ON THE RELEVANCE, PURPOSE, SUBJECT OF RESEARCH AND OTHER ISSUES OF THE COMBINED METHOD OF LARGE BLOCKS

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Abstract

The article deals with the development of a new combined calculation method "Large Block Combined Method" in the mechanics of solid deformable seals. In the present work, the author's opinions on the urgency, purpose, research subject and other issues of the development of this method are discussed. This method will be mainly used to study the tense-deformed condition of objects with very complex structures. It relies on the applications of the finite element numerical method and the large block analytical method. Such a method will be effective in cases where part of the object to be examined can be considered as elements with simple and complex structure, where the analytical method of large blocks will be used, and the rest as a space with very complex structure, where the numerical method of finite elements will be used. In addition, the contact conditions required to ensure the simultaneous operation of these parts of the object under consideration must be met. The article discusses the issues that favor the combined method of large blocks over the finite element method and the analytical method for large blocks. Especially noteworthy is the issue of specifying the results of the tense-deformed state of objects with complex structures using a new calculation method.

Keywords: *tense state, body, surface, impact, deformation, load.*

In the study of the tense-deformed condition of objects with very complex structures, the finite element method [1-3] and the boundary element method [4] are still irreplaceable methods, but as we see required further refinement of these numerical methods in order to eliminate all or part of their shortcomings. For this, it is possible to develop a combined method [5] for large blocks, which will be based on the application of the numerical finite element method [1-3] and the analytical method of large blocks [6]. This method will be effective in cases where part of the object under study can be considered as elements with a simple and complex structure, where the analytical method of large blocks will be used, and the rest as a space with a very complex structure, where the numerical finite element method will be used. In addition, the contact conditions necessary to ensure the simultaneous operation of these parts of the object under consideration must be observed.

Consider as an example the study of arched dams. When studying the stress-strain state of arched dams, it is better to take into account all boundary conditions, including the distributed hydrostatic load and the presence of holes (in the form of gutters) in the building.

When studying the stress-strain state of arch dams by the numerical finite element method, it is known that the distributed hydrostatic load can be taken into account approximately (finite elements in the form of compressed loads in the nodes); When considering them, the solution to the problem is associated with such difficulties that the use of the analytical method of large blocks practically makes no sense. As for the use of the combined method of large blocks, which is based on the representation of large blocks of the object under consideration. In most of the arched dams, which are analyzed by the

analytical method of large blocks [6], it is possible to accurately take into account the hydrostatic load, and in a small part of the building (for research by the numerical finite element method), where the above openings are located, they can be taken into account. Taking these two factors into account, it is obvious that to confirm the results of the study of the stress-strain state of arch dams, the combined method of large blocks should be used, which, in our opinion, confirms the relevance of the development of this method.

