Research on Application of Computer Big Data in Mathematical Polymorphic Game Algorithm Theory

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Abstract. In large-scale game activities, the computer big data system is collected, and then large-scale real-time data collection, processing and control systems are used to bring mathematical algorithm models, and state information reliability algorithms are used to illustrate the system control machine design and its implementation based on VMS. This article calculates the most by calculation. The main design ideas in the game mathematical model, the research found that the system controller proposed by the system is a method to solve the multi-state process synchronization problem in the Client/Server computing system, and can effectively deal with the algorithm application research in the model.

Keywords. Computer, big data, game, polymorphism, mathematical algorithm, state reliability.

1. Introduction
More than ten years ago, experts predicted that with the development of information technology and the increasing professionalization of building functions, the development of intelligent buildings will become more professional. The current intelligent construction of racetracks is just as expected. For horse racing events in the early stages of development, the primary task is to attract people's attention. Designed applications need to be attractive to users. Only by attracting users can they better impart horse racing knowledge or information to users. Regarding how to attract more people's attention, we will study how to integrate these latest information technologies into applications by learning from the most popular Moments of Friends, short videos and live broadcasts and other information technology methods, so as to better convey horse racing events to the user side. Later, explore to consolidate the user base through functions such as horse racing quiz and horse specialty store. The horse racing computer system of the racetrack is a large-scale real-time data collection, processing and control system. The information collected by the system is the ranking information of the participating horses, event information, prize tickets purchased by the participants, the results of each event and the supervisor's operation Various control commands issued by the players; the information that the system needs to feedback is the real-time instant prize rate, the large-screen display information, the selected lottery tickets for each event, the award rate, and financial settlement and statistical reports. Currently there are 8 for each tournament [1]. Each event has an interval of 30 minutes. The average number of tickets sold in each event exceeds 25,000, and the average number of winning tickets exceeds 5,000. The prizes will be redeemed 3 minutes
after the results of each game are recorded. The final prize rate of each game is summarized on the basis of all prize tickets. The sale and acceptance of winning prize tickets is completed by more than 600 ticket vending machines. The prize tickets sold and accepted by these machines at a certain time are related to the progress of the event. Therefore, all ticket vending machines must work simultaneously.

2. Introduction to State Information Reliability Algorithm

There are many characteristic quantities of state reliability. In different occasions, different characteristic quantities are used according to different requirements. Here, we use reliability R. Reliability is the probability that a state can complete a specified function under specified conditions and within a specified time interval. Generally denoted as R, because it is a function of time, it is also denoted as R(t), which is called the reliability function. If a random variable T is used to represent the time from the start of work to the failure of the state, and the probability density is f(t), then the reliability of the state at a specified time t

\[
R(t) = P(T > t) = \int_{t}^{\infty} f(t) \, dt
\]

\[
R(t) = P(S > s) = P(S - s > 0)
\]

According to the above interference model, the probability-reliability that the multi-state is greater than the state in the interference zone is calculated [2]. As shown in Figure 1, when the state is, the probability that the polymorphism is greater than the state is

\[
p(S > s_0) = \int_{s_0}^{\infty} f(S) \, ds
\]

\[
f_i(s)
\]

represents the polymorphic distribution density function. The probability that state s0 is in the ds interval is

\[
P\left(s_0 - \frac{ds}{2} \leq s \leq s_0 + \frac{ds}{2}\right) = f(s) \, ds
\]

![Figure 1. Probability density function joint integration for reliability](image)
Suppose \( S > s_0 \) and \( s_0 - \frac{ds}{2} \leq s \leq s_0 + \frac{ds}{2} \) are two independent random events, so the probability of two independent events occurring at the same time is
\[
dR = f(s_0)ds \ast \int f(s)ds
\]
(4)

Because the above formula \( s_0 \) is an arbitrary value in the state interval, considering the situation in the entire state interval, the probability (reliability) that there is a polymorphism greater than the state is
\[
R = \int dR = \int f(s) \ast \left[ \int f(s)ds \right] ds
\]
(5)

