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Aviation Logistics Mobile Internet Cloud Computing Optimization

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Abstract

Aviation logistics on a global scale in a short time will be able to transport large amounts of goods to the hands of consumers, but worldwide aviation logistics of how information can be shared in real time, the mobile Internet has provided favorable conditions for this, but the mobile Internet cloud calculate the optimal method is not related to research, solve this problem, this study proposes a mobile Internet-based cloud logistics scheduling, which is the application of global scope of things, the method can be real-time dynamic scheduling analysis, and is capable of worldwide logistics real time prediction.

Keywords: *Mobile Internet; cloud computing; real-time optimization; Forecast*

1. Introduction

With economic globalization, the emergence of new business features. First, many multinational business outlets have been all over the world, involved in the transport of products to worldwide; second, the characteristics of products to light, thin, high value-added direction, product volume is small, but high-value, and often time-sensitive; third, through outsourcing of production, multinationals production on relatively low labor cost countries, but worldwide sales; fourth, the organizational structure has changed, corporate headquarters, research and development , production in different countries or regions, resulting in the separation structure. Therefore, due to space organizational separation of the new features of globalization of markets, products, making enterprises in order to achieve fast response of the market, it needs more efficient and efficient mode of transport and services, and fast and convenient air cargo is its preferred. Boeing predicts that by 2023, the global air cargo traffic will more than 506.5 billion tons kilometers, of which the share of international air cargo freight will be 83.7% of the total, more than the share of the domestic air cargo. And all connected with the Asian market, its growth rate will be higher than other cargo areas[1-3]. According to statistics, Asia's largest cargo airport in 20, China accounted for 7 airports, traffic at Hong Kong International Airport ranks second in the world, the majority of freight goods from mainland China. China's domestic air cargo over the next 20 years will be l0.6% annual growth rate in Asia has become the "leader." At the same time, benefiting from the government's open policy, the implementation of restrictions on domestic airline routes gradually reduced, more foreign companies to enter the Chinese market, which have allowed an increasingly competitive market. At present, about 60 foreign airlines in China are open nearly 40 cities airport operating international freight business, the share of foreign airlines transported more than 70%. Although in recent years, China's air cargo freight business showed rapid growth trend, but the market share is still not high, the mainland airlines only share the remaining approximately 30% market share. In June 1, 2004 "on accelerating the development of a number of policy measures for the domestic air cargo opinion" was promulgated as a symbol, China's air cargo began reform and opening up process, the establishment of all-cargo airline, cargo hub construction, cargo flight routes approval, approval of cargo

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aircraft available for rent and other aspects of strict barriers are gradually being broken up, dramatically reducing the barriers to entry in the domestic air cargo industry, private capital and foreign capital have entered the field of air cargo. Air cargo industry also appeared foreign, state-owned, private tripod situation, competition is fierce. 2009 9 On 21 May, the Civil Aviation Authority issued "to further promote the development of air cargo policy measures" (draft), reflecting the Government's commitment to the development of air cargo.

Civil Aviation Authority undertake to coordinate customs, postal and other departments, improve customs clearance efficiency, speed up the "express green channel" construction; and the government will organize the construction of the air cargo management system to improve airport, air traffic control service capabilities to create a good environment for the development of air cargo. Faced with fierce competition in the market, the air cargo service providers must think about the future direction of development of air cargo. Air cargo safe, fast, convenient and high-quality door to door service for the advantage to meet the development requirements of modern enterprises. Particularly important stage in the transformation of economic growth mode, short life cycle, time-sensitive industries increasingly rely on air transport, air transport and logistics industry so closely combined with the development of modern logistics services for cargo offers unprecedented market space, the traditional air cargo has a greater range of services and business[4-6]. Such as the famous aviation express delivery companies UPS proposed development slogan is "synchronized to provide business services." So how able to provide customers a full range of personalized services to ensure the efficient operation of aviation logistics system, nature is an important research topic.

Logistics, understood as "material flow", which along with the development of human history and existence. Logistics concept first appeared in the United States, 1915 Archie Shaw proposed the term logistics, and it is considered the logistics market circulation problems discussed creating demand and logistics activities. During World War II the US military logistics theory established after the war to be applied to production and business activities, which contains the procurement, storage, transportation and distribution, involving supply, production and sales of the three areas, the formation of modern logistics concepts. Different countries, institutions, scholars on the concept of logistics were defined. Which is widely accepted is the definition of the American Council of Logistics Management made in 1985 on the logistics[7-9].

It is considered the logistics of goods, services and related information efficiently from origin to destination, effective flow and storage planning, execution and control, in order to meet customer needs in the process. Transportation and Realize the value of the cargo space is a core part of the logistics activities. With the scale of production of transport, specialized production development and the rapid development of transportation has become a basic industry of the national economy. In the entire process of logistics services, transportation time and costs often account for a large proportion, while its greatest risk. Achieve transport function, including transport infrastructure, such as roads, railways, airports; transportation equipment, including vehicles, aircraft, etc.; energy consumption during transport, such as gasoline and therefore associated with the development of jet fuel and other transportation to many different industry, plays an important role in promoting national economic development. The combination of transport and other functions, in order to achieve the overall goal of logistics, and therefore cannot emphasize a single transport capacity, also need to analyze the relationship between transport and other logistics functions and the way of integration[10-11].

