Soft Computing Methods and Applications

Lab Exercise and Assignment #3 (2021)

Define Universe and Fuzzy Set Classes and Display their Member Functions

(1) Analyze the data and functions of the fuzzy sets defined on a continuous universe. Exercise object-oriented techniques to develop related C# classes for implementing the fuzzy sets. For example, you will have a Universe class to let user define the value ranges and resolution for displaying the member functions of fuzzy sets. Remember that in an MS Chart an embedded ChartArea hosts a number of series. Therefore, a Universe class should possess a ChartArea to host the fuzzy sets.

(2) On the other hand, a generic Fuzzy set class can be defined to cover particular fuzzy sets, which will be derived from the generic one. Note that a fuzzy set object should have a reference to an existing universe object, on which the set is defined. In real applications, several fuzzy set objects might share the same universe object. Therefore, an object of Universe class is required in creating an object of FuzzySet and that will be imposed on constructors of the FuzzySet class. In addition, since a line chart for visual representation of its member function might be needed, a FuzzySet class should possess a Series object to display line chart on Chart component of the UI.

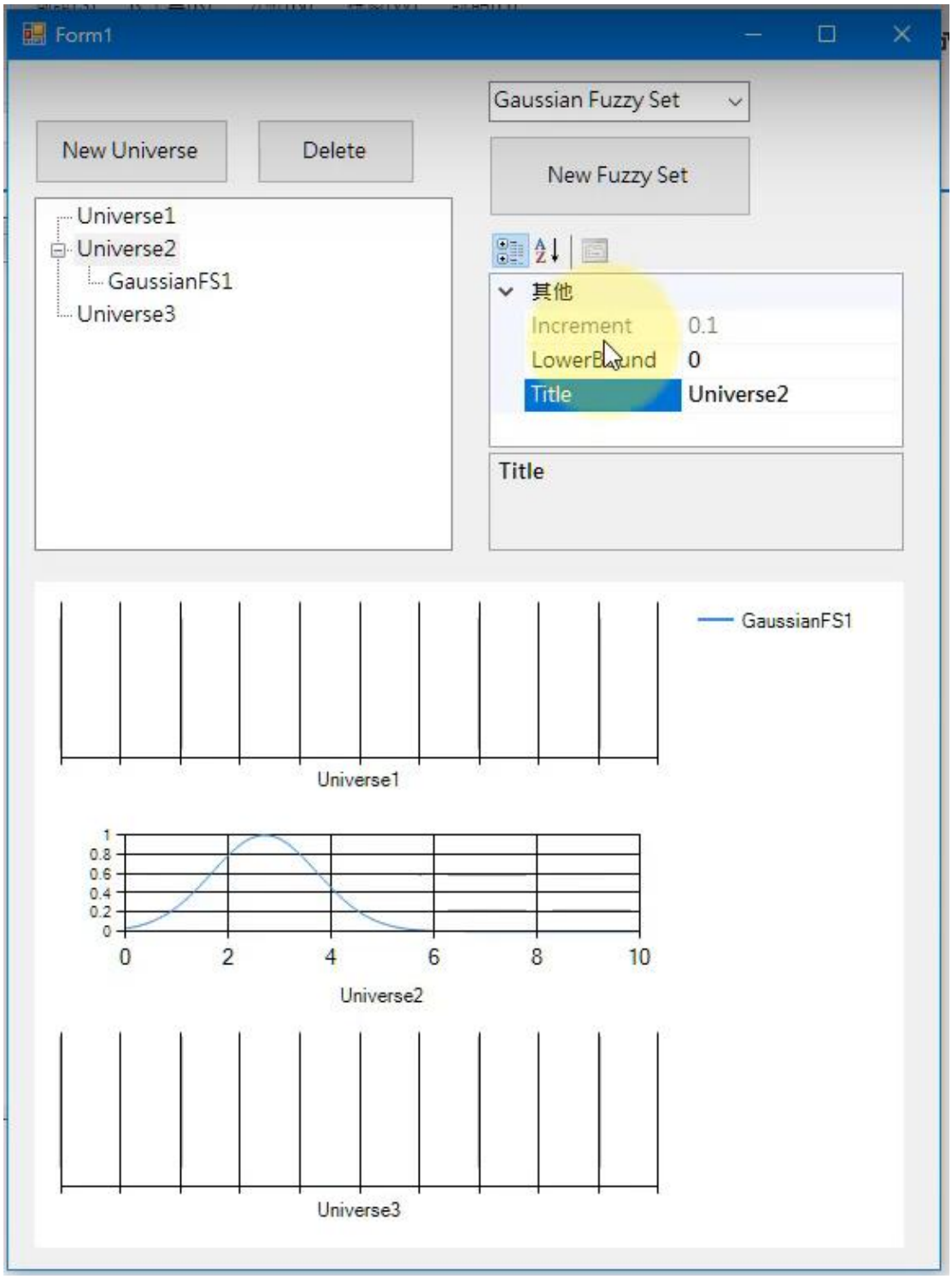
(3) Exercise C# O-O design techniques by applying *virtual-override* methods and *Properties* to the family of FuzzySets. Following the instructions given in the lab time. Get familiar with the *property* definition of C# and the fact that all C# classes are internally inherited from *object* class.

(4) Create a WinForm to host UI controls that allow user to define a universe and create objects of different fuzzy sets on it. Graphical UIs are therefore designed to display member functions of the fuzzy set objects. Note that these member functions are parameterized and you should provide UIs to let user interactively change their values. Property definitions for these parameters and uses of PropertyGrid controls can simplify the task. Default constructors with automatic naming and parameter randomization should be implemented to facilitate fast fuzzy set modeling.

(5) In general, a fuzzy inference system has more than one universe created for defining various fuzzy sets. Therefore, graphical UIs should be used to keep tracking of the created objects. TreeView control consisting of hierarchical structures is particular suitable for our fuzzy set modeling.

(6) Check your textbook and the lecture note for the function definitions of other types of fuzzy sets. For example: S, Z, π, stepUp, stepDown fuzzy sets (formulate them in advance), etc. Note that several different fuzzy set definitions can be found in the text part and exercise part of the textbook.

(7) Prepare a folder named as <your ID><your name>Ass03 to put your source code in it. Compress it as an RAR file and submit to course web site (COOL).


Form1
Gaussian Fuzzy Set
New Universe
Delete
New Fuzzy Set
Universe1
Universe2
GaussianFS1
Universe3
其他
Increment
0.1
LowerBound
0
Title
Universe2
Title
GaussianFS1
Universe1
1
0.8
0.6
0.4
0.2
0
0
2
4
6
8
10
Universe2
Universe3