



UDK 004.43:042.4

METHODS OF TEACHING PARALLEL PROGRAMMING METHODS IN HIGHER EDUCATION

Ergashev Nuriddin G'ayratovich (PhD)
Karshi engineering economics institute,
Docent of the Department
of Information Technologies
finaledition2@mail.ru

Annotatsiya. Ushbu maqolada axborot kommunikatsiya texnologiyalari (AKT) mutaxassislarini o'qitishning dolzarb muammolari, parallel dasturlarni o'qitishning zarur jihatlarini shakllantirish yoritilgan. Yuqori samarali tizimlarga parallel hisoblashlarni tashkil qilish bo'yicha amaliy ko'nikmalariga ega bo'lish uchun uslubiy texnologiyalar keltiriladi. AKT yo'nalishlari bo'yicha tahsil olayotgan talabalar uchun kompyuter va uning qurilmalarida parallel dasturlash tajribasini qo'llash metodlari taklif etiladi.

Kalit so'zlar: informatika, dasturiy ta'minot, parallel hisoblash, yuqori samarali tizimlar, o'qitish usullari, MPI, hisoblash klasteri, MPICN.

Аннотация. Эта статья содержит текущие вопросы специалистов по преподаванию информационно-коммуникационных технологий (ИКТ), формирование необходимых извигов параллельных программ. Высокоэффективные системы предоставляют методические технологии для получения практических навыков на организацию параллельных расчетов. Для студентов, обучающихся в направлениях, предлагаются методы применения параллельного опыта программирования на компьютере и его устройствах.

Ключевые слова: Информатика, Программное обеспечение, параллельные вычисления, высокопроизводительные системы, методы обучения, MPI, вычислительный класт.

Abstract. This article contains current issues of teaching information and communication technologies (ICT) specialists, the formation of the necessary frills of parallel programs. High-effective systems provide methodical technologies to acquire practical skills on the organization of parallel calculations. For students studying in directions, methods of applying the parallel programming experience on the computer and its devices are offered.

Keywords: computer science, software software, parallous calculation, high efficient systems, teaching methods, MPI, computing cluster, MPICN.

Introduction. Moltrocessor computational systems have led to the rapid development in computer technology and software, led to the active and manufacturing activity of the information society. Parallel Calculation ideas and technologies also respond to personal computers and laptops. Calculation methods of solving problem solving are improving and software technologies are improving. The parallel calculation and parallel programming have become an integral part of the computing mathematics and programming[1].

The information is required of the Information and Communication Technologies (ICT) in accordance with the educational stand of developed countries in the current countries:

- high-efficiency should know the foundations and architecture of construction;
- canecloge of someating calss in high-yielding computational systems;
- effective methods of organizing simple parallel calculations.

Literature review. Knowing modern trends in the development of highly effective computers and technical means to achieve parallel should be able to develop programs to parallel data processing problems. The necessary conditions and an important qualification of a modern specialist in the necessary conditions and applied mathematics, computer science and computer engineering should have an important qualification of the necessary conditions and practical mathematics, computer science and computer engineering[2].

Research Methodology. Research on parallel programming technologies and methods has been carried out by researchers such as A.Shemetova, V.P. Gergeya, A.A. Labutina, V. P.Gergeya, R.G.Strongim, A.A.Sokolskaya, T.A.Stepanova, A.S.Antonov, K.Ye.Afanasyev, A.V.Basov, G.K.Selevko, K.Y.Bogachev, K.Ye.Borisovs. This article lists some of the literary sentences of the above researchers.

Scientific novelty of the article. However, when they begin to study the above issues in computers and external means, parallel programming, practice shows that students are difficult to understand, because it differs significantly from common logical and systematic programming methods[1].

Research shows that the problem of teaching students parallel to students in higher education is not not only didactic, but also a psychological and pedagogical problem. The ability of students to have the skills of students, as well as the skills of their worldview, and the ability to develop data and develop algorithms for supercomputer parallel thinking methods. In parallel thinking, the method of algorithmical mental activity is understood. This will allow the parallel algorithm to create a special actions specific [3].

Thus, the development of methodological approaches to the formation of petters is a need for parallel programming to develop and prepare specialties in the future.

