Design and Implementation of Dynamic Grouping Algorithm Based on Sports Track

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Abstract. Track and field is the "mother of sports" and the basis of all kinds of sports. In the commonly used games management software, the grouping and lane division of sports track events mostly adopt fixed eight lanes, and the AR arrangement algorithm is fixed, which has some defects. The traditional manual arrangement has low operation efficiency, low accuracy, heavy copying task and heavy workload, which requires a lot of human and material resources. The arrangement of order book by computer makes the tedious organization and arrangement work completed manually realized through simple operation, and makes the organization and management of sports meeting simple, efficient and flexible. In this paper, a dynamic grouping algorithm is proposed, the design idea of the algorithm is discussed in detail, and the order arrangement is realized by computer, so as to realize the cumbersome organization and arrangement manually through simple operation, simplify the organization and management of the game, and be efficient and flexible. Using the dynamic grouping algorithm proposed in this paper, the sports track events can be grouped flexibly and quickly, which makes up for the deficiency of the existing sports meeting management software to a certain extent.

Keywords: Sports track · Dynamic grouping algorithm · Layout

1 Introduction

The arrangement of campus track and field games is a very cumbersome work. The traditional manual arrangement has low operation efficiency, low accuracy, heavy copying task and heavy workload, which requires a lot of human and material resources. The arrangement of order book by computer makes the tedious organization and arrangement work completed manually realized through simple operation, and makes the organization and management of sports meeting simple, efficient and flexible.

Through physical exercise, students hone their will quality, cultivate their awareness of rules and stimulate patriotism. As a leading school in the region, Yizheng experimental primary school strives to build a complete campus physical education curriculum, including spring track and field games, autumn fun games, winter Triathlon exercises and headmaster's Cup Basketball Games. Students not only cultivate their physical skills,

M. A. Jan and F. Khan (Eds.): BigIoT-EDU 2022, LNICST 465, pp. 336–346, 2023.
https://doi.org/10.1007/978-3-031-23950-2_36

but also establish the spirit of daring to fight. In the past few years, our teachers and students have carried forward the spirit of hard work and innovation, and made gratifying achievements in campus construction, educational characteristics and education and teaching. We must not only have the courage to learn, but also make new breakthroughs in moral, intellectual, sports and aesthetics, especially sports. Sports is a strength competition, sports is a wisdom competition, sports is a beautiful display, and sports is an ideal flight. I believe that through the efforts of teachers and students, this track and field games will be safe, orderly, healthy and wonderful!

At present, among the various software related to sports meeting management, for the problem of grouping and lane separation of sports track sprint events, eight lanes are fixed, and the lanes of athletes are arranged in the order of athletes' registration. This arrangement method sometimes leads to the situation that there are only one or two athletes in the last group and eight athletes in other groups, or the situation that multiple athletes of a certain college and department compete in the same group, or a certain college and department always compete in a fixed track. In long-distance track and field events, circle recording has always been a difficult point for referees. Whether amateur or national professional competition, due to the error of circle recording, it has had an irreparable impact on the competition. In recent years, some professionals have actively studied the circle recording of track and field middle and long-distance running, race walking and other projects, put forward some new circle recording methods and developed some new equipment, but the feasibility and universality of its application can not meet the needs of various similar projects. With the rapid development of modern science and technology, using computer technology to improve the work efficiency of referees is an effective method. Therefore, it is of great value and practical significance to develop an application program suitable for long-distance track circle recording and dynamic scoring. In college physical education, there are many sports factors related to track events, such as explosive force and speed related to sprint, endurance related to medium and long distance running, etc. the sports ability of track events is directly related to the teaching effect of other events [1]. From the current situation of the implementation of public sports in Colleges and universities, track and field events have basically disappeared, and some college track and field fields are basically idle. In view of the irreplaceable role of track and field in human health, many experts and scholars continue to call for the return of track and field. Therefore, this paper proposes a dynamic grouping algorithm not limited by the number of tracks, which can effectively solve the problems existing in the grouping and lane separation of sports track events.

