CSC 468/568 GUI Programming - Spring 2016
Programming Assignment #1: Weather Station Display

Introduction

Weather impacts many aspects of our daily lives: where we choose to live, the activities we participate in, how we dress, the food we eat, conversation topics, etc. Sophisticated personal weather stations are available for home use at reasonable prices, and can be connected to web-based worldwide live weather station networks. Weather station hardware includes sensors for temperature, humidity, barometric pressure, wind speed and direction, rainfall, and other weather-related measurements. This data may be logged to a computer for analysis and display.

Problem

Write a Java Swing program to display weather station data in graphical form. The display format is up to you, but should resemble the graphs available on most Internet weather sites (see screen shots below). Allow the user to plot any of the following measurements: temperature, humidity, barometric pressure, wind speed, UV index, and rainfall. Provide controls to toggle (zoom) between daily, weekly, monthly, and yearly displays, and move (pan) from one day/week/month/year to the next. Clicking (or hovering) on a specific data point should bring up a message box with all the available information about that particular time point. Provide menu options to compute the following weather statistics:

- daily/weekly/monthly/yearly mean (average) temperature
- daily/weekly/monthly/yearly high/low temperatures, with date/time of occurrence
- daily/weekly/monthly/yearly mean (average) wind speed
- daily/weekly/monthly/yearly maximum wind speed (gust), with date/time of occurrence
- daily/weekly/monthly/yearly prevailing wind direction
- daily/weekly/monthly/yearly rainfall

Weather station data has been logged every few minutes for several years at SDSM&T. This data has been converted to XML format, and stored in files named with the year and month of data collection, using the format *YYYY-MM.xml* (e.g., *2015-10.xml* for October 2015). XML weather tags include:

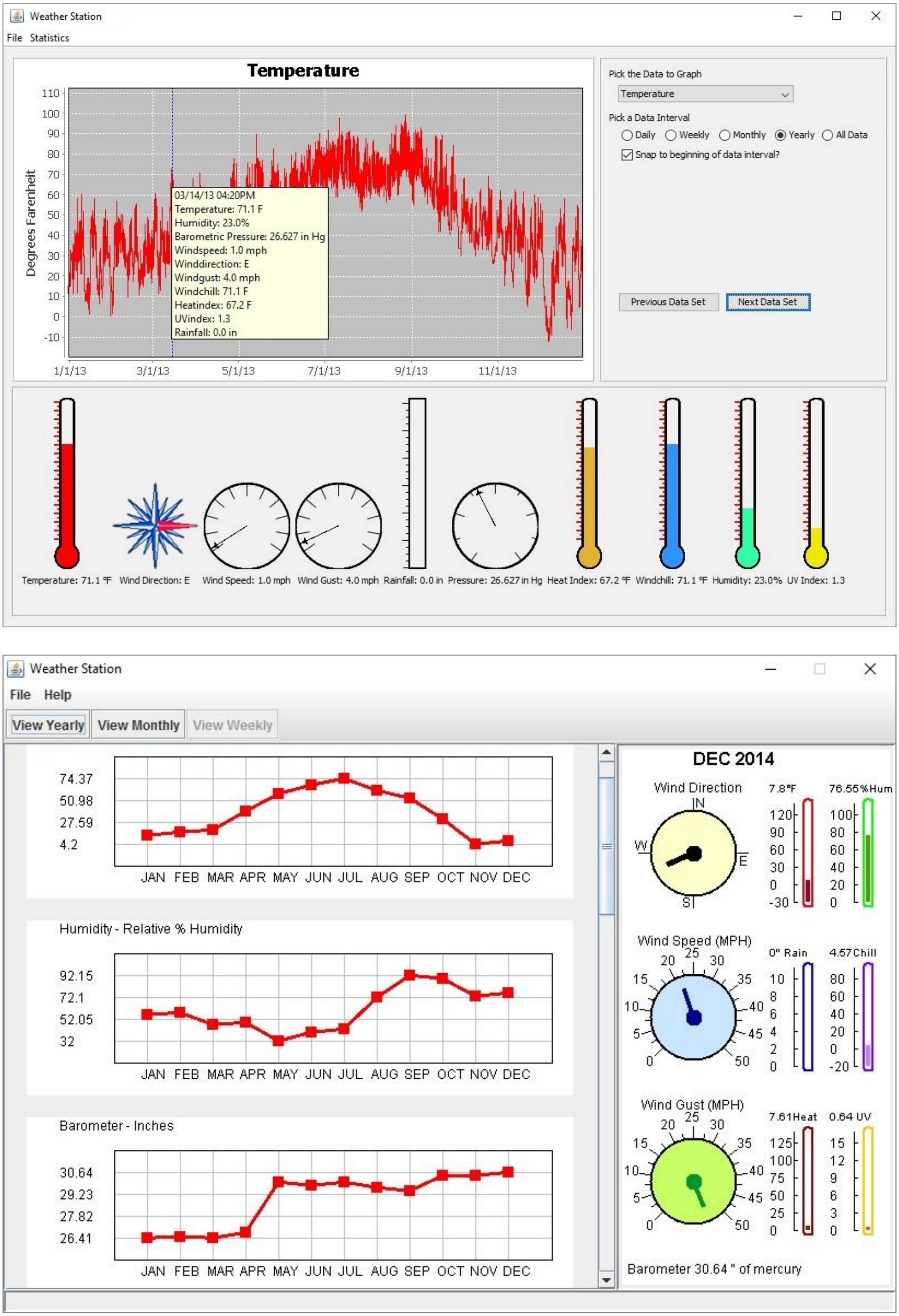
- date – MM/DD/YY
- time – HH:MM followed by A (AM) or P (PM)
- temperature – in degrees Farenheit
- humidity – relative percent humidity
- barometer – barometric pressure, in inches of mercury
- windspeed – in mph
- winddirection – one of 16 compass directions (N, NNE, NE, etc.)
- windgust – highest wind speed since last measurement, in mph
- windchill – computed from temperature and wind speed
- heatindex – computed from temperature, humidity, wind speed, etc.
- uvindex – UV radiation dose, in arbitrary units from 0 (lowest) to 15 (highest)
- rainfall – amount of precipitation since last measurement, to nearest 0.01 inch

