{+0.16}$$

Where T_a is the air temperature in Fahrenheit

V is the wind speed in mph (*consider* pow(windSpeed, 0.16))

Also, wind chill temperature is defined only at or below 10.0° C (50.0° F), and wind speeds above 4.8 kilometers per hour (3.0 mph). The program must check this.

The **cloud base** in feet above ground level is determined by the "temperature spread" which is the difference between the temperature and the dew point, and is calculated:

$$cloudBase = \text{temperature spread} / 4.4 * 1000$$