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MATHEMATICAL THEORY OF CONCEPTS: LATTICES OF (SUB)CLASSES, DISTANCE

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Abstract

Concepts are couples of sets O and A. (O, A) gives any concept, that is the assignment, of the object O to the set A of the (common) attributes of the elements of O. The lattice is created by two algebraic operations: "intersection of couples-concepts" as the multiplication of the Boolean Algebra-Lattice and "symmetric-difference(!) of couples-concepts" as the addition(!) of the Boolean Algebra-Lattice (ICM1994). There are, also, two other operations (the "union of two concepts" and the "complement of a concept"). Intersection and union(which cannot play the role of addition) express **similarities**, while the other two operations express **dissimilarities**. <u>Definition 1</u>. The complement of the concept (O, A) is the concept (O^C, A^C), where O^C and A^C are the usual set-theoretic complements. <u>Definition 2</u>. The symmetric-difference of two concepts (O_1, A_1) and (O_2, A_2), is the concept $D = (O_1 \underset{\bullet}{+} O_2, (A_1 \underset{\bullet}{+} A_2)^C)$, where $O_1 \underset{\bullet}{+} O_2, A_1 \underset{\bullet}{+} A_2$ are the usual set-theoretic symmetric-differences. The non - common objects $O_1 \underset{\bullet}{+} O_2$ have the common attributes $A_1 \cap A_2$, but they may have, also, others "out of" $A_1 \cup A_2$ (that is, in the complement of $A_1 \cup A_2$, which is the **fuzzy factor** in the **definition** or comparison of concepts). <u>Definition 3</u>. We define distance $d(X, Y)$ of two sets X and Y, the non-negative integer expressing the number of elements of the set $X \underset{\bullet}{+} Y$, that is

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