Discrete Mathematics

CSIS 2430

Programming project 1

For this assignment, write, test, and execute code to solve the following problems. You should also answer all of the questions.

For this project, write a program to solve Computer Projects 1, 2, and 3 on page 189 of your text. Please note the following points:

* While project 1 specifies that you use a bit string for the project, you may use (and may find it more convenient) to use an array of booleans.
* You will need different data structures and different methods (or even different classes) for the three problems.
* You do not need to prompt the user for input for these, it’s perfectly fine to hard code your input.

After writing your code, please answer the following questions.

Often times, in natural language processing (i.e., the user types in queries in English, in Dutch, or in some other language) the user may not distinguish between sets, multisets, or fuzzy sets. For example, ‘Which of our customers attended SLCC?’ would likely answered using a set. ‘How many of our customers have graduated from the different colleges in Utah?’ would likely be answered using a multiset. ‘Which would our customers like more, plain apple pie, apple pie with vanilla ice cream, or apple pie with butter pecan ice cream? Would that change if I changed the entrée from roast beef to barbeque chicken?’ might have been coded using sets, but probably should be coded using fuzzy sets.

1) If you used different arrays/structures/classes to represent the different types of sets, would it be possible to have overloaded methods or operations that would provide the correct functionality regardless of whether or not you were using sets, multi sets, or fuzzy sets? Why or why not? (You do not need to code this, just answer the question).

We use Python as our programming language, and in this project we use three different data structures, lists, dictionaries and collections. Each data structure has their advantages and disadvantages to sets, multisets and fuzzy sets.

I think the overloaded methods exist, for different type of inputs, we can program to have multiple methods adapt to its own data input, so one overloaded methods can deal with all three inputs(set, multi sets and fuzzy sets).

We found that it made sense that Python used the same data structure for multi-sets and fuzzy sets (Counter), but that it separated classical sets from multi-set concepts.

2) Would it be possible to use the same data set/structure/class to store sets, multi sets, and fuzzy sets? Why or why not?

Yes, we can use collections to store all of them, collections can handle sets with any number and size. However, there would be a large amount of overloaded methods, variable initialization, and memory usage to use this large class.

3) How easy or difficult is it to determine the type of set that you need to use based on the users query? Why?

We think it will be difficult to determine the users query, the user will not tell the program which type of set they are going to give, the program has to take the whole set and analyze the type by itself, at the meantime, use the proper method to solve the problem.

4) Is it possible to store the data from one type of set (plain sets, multi sets, fuzzy sets) in another type? Would you need to lose data in order to do so? Why?

We think it is possible to do so, it is not a smart way to save one type of set to another type.

For example, it will be super difficult to save the bit-wise data into the fuzzy set data containers.

You can certainly create conversion methods from one set type to another, but there are cases where you will use data such as converting a fuzzy set to a classical set. To do this you would have to drop the degree of membership data for the conversion. However, doing the conversion the opposite way (classical set to fuzzy set) you would not lose any data.

5) Discuss what implications your answers to questions 1 – 4 have for someone trying to code an interface which would allow users to type in natural language queries.

The person who is going to code this interface better to specify some keywords for the user, so the user can give a very clear command to the program. For example, question 2 ask determining the type of set based on the users query, if the users can use some keywords like “SET” for regular sets, “MSET” for multi sets, then we can reduce the programming time a lot. However, since not all users would use these keywords we need to be able to specify a mapping between natural language and computer language. This implies that we must take specific morphemes of the particular language and weigh whether or not a certain data structure would be optimal.

Your code needs to be well documented with proper comments and make good use of white space.

Make sure you clearly include your name, as well as the course and section number in a comment at the beginning of the code.

When you are done, save your source code and the answers to your questions in a folder clearly labeled with your name, and then save this into the appropriate folder in the inbox.