When the probability density function of the state and polymorphism is known, the reliability can be obtained according to the above expression. The probability density function has the following form called normal distribution, or Gaussian distribution, denoted as \( N(\mu, \zeta) \).
\[
f(x) = \frac{1}{\sigma \sqrt{2\pi}} \exp \left[ -\frac{1}{2} \left( \frac{x - \mu}{\sigma} \right)^2 \right], (-\infty < x < +\infty)
\]
(6)

The failure probability and reliability are:
\[
f(x) = \frac{1}{\sigma \sqrt{2\pi}} \exp \left[ -\frac{1}{2} \left( \frac{x - \mu}{\sigma} \right)^2 \right]
\]
(7)
\[
R(x) = 1 - F(x)
\]

In the formula, \( \mu \) is the mathematical expectation of the random variable \( x \), and \( \zeta \) is the standard deviation of the random variable \( x \). The estimated values of \( \mu \) and \( \zeta \) in the normal distribution \( N(\mu, \zeta) \) can be calculated as follows
\[
\mu \leftarrow \bar{x} = \frac{1}{N} \sum_{i=1}^{N} x_i
\]
(8)
\[
\sigma \leftarrow \sqrt{\frac{1}{N} \sum_{i=1}^{N} (x_i - \bar{x})^2}
\]

In the formula, \( x_i \) is the \( i \)th test value, \( N \) is the total number of tests, and \( \mu \) is the arithmetic mean.
\[
f(Z) = \frac{1}{\sqrt{2\pi}} e^{-\frac{Z^2}{2}}, -\infty < Z < +\infty
\]
(9)
\[
F(Z) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{Z} e^{-\frac{Z^2}{2}} dZ
\]
(10)

In the formula, \( \mu=0, \zeta=1 \), denoted as \( N(0,1) \). Normalize the non-standard normal distribution to obtain the standard normal distribution, which is convenient for calculating the cumulative distribution function \( F(x) \) or reliability \( R(x) \). The method of normalization: the random variable is transformed as follows (translation and scale transformation).
\[
Z = \frac{x - \mu}{\sigma}
\]
(11)

Then \( F(x) \) of the normal distribution becomes \( \Phi(Z) \) of the standard normal distribution:
\[
F(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{-\frac{Z^2}{2}} dZ = \Phi(Z)
\]
(12)

When the state enters the accidental failure period of the bathtub curve, the failure rate is close to a constant. At this time, the reliability \( R(t) \), the unreliability \( F(t) \), and the failure probability density function \( f(t) \) are all exponentially distributed.
\[
R(t) = \exp \left[ -\int_{0}^{t} \lambda(t) dt \right] = e^{-\lambda t}
\]
(13)
The distribution function constructed by the Swedish Weibull. Any model (series system) that is a partial failure leading to overall functional failure can generally be described by this distribution function. Mathematical expression

\[
    f(x) = \frac{\beta}{\eta} \left(\frac{x-\gamma}{\eta}\right)^{\beta-1} e^{-\left(\frac{x-\gamma}{\eta}\right)^\beta}
\]

\[
    F(x) = 1 - e^{-\left(\frac{x-\gamma}{\eta}\right)^\beta}
\]

(14)

The Weibull distribution contains three parameters. Among them, \(\beta\) is called shape parameter; \(\eta\) is called scale parameter; \(\gamma\) is called position parameter.

