Research on the Parallel Calculation Method of Real-time Financial Index Market Based on Computer FPGA

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Abstract. Social and economic prosperity, the total volume continues to increase, emerging industries are springing up everywhere, success and failure are full of variables, financial index prices are constantly optimized but also full of variables, People who judge the economy and guide investment by index industries are required to control the rapidly changing financial industry and create the future. By analyzing the financial situation in the FPGA environment, this paper puts forward the parallel computing method based on computer, and designs and verifies the feasibility of the calculation bill.

Keywords: Computer FPGA, Financial Index, Parallel Computing

1. Introduction
At present, the processing of futures market data mainly depends on the traditional server-based processing mode (the existing market acceleration system is limited by the CPU single thread) the implementation of blocking form cannot be further improved in performance. Especially with the increase of transaction volume and contract complexity, how to reduce the delay of market acquisition and improve the real-time performance has become one of the key problems that the traditional processing mode needs to solve[1]. There are two common acceleration methods: one is to select the idea of multi-core processing to complete the market acceleration, but the power consumption is huge and needs specific platform support. Another kind, uses multi-thread technology, but also introduces complex synchronization mechanism and deadlock problem. By using the traditional method based on C/S architecture, it is impossible to meet the demand between the increasing amount of data and the real-time processing, and to detect the performance and state of the futures trading system in real time. With the continuous development and improvement of FPGA performance, the use of monolithic FPGA to complete the accelerated processing of futures market data has become a new trend and solution. Therefore, in view of the above problems, this paper designs a parallel accelerated processing scheme based on FPGA market data, using the advantages of FPGA special hardware structure, carrying DDR3SDRAM memory chip, using Verilog HDL language to design each module in the
Viva do. The multi-channel parallel processing structure can effectively reduce the processing delay and improve the processing efficiency[2].

2. Financial background in computer FPGA environment
First of all, this paper will set a typical financial market situation around the operating rules and methods of the financial index market, and carry out large-scale data processing through parallel calculation for the analysis of specific financial product transaction data. According to the existing theory and model, the index market is analyzed quickly to update the financial market data in real time[3]. Secondly, in the study of computing methods, computer FPGA as the core device, through the study of internal transactions, parallel calls of converted data and conventional computing models, greatly improve the statistical speed of financial index market, accelerate the flow of information, and realize the complexity of the calculation model on the basis of FPGA[4]. The overall scheme is shown in figure 1.

![Figure 1. FPGA Overall program in the environment](image)

2.1. New Changes in financial index markets in the application of trading acceleration technology
Financial index market is a barometer for securities market practitioners, which is the information basis for their analysis of finance and investment or divestment. Securities and futures exchanges around the world are pursuing the speed and stability of their electronic trading platforms. Reducing delay is also a factor in their competition for customers. Therefore, in the financial index market update delay degree, whether from the European and American NASDAQ, the pan-European exchange group, the German exchange, the London exchange, or the Tokyo exchange from the emerging countries, the Singapore exchange, has refined the transaction delay, launched the attack to the microsecond era[5]. Coincidentally, the financial market analysis service for investors also plays an important role in the promotion of market transactions. After all, the quality of service is not only directly linked to the customer's feelings and experiences, but also closely related to the increase or decrease of the customer's financial investment income account funds. Computer information technology innovates people's cognition in the world, and innovates people's behavior way and behavior itself. In the financial sector, competition for customers is still fierce, and software is
spreading all over the world, snatching customers who work or mix in the financial securities industry. But most of the software comes with the aura of the times, its data source, quality and reliability are insufficient, and the current situation makes it difficult to distinguish and choose information, and of course it will not be satisfied with its services.

For the use of the network to deal with financial market data, foreign countries have been ahead, and in many ways have made great achievements, not only to provide us with rich experience, but also left a lot of lessons to avoid detours\(^6\). Development of computer hardware and software is very important to the realization of FPGA in parallel computing, and the Internet can also realize the prediction of some results.

2.2. Current situation and prospect of calculation method of financial index market

With the rapid accumulation of social wealth and the increasingly fierce competition in the financial market, there is an urgent need for a new turn in the development of computers, that is, high-tech hardware facilities, in-depth mining of its parallel acceleration technology, To bring customers more rapid index market analysis solutions. If the software service is equally excellent, the enterprise that leads the opponent in parallel acceleration hardware facilities can use the powerful computing power of the hardware core and the expansion channel to provide the most authoritative, real-time and scientific market index analysis for the customer.

3. Computer parallel computing technology

3.1. Introduction to parallel computing

Parallel computing is to decompose a problem solved by a goal into several sub-tasks on a parallel computer, and then assign these sub-tasks to several other processors. By cooperating with each other, these sub-tasks can be executed in parallel, which can improve the speed of solving the target problem or the scale of solving the application problem. The improvement of the computing speed of a problem often depends on the degree of parallelism of solving the problem itself. With the speed of a single processor getting faster and faster, this makes the parallel computer processing faster and faster accordingly. For a specific practical application problem, the purpose of adopting parallel computing technology is as follows\(^7\). (1) Accelerating the speed of solving the problem. (2) Improving the scale of solving the problem. Figure 2 shows the graphical interpretation of serial and parallel processing.
3.2. Research on parallel computing

At present, the research on parallel computing can be divided into the following four aspects: (1) parallel extraction of parallel computers, understanding and extracting the good characteristics of high performance computing of current parallel computer architecture. The mathematical model of parallel computing and the scientific evaluation method of parallel computing are put forward. (2) The design and application analysis of parallel computing algorithms, and the design of high efficiency parallel algorithms, decompose the application problem into several sub-tasks that can be implemented in parallel computing. (3) Parallel implementation techniques, including design of parallel programs and optimization of parallel performance. (4) Parallel application, which is the ultimate goal of our research on the target problem. Figure 3 shows the contract parallel computer framework.
3.3. Implementation of parallel computing

Parallel programming patterns usually contain three main types: (1) symmetric mode (SPMD): in this programming mode, there is no and no need to specify that process is the main process of a parallel program, Because each process has the same status in practical parallel applications. However, in the process of parallelizing the goal problem, we often need to select a process as the input process and the output process. Then the selected process as input and output plays a role that is somewhat similar to that of the main process. Therefore, once a single point error occurs and occurs in this mode, it is often possible to cause the whole parallel computing deadlock. (2) Master-slave mode (master-slave): consists of a master process and several slave processes. In this mode, which program is the main process is first specified, and the main process is responsible for the data control of the whole parallel program when participating in the related parallel computing. Other slave processes only need to complete the task of data processing and related computing. In general, there is no exchange between processes, and the exchange process between data is usually completed and implemented mainly through the main process. Although master-slave mode has the advantages of good scalability and good acceleration ratio, master process may be the biggest bottleneck to achieve large-scale parallel processing of target problems. (3) Multiprogramming mode (MPMD): While the programs executed on each processor in parallel computing may often be different, some of the same programs may be executed on some partial processors. Figure 4 shows the system processing time comparison results.

![Figure 3. Contract parallel computer frameworks](image-url)
4. Conclusion
The design structure of parallel computing is adopted to accelerate the processing of financial index market data. Compared with the traditional software, this design improves the processing rate and processing time, and its performance is about 70% higher. A design scheme of this kind of calculation method has achieved good application effect in some existing series FPGA platform financial index market data processing system, which has the characteristics of good stability, low delay, high efficiency and fast processing rate. Based on the FPGA financial index market data non-blocking parallel processing design, this paper greatly reduces the processing delay of the market data, improves the parallel processing speed, and obtains good test results in the actual financial index market environment. It has outstanding engineering application advantages and further research value.

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