2 Related Work

2.1 Research Background and Significance

With the increasing strength of China's economic strength, the status of a big country is becoming more and more obvious. To a certain extent, the results of sports events are the embodiment of a country's comprehensive strength, and the analysis of the results of sports events is of great significance, mainly reflected in the following aspects:

1) Analyze the position of China's event results in the international stage, so as to provide basis and effect analysis for the formulation of national sports related policies and strategies;
2) Analyze the achievements and change laws of advantageous projects in China, and be able to analyze them in combination with the changes of relevant policies and strategies, so as to provide basis and effect analysis for various reform schemes in the field of sports;
3) The analysis of the relationship between the performance of the event and the basic quality of athletes (age, height, weight, etc.), as well as the differences in the performance of different sports, will provide a basis for the selection of athletes and scientific training;
4) The higher and stronger sports spirit in the competition is an embodiment of the spirit of self-improvement of the Chinese nation. Building a knowledge base corresponding to the results and automatically answering common questions based on the knowledge base is conducive to the popularization of science about the existing sports results and the publicity of sports "Heroes" and "models".

In addition, with the increasing maturity of Internet technology, the openness of results is getting better and better. All kinds of event organizers and associations have created relevant websites, and all kinds of event results can be published in time, which makes it easier to obtain all kinds of event results and enriches the application scenarios of these data. Statistical analysis based on big data and prediction of possible future situations have become the focus of attention.

Track and field has been a major gold medalist in various comprehensive events over the years. Even everyone agrees that "those who win track and field win the world", so countries pay special attention to it. China's dazzling achievements in middle and long-distance running events, the dominance of throwing events such as shot put and discus, the birth of Liu Xiang's flying man, the recent rise of men's long jump and high jump, and the emergence of Su Bingtian and Xie Zhenye in men's sprint events have raised people's enthusiasm for track and field events. In this context, the scientific use of various data has become the key, and building an intelligent information management platform for track and field events has become one of the core tasks at this stage.

2.2 Dynamic Grouping Algorithm

Packet classification is an important part of QoS mechanism. The so-called packet classification refers to grouping packets into different categories according to some information in the packet header, so that different packets may get different services [2]. The TOS (type of service) domain of IP packets in the original IPv4 protocol is an example of packet classification. However, because the TOS domain has never been really used, the role of packet classification can not be reflected. However, packet classification plays a great role in the DiffServ Model of IETF. DiffServ Model redefines the header of P packet, as shown in Fig. 1 below.

The DiffServ Model redefines the TOS domain of the IP packet header in IPv4, which is renamed DS domain (differentiated service field). As shown in Fig. 1, the first six bits of the DS domain are called DSCP (differentiated service code point), and the

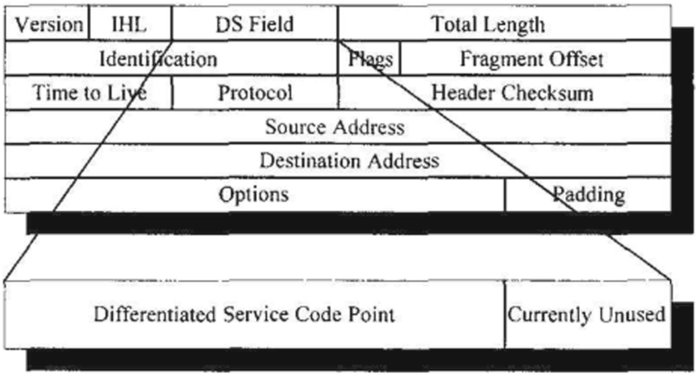

Fig. 1. Definition of DS domain in DiffServ Model

last two bits are not used. In the DiffServ Model, when a group enters the edge of the track, it must first be classified, and its classification results are encoded and recorded with DSCP. The subsequent sports event group selects the PHB of the group according to the DSCP value of the group [3]. This is actually a traffic aggregation, so that a large number of flows are clustered into a small number of classes according to their different business properties.