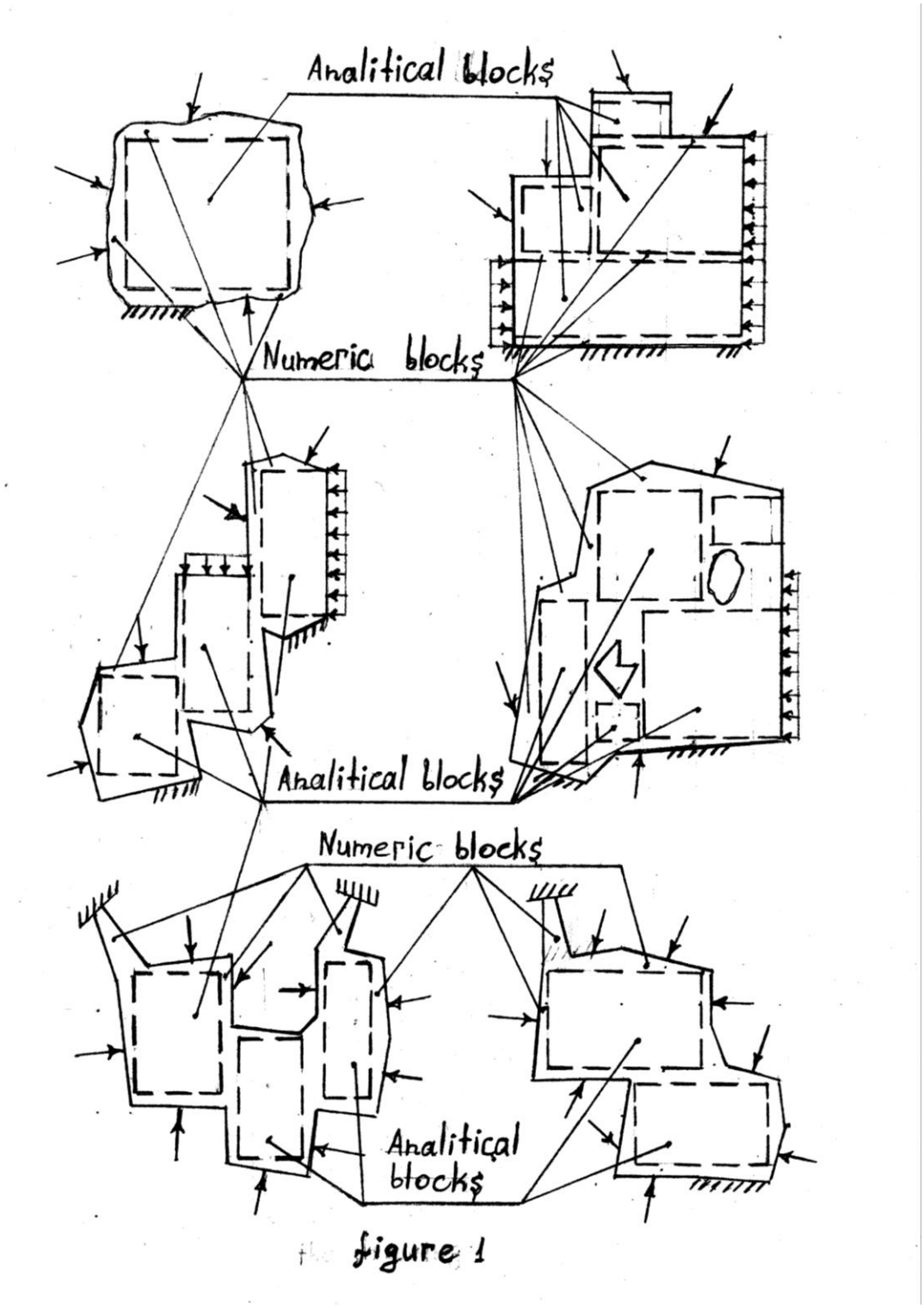

figure 1

In addition to the above, when using the combined method of large blocks, compared to the finite element method, a significant reduction in the number of finite elements is achieved and, as a consequence, a significant reduction in the amount of required information. A significant reduction in the system of general algebraic equations is also achieved (due to a significant reduction in the number of finite elements). All this is achieved through the use of the combined method of large blocks, the object under consideration is presented as a combination of large blocks, and in most of them the analytical method of large blocks is used to study their stress-strain state, and in others - the numerical method of finite elements, especially in boundary elements.

Based on the above, it can be considered that the combined method of large blocks for studying the stress-strain state of objects of very complex structures, its numerical implementation is an urgent problem of structural mechanics of great scientific and practical importance.

When using the combined method large blocks, the test object should be represented in such a way that:

- The number of large blocks should be as small as possible, especially the number of blocks for the study of which the analytical method of large blocks is used [6]. Due to the shape of the object under study and the boundary conditions, in most cases, a part of these blocks should be more than approximately 80% of the total volume of the object under study.

- Due to the shape of the object under study, it must be represented as a set of such large blocks that the boundary conditions of the object under consideration (including the distributed load) are taken into account with maximum accuracy.

As already mentioned, the combined method of large blocks allows you to represent an object as a combination of such large blocks, among which the analytical method of large blocks is used for most studies (in most cases, such blocks contain more than 80% of the object's size). In connection with the above, the use of the combined method of large blocks in the survey of an object [5] allows to refine the results obtained using the numerical finite element method, which is an important and noteworthy achievement.

The purpose of the development of the combined method of large blocks was to create a new combined method [5] (for studying the stress-strain state of objects of very complex design) using the existing analytical method of large blocks [6] and the numerical finite element method [1-3], It would have the advantages listed above in comparison with the mentioned methods [1-4,6], which is a continuation of the process of further improvement of computational methods.

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