Scholar Publishing Group
Distributed Processing System
https://doi.org/10.38007/DPS.2021.020404
ISSN 2790-0916 Vol. 2, Issue 4: 28-35

Distributed System Design Based on Image Processing Technology and Resource State Synchronization Method

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Keywords: Image Processing Technology, Power Resources, Synchronization Method, Distributed System

Abstract: With the explosive growth of data, the demand for massive data processing is increasingly strong. Unlike the previous way of using supercomputers, many of the current mainstream solutions are handled by distributed systems. The purpose of this paper is to design a distributed system based on image processing technology and resource state synchronization method. In the experiment, in order to verify that automatic adjustment of CMOS offset is better than manual adjustment, the synchronous method calculation and image processing technology are used to test different ribbon fiber splicing machines.

1. Introduction

With the rapid improvement of distributed systems, more and more new theories and technologies have been implemented in this field. Multiple distributed systems need to cooperate with each other to complete tasks such as intelligent control and collaborative solution [1]. When cooperating with each other, distributed systems are faced with a problem. They often need cross platform collaborative interoperability to synchronize data and command interaction between systems, so as to ensure the smooth execution of tasks.

With the improvement of power system automation and smart grid, image processing technology and synchronization methods are more and more applied in the distributed system of power grid. Marzouk m aims to propose a defect detection system in structural elements that can indicate the deformation position. It also evaluates the defects of the finishing materials of the building components to support the subjective visual quality investigation of the aesthetics of the architectural works. This strategy relies on defect feature analysis, which evaluates defect values in digital images using digital image processing methods. The research uses three-dimensional modeling technology and image processing algorithm to generate a system that can perform certain monitoring activities through a computer. Create a 3D model for the building based on the collected

field scans. Then, multiple images can be derived from the 3D model to study specific elements [2]. Kumar a found that multiprocessor real-time systems have been widely concerned. In order to make better use of multiprocessors in real-time environment, an optimal method for scheduling, allocation and synchronization is needed. In this study, a novel heuristic synchronization aware scheduling has been proposed to reduce the blocking delay of the critical part and also inevitably minimize multiple priority reversals. The key idea of this technology is to allocate the task set in the same processor that accesses the common shared resources, and the time to access them is the longest; Thus, the global sharing of resources is transformed into local sharing. On the basis of the result analysis, schedulability, minimization of context switching and reduced blocking time show that the proposed method is superior to the existing methods and does not affect the task completion time [3].China is a power consuming country. The safe and stable operation of power grid is closely related to the improvement of national economy. As the main component of power grid, power line is the foundation of stable and safe operation of power system and power grid.

In this paper, the image processing technology and related synchronization methods are studied. Aiming at the distributed system design, the general structure and system model of the system are constructed. In the experiment, in order to verify that automatic adjustment of CMOS offset is better than manual adjustment, the synchronous method calculation and image processing technology are used to test different ribbon fiber splicing machines. The test results show that the automatic adjustment of the CMOS offset of the ribbon fiber fusion splicer is better than the manual adjustment, which plays a positive role in optimizing the fusion loss.

2. Research on Distributed System Design Based on Image Processing Technology and Resource State Synchronization Method

2.1. Image Processing Technology

As a new technology, image processing technology first appeared in people's field of vision. Now the world computer level has reached a new high, which makes the image processing technology more mature and has been widely used in many fields: space engineering uses image processing technology to obtain celestial body topography and guide space exploration and research projects; The agricultural department uses this technology to understand the growth of crops, prevent floods, insects and droughts; The medical field uses this technology to automatically diagnose various diseases; The construction industry uses image processing technology to guide construction and detect metal defects [4-5]. Generally speaking, image processing technology can improve image quality and obtain image morphology information after image processing, such as area topography, boundary topography, gray scale topography and so on.

Image processing technology often includes image clipping, image enhancement, filtering, gray-scale processing, etc. [6-7]. Because this technology is based on the input and output of computer experimental images, it has the advantages of simple method, time-saving, labor-saving, small error, and intuitive results. At present, it is welcomed by the majority of researchers and the research entity using digital image processing technology has become a common method in scientific research. Digital imaging can directly record the shape, distribution and severity of corrosion pits on metal surface; A large number of domestic and foreign scholars use image processing technology to process metal surface corrosion images and obtain useful description information of metal corrosion morphology [8-9].

