Materials of Conferences

OBJECTS AND PROCESSES IN AUTOMATED DESIGN OF THE CONDITION OF THE FACE WHEN DREDGING COAL

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For the designing of the coal faces technical facilities condition, having interacted by means of processes with the coal massif, it should be performed the following [1, 2, 3]:

1) the independent (e.g. separated) objects and the processes separation, by means of which they are interacted, or are changed their condition;

2) the objects and the processes functional properties and their differentiation consideration with the use possibility to them the designing methods;

3) the objects' development into the individual models;

4) the processes and the methods development for their use with one or the objects' group.

So, such methodology has already been created for the stable operation multi – dimensional designing of the complex mining equipment production, for example, in the faces of the coal seams.

In particular, at the underground development in the short, or the long coal face, it can be distinguished, qualitatively, the identical sections of the rocks and the special equipment (e.g. the rocks power, its physical and the mechanical properties, the same type of the lining), and the areas, where they are, principally, different. Such areas can be connected, having made up the whole integrated system, or to have the expressed system planes of their slipping between each other. So, in the same coal face, it can be possible to be considered the intermediate bottom zones with the special artificial rocks strengthening, resulting in the terms of the one unit accession just to another are much different, or the areas, where there are the additional mine working developments, and, fundamentally, the quite different equipment, for example, such as the coal faces pairing with the other rest of the mining massif. Therefore, we distinguish several areas of their designing. One, of which – is the basic one, and the other – are the linear ones (e.g. the repeated ones). For all this, the basic areas may be repeatedly crashed, having reflected the fact, that the possible impact of the intense mining pressure from the mining massif of higher power between the linear sections, for example, such as at the mining terrain sector area overcoming.

So, the automated designing international packages structure on the basis, certainly, – of the elemental technologies is required the powerful language presence of the object – oriented (e.g. visual) programming (OOP). This one, and also the fact, that the standard is provided the control from outside possibilities, for example, on the basis of the C++ type OOP, the «Delphi VB» is provided you to build your design programs with the sites' mix within the application itself (e.g. («Ansys», «SolidWorks», «NASTRAN» and etc.), moreover, the linear areas are built on the copying and the transfer to the given step basis, with the ability to be made introduction within each of them the object and the process blocks, having clarified and distinguished within the specified and the defined framework of their main properties. If, in this case, the geometry is being constructed in the in the blocks of the objects, the materials of the basic properties are being described, then in the process ones the variable characteristics are being described, and also the fractures manifestations conditions, and etc. At the same time, the object blocks can also be differentiated:

1. On the geometry complexity, by the inserts presence from the different materials (e.g. the rocks, the concrete, the metal);

2. According the linear area description: the cavity dimensions for the special equipment displacement, on the coal face form, and the rocks and the coal properties at the coal face, with the rocks disintegration, and etc.;

3. According to the equipment components and its elements at the linear areas sections (e.g. the power characteristics and the lining geometrical parameters);

4. By the equipment elements and the components contact nature between themselves and the rocks.

So, the process blocks are also identified the system state non – stationarity [2], when, depending on the imbalance of the fixing points attachment, this or that state scheme, and the stability loss of the rocks species can be realized and etc.

These or that blocks use is practically determined by the computers' availability for the automated designing and to be performed the calculations, or the possibilities capacity connections to the servers, to the supercomputers accomplished at the operation over the network. For all this, at the same time, the calculations appointment and the time limits for their performance are considered: for the research purposes (e.g. the speed requirements calculating are non – rigid), to be managed the necessary operations in the real time regime. So, in the last case, the time norms are being dramatically decreased, and they are made up to a few seconds, for example, advancing the roof supports auto – mode of the travel. On the basis of the computers, having had the widespread use in the Republic, such calcu-

lations are carried out without any paralleling (e.g. it is not used the parallel programming), and they are taken from 20 up to 60 minutes (e.g. 1 hour). And with the increasing challenges, the calculation time is increased even more. So, the supercomputers use and the parallel programming tasks will be allowed to be reduced the calculation time down to the standard of 0,5–1 min, which is suitable for the partial control mode in the real time regime, when only one calculation is practically performed for the moving sections group, but not for each, separately. In accordance with the implementation of the tasks' solution, on the basis of the finite – element technologies, the designing is divided into the two stages:

– the geometric designing with the necessary data and the system operating conditions introduction;

– the solid – state model building, including the actual design replacement of the grid one.

The Second stage has already been complicated by the fact that the grid is constructed in the modern packages, as a whole, for the collected objects from the system, which is associated with the choice of such a system, when the assigned numbers are sequentially under the construction by the geometric elements, are followed by the previously known algorithm, which is not always possible. Since all these above – listed packages are made in abroad, and they are presented themselves "the black box" by their main program blocks. This is greatly complicated the automated designing systems development – the areas sections have to be built, individually. Therefore, the software volumes in the author's performance are significantly increased at the basic and fundamental researches production on the natural researches management in the underground mining operations production.

The areas section with the pairing mine face with the entry (e.g. the main one), the four linear ones with the primitive equipment of the mine face (e.g. the powered and the mechanized support), the process blocks and the units to be ensured the support contact with the roof lining and the soil, in particular, due to the friction and the adhesion have already been included in the tested model for the mine face. In addition, it has been considered the wall advance with the dynamics modeling possibilities of the rocks collapsing and the collapse rock arch forming in the linear blocks ad the units of the mine face. Here, it is also taken into consideration the layers peeling off, their cross – belt, the layer slip (e.g. the simulation by the deformation module). So, for the flat statement of the challenge in the steps of the program calculation, having compared the forming processes priorities, it has made it quite possible to be implemented one of the three possible factors, and then, having prepared the next round and cycle calculation, respectively, it has been changed the initial and the original data, and the system interaction pattern. So, the work's result has been the interaction system trajectory of the support – wall rocks. Then, the support primitives are quite allowed us to be applied the lining and support model with the sufficiently complete simulation of the hydraulic props work, the roof and the bases, as well as the area sections multiplicity in the mine face. In this case, it is quite possible to be taken into consideration and the slipping fractures, having separated the mine face in its length.

According to [2], the presented model scheme is the efficient one for the moving mine face, and, therefore, with the constant view of the calculation objects destruction (e.g. the rocks, the blocks, and the units). Therefore, the special methodological techniques and the procedures to be managed for the control by the finite – element network construction in the 3D models are required for the destruction and the fractures' trajectories construction calculation. Thus, at the impact modeling upon the massif with the square and the round orifices exposure, having had under the uniform pressure, the pressures picture is not very different on the left and on the right of the holes, that is, it is the symmetric one, at the same time, the principle stresses vectors, which, according to [1], the fracture formation is predicted for the square orifice, despite the use of the one and the same modeling techniques and the procedures, they have dramatically been changed the direction (e.g. to the side of the top horizontal plane of the boundary), at the while, in the other cases, they are directed at the lateral vertical boundaries, that it will be identified and the massif calculated destruction differences. This is due, to the bad visible inaccuracies of the network construction on the left and on the right sides by the corresponding processor, which is required the special measures application at the fundamental challenges solving.

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