

CECS 424 Spring 2018

Assignment 3

Overview

The objective of this assignment is to research how *generic programming* works in different programming languages.

The general idea of *generics* (or *polymorphism* as it's sometimes called in a functional programming context) is to reuse the same code with different types.

Homework 3

1. Read about “Generic programming”:
Start with https://en.wikipedia.org/wiki/Generic_programming
2. Review Lab Assignment 1. Remember that the sort functions in C and Haskell had different types: In C we sorted arrays of integers, in Haskell we sorted lists of arbitrary elements that had some notion of order. Why do you think did we restrict the type of the C sort functions in this way?

Lab Assignment 3

1. In this lab, you will use 5 different programming languages to solve the same problem: *Write and use a generic sort function*. This function should be able to sort values of any type that has some notion of order. The values to sort could be integers, floating point numbers, strings, pairs of values (say a string and a number), etc.
2. Write a console application in each of these 5 languages: C, C++, C#, Python and Haskell.
3. Each application has to use the following data:

The sequence of floating point numbers:

645.32, 37.40, 76.30, 5.40, -34.23, 1.11, -34.94, 23.37, 635.46, -876.22, 467.73, 62.26

The following sequence of people with name and age of each person. The name is a string and the age an integer:

Hal, 20; Susann, 31; Dwight 19; Kassandra, 21; Lawrence, 25; Cindy, 22; Cory, 27; Mac, 19; Romana, 27; Doretha, 32; Danna, 20; Zara, 23; Rosalyn, 26; Risa, 24; Benny, 28; Juan, 33; Natalie, 25

Use appropriate data structures to represent the data above in each of the 5 languages and define the variables **numbers** and **people**, respectively.

4. Find a generic sort function for *each* of the 5 languages.
 - (i) The objective of this assignment is to understand generics (not sorting). You can use the sort functions from Lab Assignment 1 or just use a sort function provided in some standard library for the respective language.
 - (ii) C doesn't really provide generics. However, a **void*** can be used to point to any value.
 - (iii) One way to specify an order on a type is to define a comparison function that compares two values. This comparison function could be an argument to your sort function. Some languages might provide predefined comparison functions.
 - (iv) Try to use everything we learned about these different programming languages, e.g., Python uses duck-typing, Haskell uses the type-class **Ord** to express order on a type, LINQ in C# includes the **orderby** operator, etc.
5. Use the generic sort function to
 - (i) sort **numbers** ascending by numerical value,
 - (ii) sort **people** alphabetically (lexicographically) by name, and to
 - (iii) sort **people** descending by age, where people of the same age should be sorted alphabetically (lexicographically).
6. The point here is to reuse as much code as possible to perform all 3 different sort operations. Try to isolate the specific code that is needed for each of the three tasks.
7. Write a main function in each of the 5 languages to test your code by writing the sort results to the console.

Deliverable: A private git repository named "**CECS 424 Spring 2018 Assignment 3**" with me (and only me, <https://bitbucket.org/Gedankenexperiment>) added as a reader, that contains all your source code as described above. **Due date:** *Monday 2 April 2018 at the beginning of lecture.*