The so-called packet scheduling means that when a packet needs to be sent, the sports event group selects an appropriate packet from several different queues to forward according to a certain algorithm. FIFO (first in first out) queue is the simplest example. In this queue, sports event groups always forward packets in the order of arrival. The order of packet departure in other algorithms may be different from the order of packet arrival.

Traditional sports event groups always use FIFO to forward packets, but this method has several disadvantages [4]: 1 Streams cannot be isolated from each other, and the behavior of one stream may affect other streams; 2. Unable to provide track guarantee for convection; 3. Delay guarantee cannot be provided for convection; 4. Improper flow will lead to a sharp rise in data loss rate; 5. Unable to treat all flows fairly. Therefore, it is necessary to use other algorithms to improve.

By using appropriate packet scheduling algorithm, the sports event group can ensure the requirements of packet track, delay, delay jitter, loss rate and so on. The application can make an appointment for the required resources first, and then use the track after obtaining the guarantee, so as to ensure the QoS requirements of the application.

Of course, the use of complex scheduling algorithms in sports event groups also has to pay a certain price. Complex scheduling calculation and transmission will bring additional delay to packets, which requires that the complexity of the algorithm should be considered when designing the algorithm, and hardware can be used to implement it if necessary,

2.3 Algorithm Idea

The core idea of the dynamic grouping algorithm based on sports track events proposed in this paper is to arrange the participating colleges and departments in descending order according to the number of participants [5]. Then determine different track filling methods by calculating the relationship between the number of participating athletes' colleges and departments and the track times of the current group, and calculate the group and track times of participating athletes according to the principle of the number of participating athletes, the total track times of the playground and the uniform distribution of college and Department athletes as far as possible. As shown in Fig. 2 below, the idea flow of the algorithm is shown.

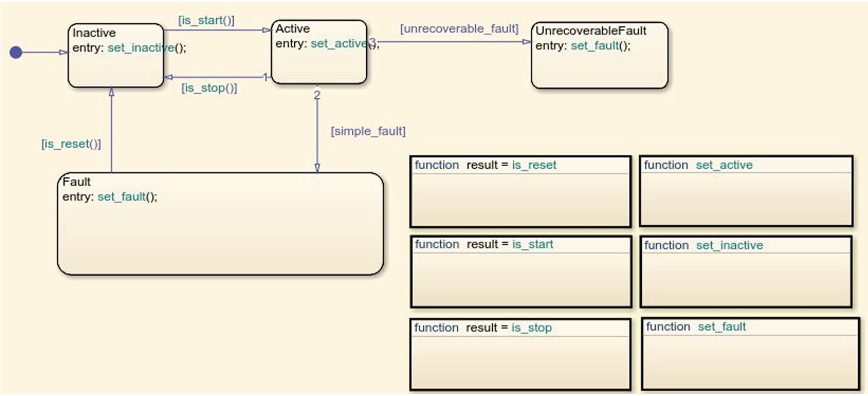

Fig. 2. Algorithm thought flow

Different from the traditional way out, the track link weight used by QoS is not only the number of hops, but can include multiple parameters such as track connection, delay, current load and so on. These parameters can be either statically specified or obtained through dynamic measurement network. There are many ways to use these parameters as the basis for route selection. You can either set the weight for each parameter and calculate the weight of a single track, or use multiple track tables in the sports event group to make the group have multiple tracks to choose when forwarding is needed.