Methods and means of parallel programming. The most appropriate methods of teaching parallel programming to students are:

- at the stage of acquaintance - large volume and visual use of visual material;
- partial search and research - partial search and research - partial search and research
- In the process of laboratory work - research and design.

Analysis and results. Introduction to students with some methods of parallel programming, and in the process of high education, in the process of higher education, it helps to have practical skills in the organization of parallel calculations in high-efficiency systems.

The first phase of teaching is access. The theoretical study of the maintenance and architecture of many processor computational systems, as well as the basic study

of the main paralleling methods of solving problems, is offered to use the software system (short name).

In concluding the efficiency of the parallel computational methods, it can be established on ordinary computers (in multidisciplinary mode of simplification of parallel calculations) that operate in the operating system. In addition to simulation mode, in current parallel calculation mode, this is a special connection to a multi-processor calculation system, which contains a parallel system. Many Processor System at the initial preparatory system is provided virtually to students. The environment and personal computer works as a remote access terminal[4].

Using the simulating experiences using the parallel system, the user will have the following features:

- Identify the topology of the parallel computing system for the experiment, set the number of processors in this topology, determines the performance of processors, selects the features of the processor and the method of communication;
- Palpable system formulates the formation of calculation functions of parallel solution algorithms, define task parameters;
- Choose a parallel method to address the selected problem; Tanlangan ish haqining parallel echimi uchun tajriba o'tkazish; bir vaqtning o'zida (vaqtli taqsimlash rejimida) bajarilishi mumkin bo'lgan turli xil protsessor tizimlari, zaryadlash yoki parallel hisoblash usullari bilan tajriba o'tkazish uchun ParaLab tizimida bir nechta turli xil vazifalarni yaratish mumkin;
- collection and analysis of the results of the experiments; Based on the saved results, the system has the ability to create graphs that describe the dependence on the parameters of the task and the calculation system.

In practical training, students are invited to study parallel methods to address the following calculation problems:

- data sorting (conducting experience in calculating the bubble sheltering, calculation and computing system of the system);
- increasing the matrix (conducting experiments with the tape method of matrix with methods of the calculation system with Fox and Cannon methods).
- graphic processing (Calculation experiments using algorithms. Finding the reason for the minimum length of the tree and finding short ways);
- increase the matrix into vector;
- solve the system of linear equations (conducting calculations with Gauss and Konukt Gradians).

The second stage of the training is the construction of the system. The system is invited to create the simplest computing cluster on several computers based on Microsoft Server 2008.

It is known that the cluster is a group of connected computing systems (nodes), which form a single user acceptable resource resource. Computational clusters can shorten calculations by dividing the task through the connected network to the parallel networks that share data.

During the process, students make the installation and adjustment of head and calculation nodes. The cluster and diagnostic built at the end of the work will be done.



The third stage of training is that parallel applications in the computing cluster are available to send messages model. This means that the program consists of many processes, each of which works in its own processor and has their own address area. In addition, direct access to the other process is impossible and the exchange of information between processes using the receipt and sending operations [2].

The created clusters use the MPI (Message Passing interface) to send MPICH (Message Passing Interface Chameleon). There are several MPI implementations, including free and commercial, portable and directed to a particular communication network. Selection MPICN The technical characteristics of computer equipment (the ability to create a domain, domain) were associated with the possibility of its free availability and ability to install the operating system. The organization of such a system has allowed the launch of programs to make parallel algorithms for calculating and processing data. During the conduct of classes, the 9 processes were tested to parallel 3 computers.

In the process of practical work, students perform parallel algorithm for matrix-vector breeding. The classic area used for the parallel calculation parallel to calculate the calculation time, which requires a matrix calculation. Thanks to its simplified formula, matrix transactions create a great opportunity to display many of the most tricks and methods of parallel programming.

During the process, students will get acquainted with the scheme of students, make programs, get acquainted with a series and parallel assignments. In addition, a good motivational effect allows you to compare the performance time of seeloped and vector multiplication algorithms. Practice shows that the comparison will allow us to demonstrate a decrease in the processing due to the potential efficiency of the parallel software and the incorrect organization of messaging resources or incorrectly formation of messages[5].