2.2. Synchronization Method

In nature, chaos has been found in various scientific fields such as physics, chemistry, biology, geoscience, technical science, social science and so on. Some people think that it is the third major scientific discovery after relativity and quantum theory in the last century [10-11]. In the improvement of chaos synchronization , It is worth mentioning that the synchronization method proposed by and , Their work and the work of controlling chaos have greatly promoted the research of chaos control and synchronization theory , The prelude to the utilization of chaos was opened. Therefore, a chaotic synchronization method is proposed, and the realization of chaotic synchronization , It breaks the previous view of chaos , It opens up a new field of chaos application. In recent years , With the improvement of new chaotic synchronization methods , Its application field is no longer limited to the original physics. Chaotic synchronization can be understood as the control of aperiodic orbits in chaos , Therefore, in brief: , Chaos synchronization is a kind of generalized chaos control. Experiments in recent years have confirmed that , A chaotic circuit that can realize synchronization , One system drives another , The former is often referred to as the drive system , The latter is called a response system. The synchronization theorem tells us , When the condition index of the response system is negative , It will achieve chaotic synchronization with the drive system. At present, the research on synchronization of chaotic systems includes self synchronization , Heterogeneous synchronization , Switch synchronization, etc. [12-13].

2.3. Power Resource Distributed System Design

(1) Distributed system model

Based on the image processing technology and the resource state synchronization method, the distributed wireless system is adopted in this paper. The signal loss of the radio wave in the propagation process is usually attenuated according to the exponential law. When the high antenna is used to ensure coverage, the power of the edge area and the central area are greatly different, and there is a near far effect [14-15]. In order to realize the normal communication between users in the center and the edge area at the same time, the idea of power control is proposed. But even so, there are still some coverage blind areas, resulting in some users can not get good communication quality services. In order to improve the coverage of signals and ensure the communication quality of users, the concept of microcell was generated [16-17]. However, considering that equipping each microcell with a processing unit will lead to a sharp increase in network deployment cost and maintenance cost, people have separated the processing unit and antenna unit of the base station. After separation, only a small number of hardware units remain on each antenna, and the signal processing is concentrated on the processing unit of the base station. In this way, one processing unit can serve multiple antennas at the same time, thus generating a distributed antenna system. Distributed wireless system is more conducive to the use and improvement of image processing technology and resource state synchronization method [18].

(2) Overall structure of distributed system

The overall functional diagram of the distributed resource scheduling platform includes the scheduling part, the deployment part, the basic integrated support system and the client. The distributed resource scheduling platform is shown in Figure 1:

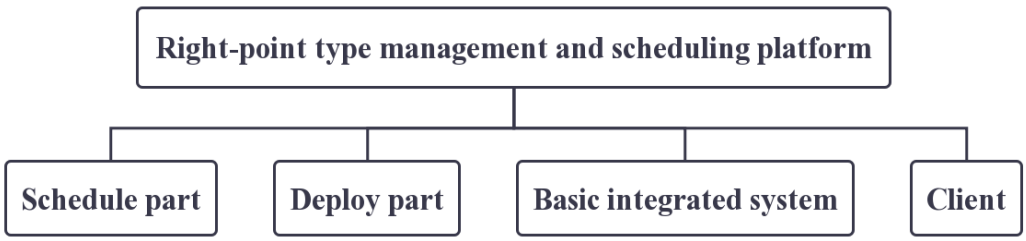

Figure 1. The overall functional diagram of the system

3. Investigation and Research of Distributed System Based on Image Processing Technology and Resource State Synchronization Method

3.1. Design Scheme

This design scheme uses the comparative test method to verify that automatic adjustment of CMOS offset is better than manual adjustment. Randomly select three ribbon optical fiber splicing machines with different maximum number of fusible optical fiber cores, and manually adjust the CMOS offset of the camera of each splicing machine. Here, in order to simplify the calculation, the adjusted optical fiber display area is divided into four pieces, and the average brightness is 1, 2, 3 and 4 respectively. Record the adjusted horizontal offset and vertical offset. Then automatically adjust each welding machine, and record the average brightness and offset of the camera corresponding to the four parts.