The use of QoS based tracks will also introduce new problems. When the sports event group finds a path with light load through the QoS track, it will direct the service flow to the path, so as to change the current network load [6]. After a period of time, it may be found that the load of the original heavily loaded path has decreased, so the traffic flow will be directed back to the original path. If the rate of traffic switching back and forth on different tracks is too fast, it will lead to network oscillation, which will produce too much unnecessary additional overhead and is not conducive to the utilization of network resources. In addition, QoS track protocols and algorithms are complex, which will increase the amount of track information transmitted between sports event groups and increase the computational overhead of sports event groups. These factors should be taken into account when using QoS track.

3 Design and Implementation of Dynamic Grouping Algorithm Based on Sports Track

3.1 Design of Dynamic Grouping Algorithm Based on Motion Trajectory

In the information management of large-scale sports events, personnel management is very important. Personnel management includes the management of athletes, referees, Venue Managers and volunteers. The application of dynamic grouping technology in sports event information management is to realize the collection and storage of personnel data information. The information management of all kinds of personnel is very necessary, such as the management of audience information, which is convenient for the audience to register information and enter the stadium, which is conducive to maintaining the good order of the event; Athletes' information is the main basis and basis of schedule arrangement, especially in large-scale sports events. This is because large-scale sports events involve more venues and a large amount of information, which needs to be applied to dynamic grouping technology to deal with huge data. Based on the dynamic grouping technology, the personnel information is collected and saved. The information changes can be centrally managed or authorized distributed in each venue. The database of the competition venue maintains data communication with the central database through the network, and always keeps synchronization, so as to ensure the accuracy and consistency of personnel information. For example, in the 2002 World Cup, the world's largest voice and data fusion network was built and adopted for the first time in the event, and it was the first time to connect the infinite LAN to the sports competition. Insert a wireless network card into the laptop to cover the LAN in the sports competition venues. The media can use the network to broadcast sports events timely and effectively, and use the network for personnel management. Its personnel include athletes, referees, Venue Managers and volunteers. In personnel management, the registration and change of personnel basic information are carried out. The information registration of athletes needs to be carried out according to the competition arrangement of sports events. In large-scale sports events, multiple venues are involved. Therefore, it is necessary to accurately record personnel information. The application of dynamic grouping technology in personnel information management can make personnel information management more efficient and conducive to the process of sports events.

For any large-scale event, ensuring public safety is the top priority. As a link of network information security, personnel information collection is the key to ensure public security. Among the complex and numerous information resources, dynamic grouping provides the best choice for solving the integration and management of information resources. For example, it is very important to establish intelligent video monitoring and command and control solutions, implement the general basic standards of network information security, and improve the ability of dynamic grouping system to resist network attacks to ensure the safety of events, The Charter of trust signed at the Munich Security Conference in 2018 also reflects the importance of network information security. China should also speed up the establishment of general standards for network security of sports events, so that dynamic grouping can provide great guarantee for sports event information management in a standardized system.

In the DGA algorithm model, the device with packet forwarding function is called network element, which is characterized by two error values C and D. Where, C is the maximum packet length of a single stream, D is equal to L/C, l is the length of the maximum packet in all packets passing through the network element, and C is the capacity of the network element, that is, the total track. These two values represent the deviation of network elements from the ideal flow model.

$$P_{loss} = 1 - \frac{1 - p_0}{p} = \frac{p_0 + p - 1}{p} = \sum_{n=1}^{N} P_K \tag{1}$$

$$Sim_1\left(d_i, d_{1j}\right) = \frac{\sum_{k=1}^{M} W_{ik} \times W_{1ik}}{\sqrt{\sum_{k=1}^{M} W_{ik}^2} \cdot \sqrt{\sum_{k=1}^{M} W_{1jk}^2}} \tag{2}$$

According to the basic idea of DGA algorithm, we use c# language and office Net component 3 ^ designs and implements the automatic generation module of track events according to sub item grouping list in the order book management system of the sports meeting. Its specific functions include: inserting the pre-set format of the track sub item grouping list of each college and department, obtaining the information of athletes participating in each track event, filling athletes into their due groups and passes according to the track event grouping and lane separation rules, and filling the results into the track sub item grouping list of each college and department.

