THE ADVANTAGES USE OF PARALLEL COMPUTING IN SOLVING PROBLEMS OF FILTRATION PROCESSES

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ABSTRAKT

In this article reviewed the advantages of parallel computing in mathematical modeling of filtration processes in oil fields. The developed algorithms of parallel computing serving to reduce the time for computational processes and increases the efficiency of designing in oil fields.

Keywords: *parallel computing, oil filtration, algorithm, modeling method, porous medium.*

In recent years, there have been significant shifts in the organization of scientific research due to the widespread introduction of multiprocessor supercomputers. High-performance computing technology in its current form - in the form of massively parallel systems - is a powerful tool that allows you to accelerate progress in solving particularly complex problems of fundamental science and applied research. In the scientific study of scientists N.Ravshanov, E.Sh.Nazirov[1], the problem of modeling the process of oil filtration in porous media is considered. A brief review of scientific papers devoted to the development of mathematical support for this problem is given.

The model is described by a complete nonlinear equation of hydrodynamics in a three-dimensional formulation. Therefore, an efficient algorithm has been developed to solve it, which takes into account the approximation of the boundary condition on

wells. In addition, it is possible to split the general task into independent tasks for calculation on hybrid distributed computing systems.

The parallel calculation algorithm makes it possible to increase the efficiency of oil development and reduces the time for computational processes in comparison with sequential algorithms on current block calculations depending on the number and power of processors.

The transformation of a nonlinear oil filtration algorithm into a computer parallel algorithm with a divided task into crystals of multiprocessor computing systems with teraflops performance[2] allows deep research and improvement of mathematical models for oil filtration problems by scientists N.Ravshanov, E.Sh.Nazirov[1]. Parallel computing makes it possible to increase the efficiency of oil development and reduces the time for computing processes in comparison with single-core processors by 20-30%.(Fig.1)
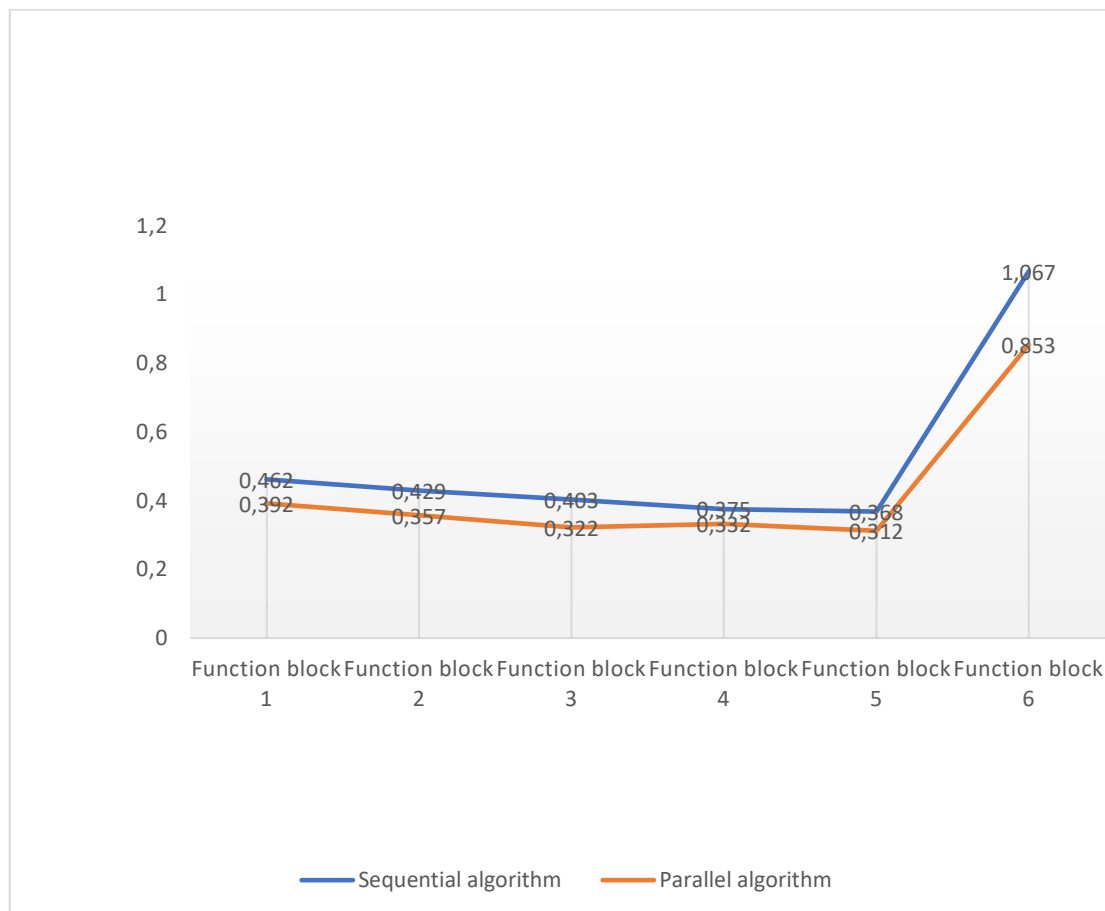

Figure 1. Results comparison of serial and parallel algorithms on a two-core processor with a frequency of 2.8 GHz

Today, thanks to the use of new high-performance multiprocessor computing systems with teraflops performance technology, significant progress has been made in solving computational problems of mechanics (problems of applied aerodynamics, etc.), modern physics (studying plasma under extreme conditions, etc.), quantum chemistry, biology (calculations of the structure formation of protein macromolecules) and other areas of science.

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