3. GZSMS calculation mode and architecture

To efficiently solve various design problems of GZSMS, we must first determine the calculation mode of GZSMS. The GZSMS system has a large number of processes running at the same time (more than 600 service processes plus client processes), frequent access to shared files by processes, and degree of concurrency Advanced features. If GZSS adopts the traditional time-sharing computing mode of the host connected to the terminal and the file server system based on the local area network, it is technically difficult to overcome the host I/O bottleneck and the restriction of the network bus bandwidth on the overall system performance. To this end, GZSMS uses the Client/Server computing model, uses the super minicomputer VAX7000 as the central server, and uses the ticket vending machine as the client (the client uses 286/386 microcomputer or automatic ticket vending machine as the platform), and connects through DECNET and PATHWORKS. Bus-type network. The current network bus transmission bandwidth is 10Mb/Sec, and the server disk I/O bandwidth is 16Mb/Sec. Although the use of Client/Server computing can reduce the pressure on the network bus and server disk I/O bandwidth However, when the network bus bandwidth and server disk I/O bandwidth are shared by more than 60 clients, the bus and disk will still become the bottleneck of system performance. Therefore, GZSMS further adopts network segment miniaturization technology to solve this Question [3]. The specific method is: divide the network bus into 5 segments, the central server and the control centre client exclusively occupy one network segment, and more than 60 ticket vending machines are evenly distributed on the remaining 4 network segments and separately on these 4 network segments Add 1-2 front-end servers (the front-end server uses VAX3100 or 486 microcomputer), and then connect these 4 network segments to the network segment where the central server is located through a bridge or router. For remote stations, use MODEM to connect through DDN. In this way, each the number of ticket vending machines in the network segment is relatively reduced, thereby reducing the pressure on the network bus and server disk I/O bandwidth. The GZSMS network hardware structure is shown in Figure 2.
Figure 2. GZSMS network hardware structure

The GZSMS system based on Client/Server calculations not only distributes data, but also distributes applications and processing. The collection and distribution of prize tickets are coordinated by the client process of each ticket vending machine, each front-end server and the service process on the central server. Completed together, the interaction between them is shown in Figure 3. Before each event starts, the ticketing software on the ticket vending machine collects the tickets and passes the collected tickets through the network depositor ticket vending machine on the network segment. In the lottery database of the front-end server. The sold lottery tickets are numbered. According to the number of the lottery ticket, the lottery ticket database can be determined to store the lottery ticket. After the game starts, the ticket vending machine stops the ticket sales in the field, and the integrated on the central server the statistical software queries the lottery ticket database, counts the winning rate and generates financial statements [4]. Then the lottery processing software generates the winning lottery ticket database from the lottery database on each FS according to the result of the game, and updates the lottery database on each FS accordingly. After the redemption starts, the horse fan can hold the ticket to any ticket vending machine to redeem the award (all-in-one redemption). The redemption software on the ticket vending machine determines the front-end server to be connected to the network according to the ticket number, and accesses the ticket on the server Database to confirm winning tickets and redemption.
4. Introduction to some functions

4.1. Check in to get horse coupons
In order not only to make the application a dissemination platform, but to make it a platform with high user stickiness and entertainment functions, a quiz function is integrated in the application. In order to complete rewards and punishments, a set of digital currency rules is constructed, namely horse coupons, which can be used not only for guessing, but also for gift exchange. Users can get horse coupons by clocking in, so the clocking function is designed. The user only needs to log in to the application and click to obtain horse coupons. The background will determine whether the user has clicked to obtain horse coupons on the day [5]. The number of obtained horse coupons will also be randomly assigned to the user. When the user's check-in record of the day already exists in the database, the software will prompt the user Horse coupons have been obtained.

4.2. Game quiz function
In order to mobilize users to participate in horse racing and spread the rules of horse racing quiz, the competition quiz function is constructed by studying the existing horse quiz rules, summing up and refining the rules. The administrator adds game items that can be guessed on the server, and then adds participating horses and participating riders to the item [6]. Ordinary users can select the item to be guessed through the application, and then select the horse and rider to bet on and the number of horse tickets to bet on. When the game result is announced, if the user guesses correctly, the system will return the user's horse coupons and deduct the horse coupons of all users who lost the game as rewards. Then, the rewards will be based on the proportion of users who won the guess. Issued to the winning user (see
Figure 4). Users can use horse vouchers to keep guessing, or redeem gifts in the horse specialty store of the app. Horse coupons cannot be exchanged for cash, nor can they be recharged with cash.

5. Conclusion
GZSMS is a large-scale horse racing control and management system. The system control machine technology used in the system design is a new idea to solve the problem of process synchronization in distributed systems. Its method is general to the system using the Client/Server computing model. The kernel communication mechanism in the system control machine also provides a basis for the realization of other application functions of the GZSMS system.

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