Yes In DiffServ Model, sports event groups are divided into two categories: edge router and core router, and their functions are obviously different [7]. The boundary sports event group should control the business flow injected into the event service, and its work includes: admission control should be carried out according to the SLA agreed in advance between the event service provider and the athlete; Shaping the injected business flow; Aggregation of microfluidics; Mark each group with DSCP, etc. After passing through the boundary sports event group, the business flow is divided into a few QoS classes for the core sports event group of the event service. The core sports event group is located inside the event service and is responsible for different processing of packets belonging to different QoS classes. These embedding methods are called PHB, and the DSCP domain in the packet is used to select PHB.

IETF does not specify what PHB must be realized by sports event groups, and the corresponding relationship between DSCP and PHB is not fixed in the whole network [8]. The subnet that provides a specific PHB service set and specifies the corresponding relationship between DSCP and PHB is called DS domain. Generally, the event services of different event service providers belong to different DS domains. When the group leaves one DS domain and enters another DS domain, it is often necessary to re label the DSCP, which is the work to be completed by the sports event groups located between different DS domains. Because the sports event group is the exit of the group leaving the DS domain, it is called the export sports event group, which is different from the entry sports event group when the group enters the event service.

After completing various preparations before the competition, enter the basic information of the participants (such as the participating unit, name, number, etc.) into the "participant registration form". Then install the program on the computer for recording the competition referee, double-click the program icon to run the application. When the competition starts, click the "start" button on the menu bar, and the program starts to record the competition start time. Whenever an athlete arrives at the recording desk, the operator records the athlete's number, and the program instantly displays the dynamic ranking and relevant information of the athlete.

3.2 Analysis of Simulation Results

The dynamic interaction between the classes and their methods involved in the business model of the automatic generation module of track event grouping list.

The business model of the automatic generation module of track event grouping list mainly involves four user-defined classes [9]:

(1) The wordmethods class is responsible for calling word components to realize the formatted output of word documents.
(2) The wordmanager class is responsible for calling wordmethodlibrary The D11 component can realize the formatted output of the itemized grouping list of track events of each college and department.
(3) Eventorderitem class is responsible for storing the grouping information items of track events. It has four attributes: trackno, PlayerNo, playername and dept-name. These are the contents involved in the track sub grouping list of colleges and departments.
(4) Eventorderlist class encapsulates the DGA algorithm to realize the grouping and lane separation of athletes.

As shown in Fig. 3 below, it is easy to understand from bottom to top from the code: we directly start from the bottom, the simplest and the smallest problem scale, f (1) and f (2), until we push to the answer we want, f (n). This is the idea of dynamic programming. This is why dynamic programming generally breaks away from recursion, but completes the calculation by cyclic iteration [10].

Depending on the solution of the subproblem, the top-down of the slow band memo is also self-determined down, but the results of the subproblem can be saved and used to avoid repeated calculation, fast bottom-up, and directly start from the bottom, the simplest, and the smallest problem scale until the desired calculation results are obtained.

```
int countMethods(int n){
    if(n==1||n==2)
        return n;
    int f[n];
    f[0]=0;
    f[1]=1;
    f[2]=2;
    for(int i=1;i<n;i++){
        f[i+2]=f[i+1]+f[i];
        if(i+2==n)
            return f[i+2];
    }
}
```

Fig. 3. Dynamic grouping calculation code

4 Application of Dynamic Grouping in Sports Event Management

Sports events are inseparable from competition venues and venues. The venue style of sports events is an important condition for the development of sports events. The application of dynamic grouping makes the stadium information construction of sports events more rapid. At the same time, the state has also given a lot of support and help in the information construction of stadiums and gymnasiums. In China, there are more than 10 high-level comprehensive training venues. In recent years, China has held many large-scale sports events. In practice, it is found that the awareness of comprehensive fitness is helpful to improve the level of competitive sports in China [11]. The construction of sports venues is also continuously enhanced. Internet technologies such as cloud computing technology, triple play technology, dynamic grouping technology, mobile Internet technology and new flat panel display technology are continuously integrated into the construction of stadiums and gymnasiums, and are committed to building intelligent stadiums and gymnasiums. Judging from the current situation of sports venues construction in China, the construction of smart venues is still in the primary stage, in terms of technology and application conditions There is still a lot of room for improvement [12].