3.2. Calculation of Synchronization Method

The synchronization method used in this paper. Where, $U=(u_1,u_2\Lambda\ u_n)^T$, $\Gamma=(\psi_1,\psi_2\Lambda\ \psi_n)^T$ are n-dimensional vectors. Among them, $\psi(U',U)$ in the feedback term can be a vector function or a scalar function. The specific formula is as follows:

$$U'=\Gamma(U',\rho)-\psi(U',U) \tag{1}$$

$$U=\Gamma(U,\rho) \tag{2}$$

4. Test Results of a Distributed System Based on Image Processing Technology and Resource State Synchronization Method

The test machine numbers 1, 2 and 3 correspond to three different ribbon fiber fusion splicers with 10 cores, 5 cores and 2 cores respectively. Since the values of offset veroff and horoff are adjusted within the resolution range of CMOS, no invalid offset will occur, no matter whether they are adjusted automatically or manually, it is only necessary to compare the standard deviation to determine which of the offset values after automatic adjustment and manual adjustment is the best. The standard deviations of 1, 2, 3 and 4 are calculated respectively, and it is verified that the standard deviation of 1, 2, 3 and 4 corresponding to manual adjustment is generally greater than or equal to the standard deviation of 1, 2, 3 and 4 corresponding to automatic adjustment, thus proving

that automatic adjustment is not only easier in the adjustment process, but also the brightness uniformity of the adjusted optical fiber display area is better than that of manual adjustment. The test results of manual adjustment and automatic adjustment are shown in Table 1 and Figure 2, and table 2 and figure 3:

Table 1. Manually adjust the test results

Hand regulation	Core number	1	2	3	4	Standard deviation	VerOff	HorOff
Test machine 1	10	93	90	96	89	2.65	535	862
Test machine 2	5	84	87	95	88	8.48	741	894
Test machine 3	2	90	102	103	99	6.32	865	968

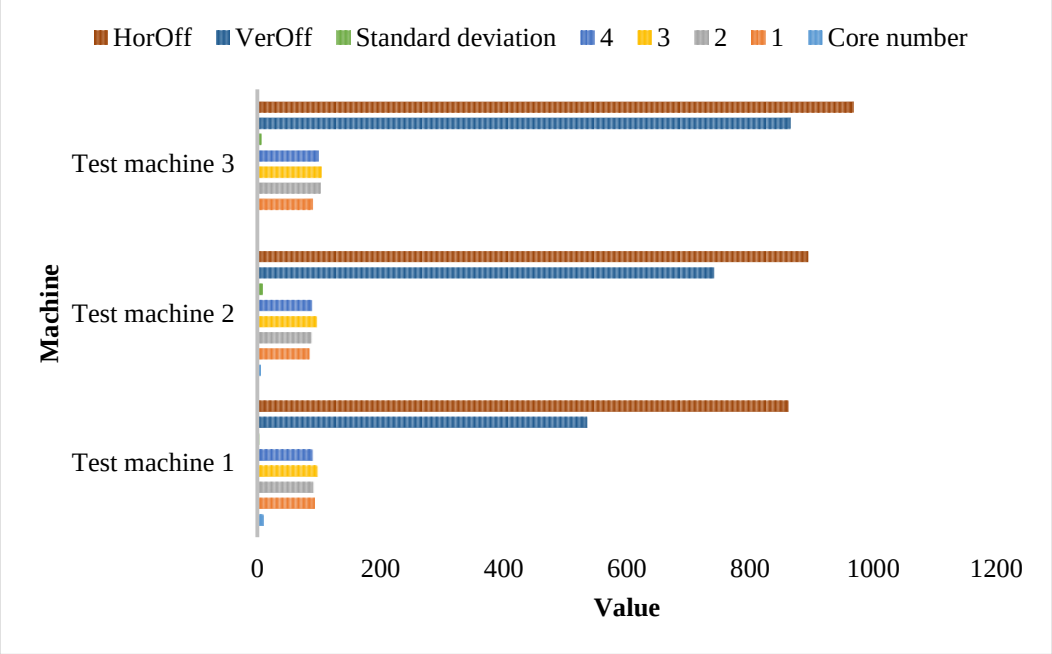

Figure 2. Comparison diagram of the test machine data

Table 2. Automatically adjust the test results

Self-adjustment	Core number	1	2	3	4	Standard deviation	VerOff	HorOff
Test machine 1	10	95	93	98	89	2.75	604	871
Test machine 2	5	89	85	90	98	8.98	754	884
Test machine 3	2	92	102	103	98	6.54	795	856