Not all tags need be present for every time point. By default, your program should access all weather data files in the current directory. Allow the user to specify other weather data directories with a file dialog.

Notes

- This assignment will give you practice in writing desktop GUI applications, using the Java Swing library. You will also gain experience manipulating XML files.
- You may wish to use NetBeans for software development. NetBeans provides a powerful Java development IDE, including a design tool that permits drag-and-drop GUI development with Java Swing widgets. The JDOM (*www.jdom.org*) class library is recommended for parsing XML tags.
- Extra credit will be awarded for particularly nice displays with custom dials/gauges. Free chart/dial software may be found at http://www.jfree.org/jfreechart, http://www.genlogic.com/free_graphs_and_dials.html, etc.
- Submit your source code in a *zip* or *tar* archive by the due date (Sunday February 28), using the *Submit It!* link on the MCS Department Website (*http://www.mcs.sdsmt.edu*). Late programs will not be accepted for partial credit, unless prior arrangements are made with the instructor.
- To receive full credit, your code must be readable, modular, nicely formatted, and well documented, in addition to being correct. It must compile and run successfully under the current Java compiler/interpreter (Java 8). Be sure to include compilation and execution instructions with your code. If your program does not run correctly, indicate why. This will make it easier to give you partial credit.
- You must work in teams of three students on this assignment. Teams should make one joint submission, not individual submissions for each team member. You will be asked to submit a teamwork evaluation form with your program, assessing both distribution of workload and team interactions. Teams for this assignment are:

  1. Johnathan Ackerman + Daniel Andrus + Mackenzie Smith
  2. Jason Anderson + Marcus Haberling + Christine Sorensen
  3. Marcus Berger + Derek Lane + Christian Sieh
  4. Allison Bodvig + John Mangold + Joseph Mowry
  5. Charles Bonn + Benjamin Kaiser + Ryan Quasney
  6. Taylor Doell + Lauren Keene + Adam Lawson
  7. Daniel Halloran + Yanlin Li + Dicheng Wu
  8. Evan Hammer + Alex Herman + Austin Rotert
  9. Kayhan Karatekeli + Jayson Kjenstad + Luke Meyer
  10. Samantha Kranstz + Forrest Miller + Zachary Pierson
  11. Murray LaHood-Burns + Alex Nienhueser + Jiasong Yan
  12. Matthew Dyke + Charles Parsons (+ instructor, if needed)



```
03/14/13 04:20PM
Temperature: 71.1 F
Humidity: 23.0%
Barometric Pressure: 26.627 in Hg
Windspeed: 1.0 mph
Winddirection: E
Windgust: 4.0 mph
Windchill: 71.1 F
Heatindex: 67.2 F
UVindex: 1.3
Rainfall: 0.0 in
```