With the development of the Internet, information technology has penetrated into various fields. The combination of the Internet and sports has given birth to a new sports development model. China has given great support to the development of sports industry, and China's sports industry has also made great development and progress in recent years. As the basis of carrying the development of sports industry, the construction, improvement and development of stadiums and gymnasiums play a very important role in promoting the whole industry. With the emergence, development and industrialization of new generation information technology such as dynamic grouping and cloud computing, Internet plus sports has been constantly innovating, and the combination of sports venues and the Internet has become more and more closely linked, and the "smart venues" have emerged. "Smart venues" refers to the use of intelligent information technology in the initial stage of stadium construction and operation of sports events, and its integration into the actual operation of stadiums and gymnasiums [13]. It is a new type of stadiums and gymnasiums, and its development is based on dynamic grouping. In the future sports events, the application of smart venues should be very extensive, which is also the trend of the construction and development of sports venues. "Smart venues" can alleviate the problem of insufficient supply of stadiums and gymnasiums, improve the informatization of venue resources, improve the utilization rate of venue resources, and help the development of sports industry and sports undertakings. Under the background of dynamic grouping technology, the new "smart venues" have the following characteristics:

(1) The construction concept of "smart venues" always abides by "people-oriented". In the construction and operation of "smart venues", we always put people's needs first, take the market as the center, provide high-quality and diversified services for athletes and spectators, and constantly strengthen the strength of sports venues.
(2) "Smart venue" is an intelligent venue construction. The facilities and equipment inside the smart venue adopt dynamic grouping technology to make it more intelligent and provide more convenient conditions for various sports events. Through dynamic grouping technology, it collects and processes data to facilitate the needs of spectators and athletes, and uses big data analysis to continuously improve the venue construction and future development direction.
(3) "Smart venues" are characterized by "decentralization". Under the background of dynamic grouping technology, each point is a node in the connection of everyone, objects and characters. Any one point may become a central point. This central point is temporary and not permanent. In the construction of "smart venues", give full play to the brand effect, carry out publicity and promotion through the network, and achieve the purpose of obtaining good benefits.
(4) The characteristics of "sustainable development" of "smart venues". Inside the "smart venue", all intelligent equipment can be recycled, which needs regular maintenance, repair and renewal, and a professional talent team is established to achieve a higher combination of social and economic benefits [14].

When sports events are held in stadiums, a large number of people will gather, so it will involve safety issues. In the construction of smart venues, dynamic grouping technology needs to be applied to security. The non dead corner monitoring field of the exhibition hall, access control system, security system, fire control system, garage management, lighting control, air quality monitoring and monitoring of important items (valves, switches and gateways) are closely related to the basic safe operation of the exhibition hall. Using dynamic grouping technology, The whole exhibition hall will realize the construction of "hub" security of information center in the field of security.

5 Conclusion

In view of some disadvantages of sports event grouping and lane separation in the current sports meeting management software, this paper puts forward a dynamic grouping algorithm not limited by the number of lanes, and applies it to the order book management information system of campus track and field games, realizes the automatic arrangement of the order book of campus track and field games, and greatly improves the work efficiency of sports meeting managers. Practice has proved that the rationality of DGA algorithm for grouping and lane separation of participating athletes is higher than that of traditional eight Lane grouping algorithm, which makes up for the deficiency of current sports meeting management software to a certain extent.

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