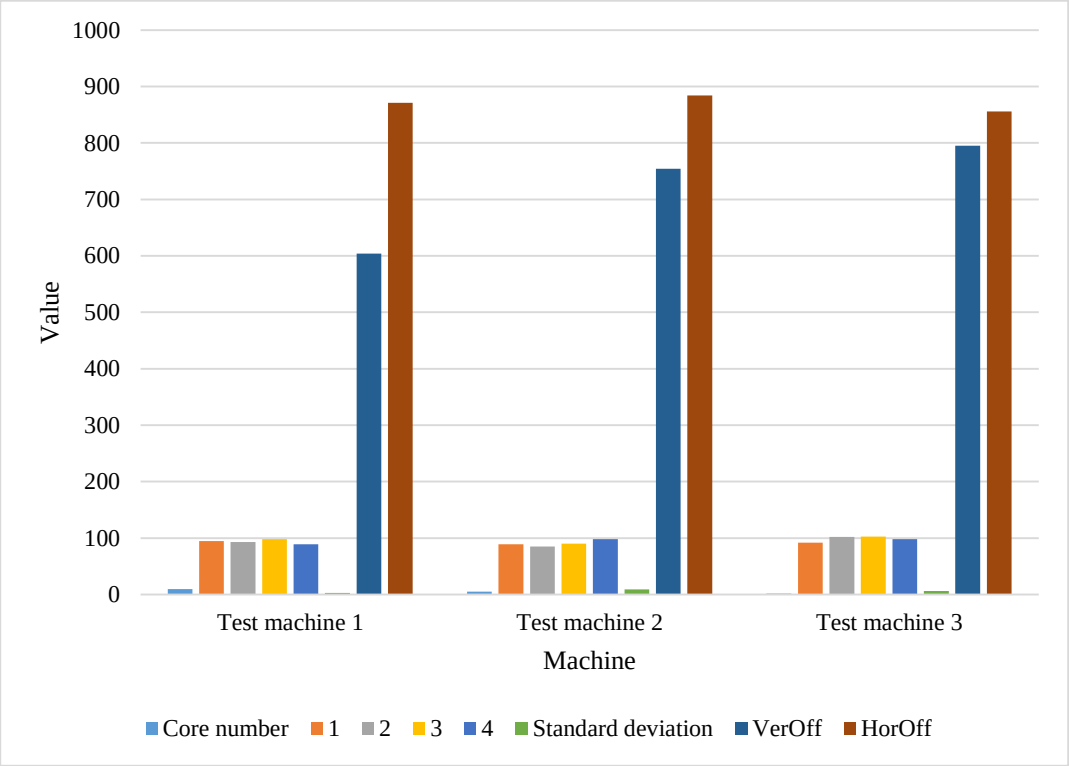

Figure 3. Test results data fig

The experiment shows that comparing the standard deviation of the same testing machine in the two tables, it can be found that the standard deviation of 1, 2, 3 and 4 after manual adjustment is generally greater than or equal to the automatic adjustment. The mean standard deviation of brightness indicates the uniform level of brightness in the optical fiber display area. The smaller the standard deviation is, the more uniform the brightness is. Therefore, under the condition that the hardware structure is consistent and the installation is excellent, the automatic adjustment of the CMOS offset of the ribbon optical fiber fusion splicer will be better than the manual adjustment, and play a good role in optimizing the image quality of the optical fiber, thus playing a positive role in optimizing the fusion loss.

5. Conclusion

Analyzing the current software implementation and test results, this paper has achieved the expected results in the distributed system design based on the image processing technology and the resource state synchronization method. At present, the system has been deployed in the actual application. Due to the limitation of personal energy and time, this system is not perfect. According to the actual production demand and some special application conditions, the system still has shortcomings, and the research work of this paper needs to be further deepened: only the error caused by noise is considered in the image processing, and the error caused by the actual image is very complex, such as the influence of distortion is not considered; Due to time, there are not many test research samples. In order to better display the rules, the number of research samples can be increased.

Funding

This article is not supported by any foundation.

Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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