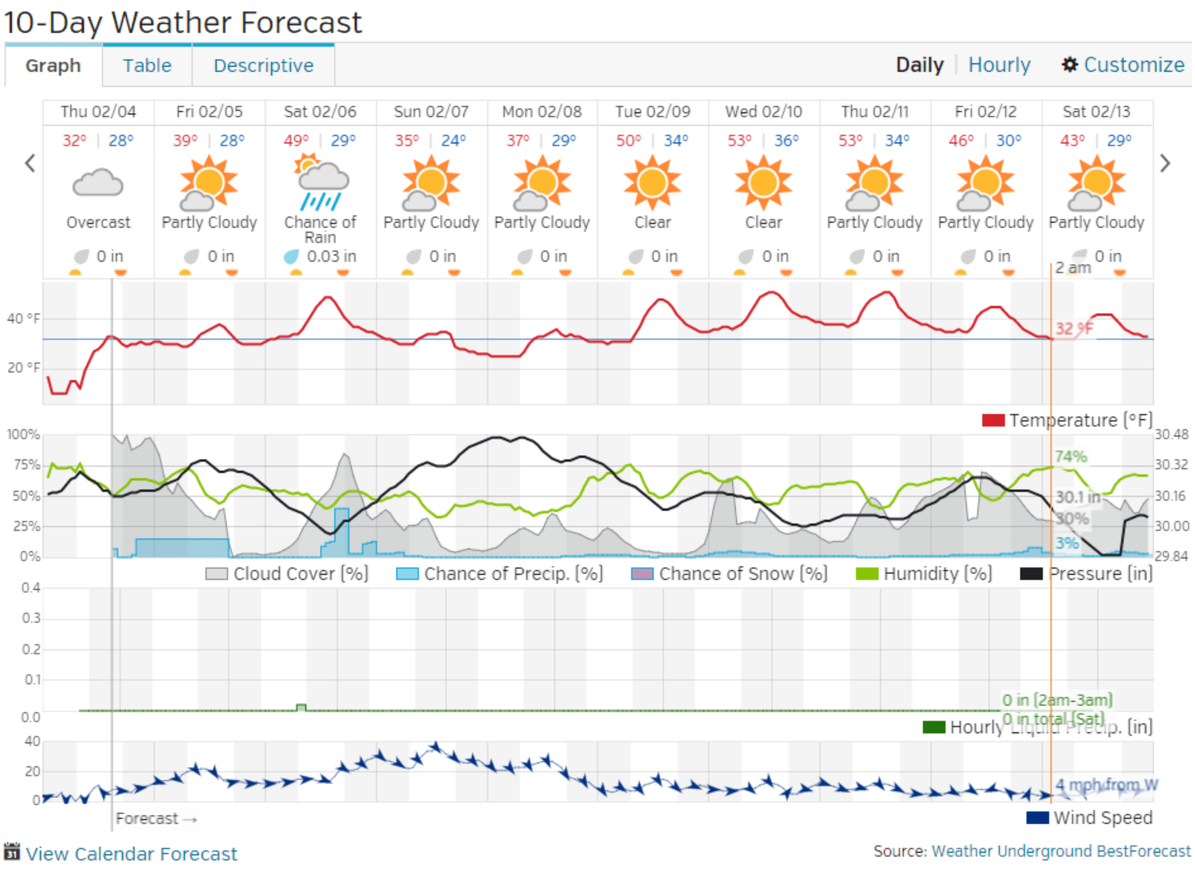
Pick the Data to Graph: Temperature

Pick a Data Interval: ○ Daily ○ Weekly ○ Monthly ● Yearly ○ All Data

☑ Snap to beginning of data interval?