In addition, students are invited to study the parallel methods of solving the following calculation problems: data sorting, matrix, processing, system of linear equations, system of linear equations.

Conclusion. In conclusion, we will conclude that the methodological methods of training effective programs in parallel programming of future ICT specialists. An important feature of the use of these teaching methods is that they become parts that are logical related. In this case, users are prepared to work with high effective systems and have sections on the study of the basics of parallel calculation.

The formation of the algorithmic method, in which the stages of the development of parallel algorithm, i.e., the formation of parallel thinking forms naturally correspond to the thinking process of forming algorithms. Development of parallel algorithmic skills to solve the problems of education, including divisions of the task, identify and analyze the dependence between complex lines, to organize information ties between subclasses.

Parallel Computational Systems and their programming methods, and mastering the knowledge of the use of the main functions of the MPI library using various parallel programming technologies, using MPI technology.



In the selection and implementation of methods at different stages of education, such an integrated approach ensures the systematic and successful development of practical skills in the organization of work in high efficiency systems.

References:

- [1]. Shemetova A. Techniques for parallel programming teaching. *Prikladnaya Informatika - Journal of Applied Informatics*, 2016, vol. 11, no. 6 (66), pp. 43–48 (in Russian).
- [2]. Gergeya' V.P., Labutina A.A. ParaLab Programmnyaya sistema dlya izucheniya i issledovaniya metodov parallel'nix vichisleniy. *Uchebnoe posobie*. N. Novgorod: Izd-vo NNGU im. NI Lobachevskogo, 2003. - 125 s.
- [3]. Gergeya' V. P., Strongim R. G. Osnovi parallel'nix vichisleniy dlya mnogoprocessornix vichislitel'nix sistem. *Uchebnoe posobie*. N. Novgorod, NNGU. 2003. -84s.
- [4]. Sokol'skaya A.A., Stepanova T.A. Utochnenie ponyatiya «Parallel'niy stil' mishleniya» na osnove informasionno-deyatel'nostnogo podxoda // *Vestnik Krasnoyarskoyu gosudarstvennogo pedagogicheskogo oliy ta'lima im. V P Astaf'eva*. 2012. №1 (18)S 133-139.
- [5]. Antonov A.S. *Vvedenie v parallel'nie vichisleniya (metodicheskoe posobie)*. — M.: Izd-vo Fizicheskogo fakul'teta MGU, 2002.
- [6]. Afanas'ev K.E. *KMGE dlya resheniya ploskix zadach gidrodinamiki i yego realizatsiya na parallel'nix komp'yuterax: Uchebnoe posobie / Afanas'ev K.E., Stukolov S.V.* - Kemerovo: KemGU, 2001. 208 s.
- [7]. Basov A.V., Selevko G.K. *Novoe pedagogicheskoe mishlenie: pedagogicheskiy poisk i eksperimentirovanie. Metodicheskie rekomendatsii dlya uchitelya*. — Yaroslavl', 1991.
- [8]. Bogachev K.Yu. *Osnovi parallel'nogo programmirovaniya*. — M.: BINOM. Laboratoriya znaniy, 2003. 342 ye., ill.
- [9]. Borisov K.E. *Postroenie parallel'nix komp'yuterov*. — <http://katpop.narod.ni/txt/regstru>.
- [10]. Bocharov N.V. *Texnologii i texnika parallel'nogo programmirovaniya (Institut mexaniki i mashinostroeniya Kazanskogo nauchnogo sentra Rossiyskoy Akademii nauk)*. — <http://dks.invitation.ru>.
- [11]. Ergashev N.G'. *Using visual program technology methods in engineering education // European Journal of research and reflection in educational sciences*. — London. ISSN 2056-5852. — 2019. — № 7. — P. 107-111.
- [12]. Ergashev N.G'. *Software for visualizing instructional materials in modern education // Zamonaviy ta'lim*. — Toshkent, 2020. — № 5. — B. 17-22.
- [13]. Ergashev N.G'. *Specificity of solving engineering orientation issues with the help of visual programming languages. // Mug'allim hem uzliksiz bilimlendirio'*. — Nukus, 2019. — №3. — B. 90-95.