Modeling database management systems in medicine

Bakhtiyar S Rakhimov, Feroza B Rakhimova and Sabokhat K Sobirova
Department of Biophysics and information technologies of Urgench branch of Tashkent Medical Academy, Uzbekistan

E-mail: bahtiyar1975@mail.ru, feroza1972@gmail.com, sabokhat1971@gmail.com

Abstract. Nowadays, the role of computer and information technology in medical education is very important. Increasingly, information pressures are on the agenda for improving the methods of selecting, sorting and utilizing information for optimal, constructive, rational organization and management. To modeling database, fill it with new information, and use it, you need specific database management software - these are called database management systems. The theoretical basis of the spent researches is made by the theory of the functional analysis, methods of splines-functions and modeling, variation and difference methods, methods of the numerical integration, the generalized spectral methods, the theory of numbers and matrixes, and also the theory of parallel computing processes in database medical system. Computer technology in today’s world is the most modern mean of creating, maintaining, and storing new data. Database formation is based on the visualization, meaning, structure and volume of the object under investigation.

1. Introduction
Therefore, it is essential for every field employee who wants to be an expert in the future to have theoretical knowledge and practical skills, including free access to modern computers, ability to work in software packages and database management systems and to use simulators. With the advent of modern information technology, the increased flow of information and the rapid exchange of new data, it is necessary to seek timely processing of the information in this area.

2. Objective statement
Acquaintance with modern theoretical knowledge about physical and mathematical models used in medicine, ability to correctly analyze medical statistics, to identify ways of preventing or treating disease based on the results of information technologies requires basic skills to use.

The creation and use of databases for storage, transfer and processing of existing and up-to-date medical data remain the main topic of our day. All data entered on your computer is stored in the database.

Database (DB) is a set of interconnected and organized databases that accurately represent the properties, condition, and interconnectedness of the objects under consideration.

The database can be logical and physical. The database on which tables are based is a logical type of database. Tables are made up of columns and rows, which are called relational databases. The database must be at least a table that is the minimum requirement for a database to exist.

When creating a health database, you must first consider the following:
- The program used does not depend on the type and appearance of the medical data being entered, it is not required to change programs when entering new data or changing the type of database.
- There is no need to create another program to find or search for necessary information in the existing medical database.

Consequently, the creation of a medical database requires that certain rules be followed. The database world is constantly expanding and developing. This requires the creation of a single standard language that can be used to create information systems that provide services in different types of computers. If the user knows a set of commands, he or she will be able to create, search, and transmit data regardless of the kind of computer they are using.

The main purpose of this project is to reduce the economic expenses of internet based applications using parallel-conveyor computing systems. To the limits of this project algorithm piecewise-polynomial signals processing from improvement positions of characteristics of computing means on their basis will be investigated, and also programs of their modeling and simulation will be developed for use in Internet based applications. The simulation and computing models are used program in Mat Lab and Simulink [3]. It offered set of models and means of signal processing on the basis of basic splines and fast spectral transformations is intended to use various applications [1, 2].

3. Methodology
Modeling Data base Management Systems (DBMS-Data Base Management System) is a system that is used by many users to create databases, add and share data. It is a tool for universal programs.

Examples of modeling database management systems include MS Access, Clipper, Paradox, OpenOffice.org Base, Cache, IMS, Firebird, MySQL. These tools process information used in medicine and pharmaceuticals and these medical records are edited as documents.

- Comprehensive, formal and electronic documents are created using the text processors. Optimal methods are used to create and process industry information;
- Formation of presentations in the field of pharmaceutical and medical information and its effective implementation in the field;
- Medical data is grouped and filtered, as well as diagrams and charts of medical issues;
- Internet services use interactive and e-mail services. Medical information is transmitted and received. It uses server-client technology and network resources.

4. Graphic processor architectures for database medical systems
For the first time, the G80 architecture was presented in November 2006 and became widespread in several versions of graphic processors, differing in the number of multiprocessors installed on them [1]. If we remove all the elements of the architecture associated with the processing of graphics, we get the following structural diagram, shown in Fig. 1.

The main elements of the G80 architecture are:

1) A flow control block designed to generate a schedule and control the execution of flows. This block is controlled by the main processor of the system (CPU), which delegates a parallel task consisting of many threads to the GPU;
2) Computing unit, consisting of multiple streaming multiprocessors that receive and process parallel streams (work in MIMD mode);
3) Memory hierarchy, in which the main element is video memory (graphics adapter memory). It is accessed through L1 and L2 caching. However, the memory access operation is very expensive and can cost from 400 to 600 multiprocessor clock cycles.

The multiprocessor consists of the following components (see figure 2) [4, 7]:
1) 8 unified scalar processors (SP, Stream Processor), which allow performing both operations on integers and on floating point numbers;
2) 2 blocks for calculating transcendental functions with single precision (SFU, Super Function Unit);
3) shared memory block;
4) flow control unit
5) constant memory cache;
6) general purpose registers (RF, Register File).

Figure 1. Block diagram of the G80 architecture without graphics processing blocks.