Temperature: 71.1 ℉ Wind Direction: E Wind Speed: 1.0 mph Wind Gust: 4.0 mph Rainfall: 0.0 in Pressure: 26.627 in Hg Heat Index: 67.2 ℉ Windchill: 71.1 ℉ Humidity: 23.0% UV Index: 1.3

Sample GUI designs



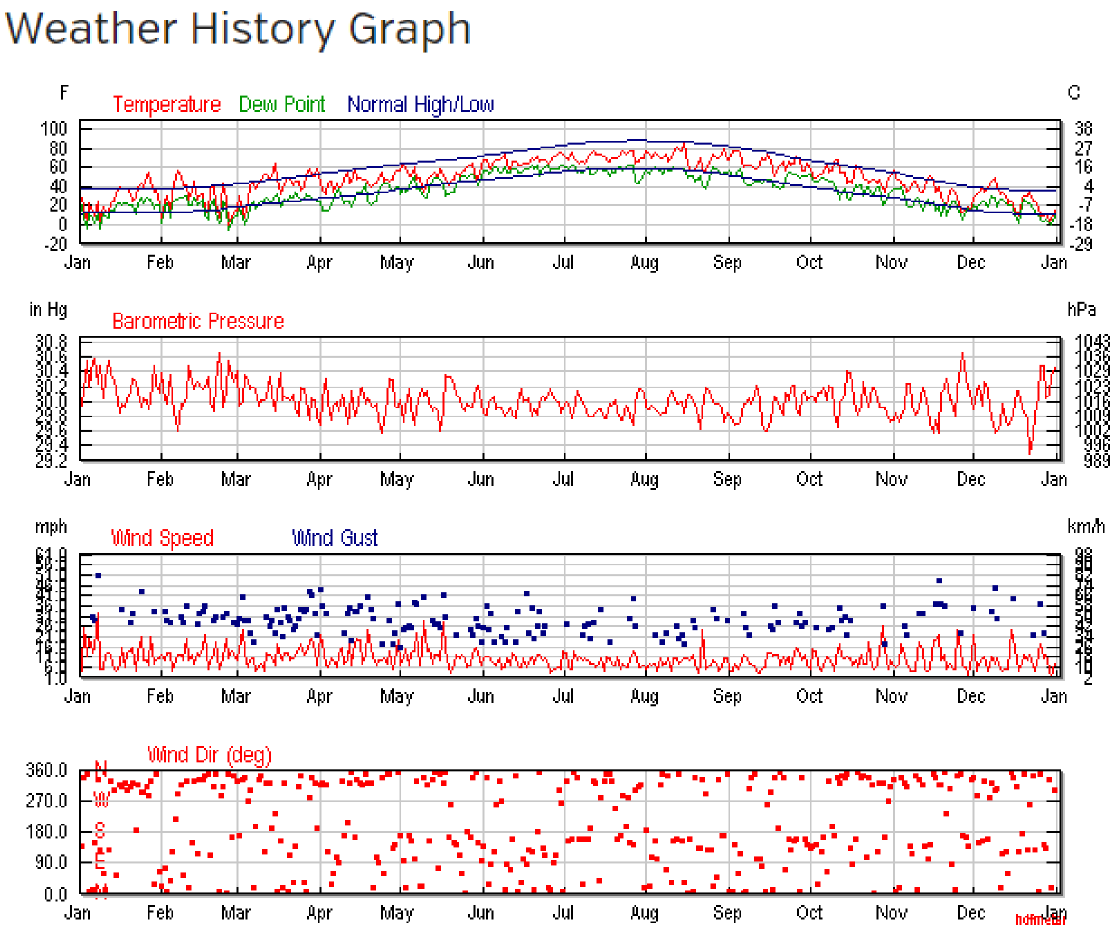
10-Day Weather Forecast

Graph | Table | Descriptive — Daily | Hourly | ⚙ Customize

Thu 02/04	Fri 02/05	Sat 02/06	Sun 02/07	Mon 02/08	Tue 02/09	Wed 02/10	Thu 02/11	Fri 02/12	Sat 02/13
32° | 28°	39° | 28°	49° | 29°	35° | 24°	37° | 29°	50° | 34°	53° | 36°	53° | 34°	46° | 30°	43° | 29°
Overcast	Partly Cloudy	Chance of Rain	Partly Cloudy	Partly Cloudy	Clear	Clear	Partly Cloudy	Partly Cloudy	Partly Cloudy
0 in	0 in	0.03 in	0 in	0 in	0 in	0 in	0 in	0 in	0 in

View Calendar Forecast

Source: Weather Underground BestForecast



Weather History Graph

wunderground.com: screenshots of daily and historical weather graphs