FUZZY CLASS POINT APPROACH FOR SIZE ESTIMATION

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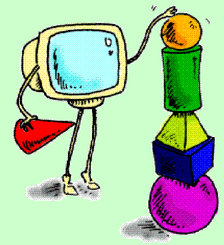


Introduction

The Class Point Approach was first started with the aim of size estimation of object-oriented products based on design documentation. Class Point Approach (CPA) quantifies classes which are the logical building blocks in object oriented paradigm as opposed to functions in procedural paradigm for which Function Point Analysis (FPA) is used. However, like FPA, CPA also depends on classification of complexity of class based on discrete intervals and hence suffers from the shortcomings of conventional FPA namely inability to capture imprecision of human knowledge. Thus our approach is based on Fuzzy Logic that allows for a gradation of values and is more tolerant to uncertainty, imprecision, partial truth and approximation to achieve tractability, robustness and low cost solution.

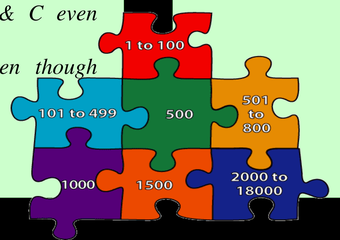
Why Fuzzy Class Point?

- ❖ Captures human way of thinking
- ❖ With traditional approach, values like 20, 21 which are intuitively similar may get categorized in different classes.
- ❖ Provides a more uniform criterion for determining whether a system has very high/high/low complexity.
- ❖ Based on membership value in each complexity level, class points for a class are calculated.

❖ **Example**:

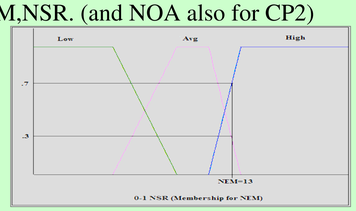
Class	Type	NEM	NSR	Complexity	Weight
A	PDT	1	1	Low	3
B	PDT	8	1	Low	3
C	PDT	9	1	Average	6

- *Different weights assigned to class B & C even though difference in NEMs is less.*
- *Same weights assigned to A & B even though difference in NEMs is more.*



Methodology

1. Process the information available for size estimation as follows :
   a. Identify and organize the classes into groups depending upon their application domain.
   b. Evaluate the **Class Point** of each class using NEM,NSR. (and NOA also for CP2)



e.g. For class of type PDT with μ_{avg} *= 0.3 &* μ_{high} *=0.7*

*Class Points= 0.3 *6 + 0.7*10= 8.8*

c. Estimate the **Total Unadjusted Class Point (TUCP)** as the sum of class points of each class.

2. Estimate the **Technical Complexity Factor (TCF)** by assigning degree of influence to 18 general system characteristics .

   TCF= 0.55 + (0.01 *TDI)

   where TDI is the sum of the degree of influence (and varies from 0 to 5, like in Function Points) of all 18 system characteristics.

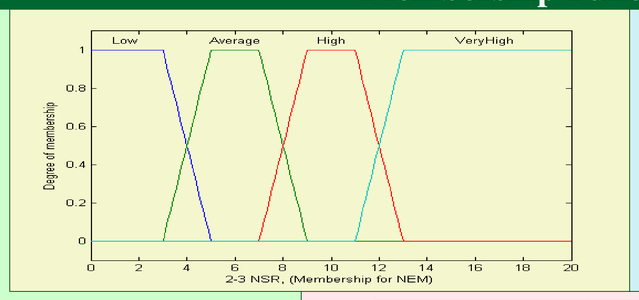
3. Evaluate the final **Class Point** value based on the results of the above steps.

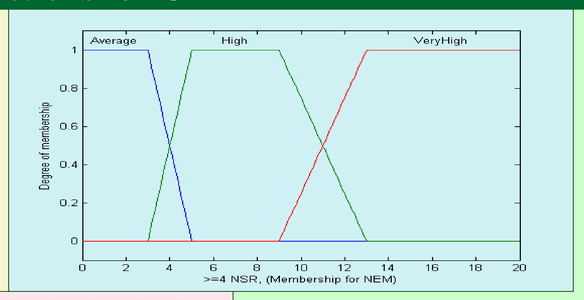
   CP= TUCP * TCF

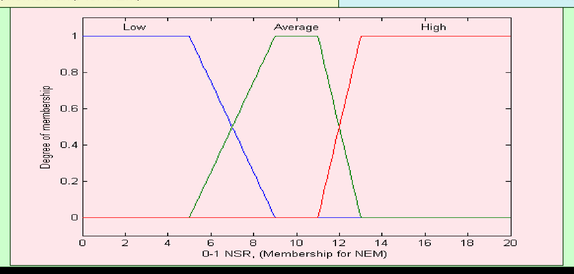
Evaluating Class Points

System Component Type	Description	Complexity			
		Low	Average	High	Very High
PDT	Problem Domain	3	6	10	15
HIT	Human Interaction	4	7	12	19
DMT	Data Management	5	8	13	20
TMT	Task Management	4	6	9	13

Membership Functions for CP1







Terminology

Types of Classes:

- ❖ **PDT**: Problem Domain Type
- ❖ **HIT**: Human Interaction Type
- ❖ **DMT**: Data Management Type
- ❖ **TMT**: Task Management Type

Variables :

- ❖ **NEM**: Number of external methods in a class
- ❖ **NSR**: Number of services requested
- ❖ **NOA**: Number of attributes in a class

Class Point Measures:

- ❖ **CP1**: Used as initial estimate. Considers NSR & NEM for computing complexity of a class
- ❖ **CP2**: Considers NOA, NEM, NSR.

Conclusions and Future work

- ❖ It is proposed that use of Fuzzy Class Point Approach would yield better results than traditional methods.
- ❖ The computations for same have been implemented and membership functions generated in MATLAB.
- ❖ This can be further analyzed and proved if real data for Class Point Approach is available.
- ❖ Once the Class Points have been calculated, they can be used to compute **development effort**.
- ❖ One example of such work is that of Kanmani et al. which compares the *Fuzzy Subtractive Clustering* and *Artificial Neural Networks* to estimate the development effort of OO systems using Class Points. However, effort can also be computed by other methods also using Class Points

References

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