The device that is the main one in the computing system (CPU) is called the Host. It runs the main sequential program, which transfers control to the parallel computing device Device (GPU) to implement parallel computations. The program that Device runs is called the Kernel. The kernel is developed in the same language in which the sequential program (C / C++) is implemented using special language additions. Parallel execution on a Device is implemented due to threads combined into blocks. The blocks, in turn, are combined into a (Grid) section, which must completely cover the data processed by the kernel. In order for the Device to process any data, it is necessary to transfer it to the Device memory, then get the result by copying the data in the opposite direction [8, 9, 10, 15]. CUDA allocates five types of memory. These are registers, local, global, shared, constant and texture memory. Whenever possible, the compiler tries to place all local function variables in registers. These variables are accessed as quickly as possible. In the current architecture, 8192 32-bit registers are available per multiprocessor. In order to determine how many registers are available to one thread, it is necessary to divide this number (8192) by the block size. With the usual division into 64 threads per block, only 128 registers are obtained [11]. Local memory, when the local data of procedures is too large, or the compiler cannot calculate some constant step for them when accessing, it can place them in local memory. This can be
facilitated, for example, by casting pointers for types of different sizes. The CUDA documentation lists the ability to arbitrarily address global memory as one of the main technology advances. That is, you can read from any memory cell, and you can also write to an arbitrary cell (this is usually not the case on a GPU). Global memory is not cached. It works very slowly, the number of calls to the global memory should be minimized in any case. Global memory is mainly needed to store the results of the program before sending them to the host (in conventional DRAM). The reason for this is that global memory is the only kind of memory that can be written to. Shared memory is non-cacheable but fast memory. It is recommended to use it as a managed cache. Only 16KB of shared memory is available per multiprocessor. Dividing this number by the number of tasks in the block, we get the maximum amount of shared memory available per thread. Constant memory is cached, the cache exists in a single copy for one multiprocessor, which means that it is common for all tasks within the block. Constant memory is very easy to use. You can place any type of data in it and read it using a simple assignment. Texture memory is cached. There is only one cache for each multiprocessor, which means that this cache is common for all tasks within the block. Texture memory is not physically separated from global memory.

5. Conclusions
In summary, the demand for database management systems is growing day by day to address large-scale databases or to facilitate user access to data management. Because such systems are not only used for data entry and storage, they also describe their structure: file collection supports logical consistency; provides data processing language; restores data after various interruptions; database management systems allow multiple users to work in parallel [12, 14].

The main requirement for medical database management systems is to safely store external data and to respond to the request of the user to satisfy it. This requires the completeness of the information stored in the medical database to maintain the integrity of the data.

If the GPU is the Device, then the size of the partition and blocks is limited. Each block is executed on a separate multiprocessor independently of other blocks. Therefore, the width and height of the block are determined by the maximum number of simultaneously processed threads on the multiprocessor. In turn, when executed, the blocks are divided into bundles of 32 threads, which are launched in accordance with the commands of the multiprocessor thread control unit. Communication between threads in a block is done using shared memory and barrier thread synchronization.

References
[1] Carl de Boor 2001 A practical Guide to splines. Department of computer science University of Wisconsin (USA: Madison, Madison)
[2] Ren-Hong Wang 2001 Multivariate spline functions and their applications Kuliver Academic Press, Netherlands
[3] Rakhimov B S, Allabeganov O R and Saidov A B 2020 Processor means for the spectral analysis of medical signals on the of polynomial walsh bases epra International Journal of Research and Development (IJRD) 5(7) 10-1
[4] Rakhimov B S, Ismoilov O I and Ozodov R O 2017 Russian “Software and automation of forensic examination” METHODS OF SCIENCE Scientific and practical journal 11 28-30
[5] Rakhimov B S 2017 Russian “Information technologies in medical education” METHODS OF SCIENCE Scientific and practical journal 12 25-7
[6] Pen U 2000 Application of Wavelets to Filtering of Noisy Data. In Wavelets: the Key to Intermittent Information? Oxford University Press 2000
[7] Ashok V, Balakumaran T, Gowrishankar C, Vennila A and Kumar A 2010 Nirmal. The Fast Haar Wavelet Transform for Signal & Image Processing International Journal of Computer Science and Information Security, IJCSIS, USA ISSN 1947 5500 http://sites.google.com/site/ijcsis/
[8] Bakanov V M 2006 Parallel computing (Moscow: MGUPI)
[9] Boreskov Kharlamov 2012 Markovsky: Parallel computing on GPU. Architecture and software model of CUDA (Moscow: MGUPI)
[10] Voevodin V V and Voevodin Vl V 2002 Parallel computing (SPb: BHV-Petersburg)

[11] Gergel V P Theory and practice of parallel computing http://www.intuit.ru/department/calculate/paralltp/

[12] Kalachev A V 2014 Multi-core processors (M: Binom)

[13] Krasnobaev A A 2005 Review of algorithms for detecting simple image elements and analysis of the possibility of their hardware implementation: preprint (M)

[14] Kudryashov P P 2007 Algorithms for detecting a human face for solving applied problems of image analysis and processing (M: dis. Cand. tech. Sciences: 05.13.01)

[15] Tanenbaum E 2002 Modern operating systems (SPb: Peter)