

Similarity, variant and generative process planning

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The similarity is a very significant phenomenon in the Nature, in society, in human living and in manufacturing too. We behave in similar conditions similarly. Similar detail in similar conditions are manufactured similarly. The standard process planning (A. P. Sokolovskij) and the group technology (A. S. Mitrofanov) are based on similarity. Both approaches to the process planning; the variant and the generative approaches are based on the similarity.

What is the similarity?

Mathematics knows similarity, coincidence, identity and equality of abscissas, triangles, sets, vectors. Two vectors are regarded as equal if they have on corresponding places equal elements.

Sets are created from elements. The elements may have various form, as components, vectors, structures etc. If elements of two sets A, B are equal, we consider these sets as equal, for congruent.

It seems, that examination of mutual relations of two sets may explain the term of similarity. Let the set A be the pattern (the standard), the set B the task to be solved. The sets A, B (i. e. the pattern and the task) have $2^3 = 8$ relations. Here they are (the \emptyset is the sign of an empty set, in a frame is the mode of approaches to process planning):

1. $A = \emptyset, B = \emptyset$	no practical meaning	
2. $A \neq \emptyset, B = \emptyset$	no practical meaning	
3. $A = \emptyset, B \neq \emptyset$	no pattern	Full generative
4. $A \neq \emptyset, B \neq \emptyset, (A \cap B) = \emptyset$	no pattern	Full generative
5. $A \neq \emptyset, B \neq \emptyset, (A \cap B) \neq \emptyset$	insufficient pattern	Partly generative
6. $A \neq \emptyset, B \neq \emptyset, A \subset B$	insufficient pattern	Partly generative
7. $A \neq \emptyset, B \neq \emptyset, A \equiv B$	identical sets	Standard (paradigm)
8. $A \neq \emptyset, B \neq \emptyset, A \supset B$	abundant pattern	Variant access

Only the standard process plan is fully applicable. At variant access the abundant elements are omitted, in generative mode the missing elements or all of them must be completed.

If the task is a process planning for production of machine or equipment parts, details, components etc., the laws of part production are applied. They are formulated in the present by author and his colleagues in research. The information about laws and rules of part production you will find in articles for further reading.

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