In the five main modes of transport, air transport for its fast, safety features have an increasingly important role. Air Cargo is the use of cargo or passenger aircraft belly space and ground airport, navigation equipment, flying on the specified route, to achieve the spatial displacement of goods. Cargo airlines are A-A (Airport to Airport) services, it is

the core of aviation logistics, and extending therefrom and warehousing, distribution and other business which aviation logistics services. Advantage is that high-speed air transport, only full play to their strengths, in order to meet the owner's requirements. At this stage, the main target of air cargo can be divided into four categories, namely general cargo, heavy cargo, mail and courier goods according to weight and time requirements of each goods has a specific product type. Such as courier including documents, business documents, communications products, electronic products, and other valuables. It is characterized by light cargo weight, small size, but the timeliness of transportation demanding. With the development of air transport equipment, with a number of large transport aircraft equipment capacity has been started, the future of air cargo services will increase. The main object of this study is general cargo, with the general characteristics. Air Cargo is the basis of logistics, will only give full play the advantages of air cargo is only possible in collaboration with other business sectors to provide a high level of logistics services. Therefore, the existing problems including air cargo freight capacity optimization of resources, optimization of the freight market development freight air logistics route is necessary to study the content. Cargo traffic fluctuations over time due to the large social traffic to various factors, market competition, business needs, etc., to the owner, from the logistics center to take delivery presents certain rules, but the short term may be unevenly distributed. According to the survey, such as the Pudong International Airport cargo exhibit greater volatility within 24 hours. From the morning between 8:30 to 2:30, before 12:30 and 20:30 after arriving truck large quantities, more concentrated cargo, aviation logistics center operating time are mainly distributed in the morning and at night, especially large hub airports, in order to avoid airport congestion, cargo flights will be mainly in the evening, so there arrived at night picking logistics Center, installed early morning or given trend, will form the night stranded in the library, together, focus decomposition goods Happening. This arrangement is also adapted to the production of their products during the day, night transport organization, the next day delivery to the operational requirements of the destination. Logistics services based on customer demand as the core, to achieve product from origin to which are brought to the efficient and effective operation, including transportation, storage, handling, packaging, order processing and other aspects of the content. Since the reaction speed of air logistics, network coverage, ground handling capability, customer service and other areas of the business can be achieved significant competitive advantage to meet customer requirements for both efficiency and effectiveness, so that the rapid development of aviation logistics of its inevitability. Aviation logistics development can not only rely on air transport, but also has a comprehensive and efficient ground transportation, warehousing, packaging and other services, including freight forwarding, ground carrier, warehousing services and airline service throughout the process[12-15].

Basic aviation logistics services including transportation, warehousing, packaging, handling, distribution and the associated flow of information services, transport services is the core of logistics. At a given facility network and information capabilities condition it is to transport goods from the geographical positioning of a job in the field of logistics. Generally evaluate the quality of transport services from three aspects, namely, cost, speed and consistency. Therefore, the goal is the pursuit of transport services in the case of continuously reduce logistics costs, improve the speed and quality of service to ensure the consistency and stability. Basic functions of logistics services, and transportation of goods closely have warehousing, packaging, handling and the like. They are an integral part of the logistics operation, these functions do not have an independent nature, they are interrelated and influence each other.

2. Related Works

2.1. Status Aviation Logistics

According to aviation-related logistics concept analysis, aviation logistics in air cargo, based on its development is inseparable from airlines, airports and ground handling companies, so the research on aviation logistics in China focused on air cargo and aviation logistics relationship the development trend of aviation logistics, aviation logistics services, aviation and airport logistics business logistics and other aspects. Chinese scholars mainly use management, Logistics, Transport Economics knowledge of issues related to the study, most of the literature research method of qualitative analysis, only a small amount of literature quantitative analysis. Almost all scholars clear air cargo and aviation logistics are closely related, and the development of aviation logistics is based air cargo above. With the development of aviation logistics and air cargo development in China is still a lack of experience and ability aviation logistics development, requiring comprehensive analysis based on the development status of air cargo, study hard and major issues facing the development of aviation logistics, so to get better development opportunities. Chinese scholar Liu Shi Gong to China Aviation Logistics conducted a comprehensive analysis of fifteen he introduces the status quo of the development of air cargo, and from twelve analyzes the main problems existing in China aviation logistics development, drawing on foreign aviation logistics development on the basis of experience for the development of our country aviation logistics put forward their views. At different stages of development, the relationship between aviation and air cargo logistics is also different. Ke Zhimin that modern logistics is to meet consumer demand as the goal, the manufacturing, transportation, sales and other market conditions unified strategic approach to consider. Transport is the central link in the logistics business, but not limited to modern logistics and transport functions, when the aviation business to a third party logistics company into, to provide consumers including transport, warehousing, packaging, handling, distribution, processing and distribution chain transport complete product , the meaning has become a modern logistics logistics company. And expounds the difference and connection between air cargo, aviation logistics and modern logistics development of three nodes, noted the development path must go through two stages: the first stage is mainly by way of relational contract transition from air cargo to air logistics, the second stage is the joint effect of longitudinal expansion and horizontal expansion of power, aviation logistics will continue to develop into the modern logistics.

Stage air logistics services companies focused on the specific function of a logistics chain to implement and manage the transportation, handling, storage, processing and other sectors is isolated, undertaken by different economic entities do not communicate, respectively, each enterprise basic It is in accordance with the value chain based on creating value for customers, and accordingly arrange logistics activities. With the development of the market, demand for logistics services tend to be specialized, multi-species, timeliness and accuracy, so that the current value of a single function service will continue to be weakened, replaced by a multi-functional, comprehensive integration and personalization service.

Aviation logistics enterprises in the development must consider three questions:

(1) enterprises to provide logistics services business types: business content can be integrated into the air logistics enterprises aviation logistics enterprises and functional air logistics enterprises. Integrated aviation logistics enterprises with complete "door to door" logistics service capacity of all large-scale enterprises, is rich in resources; functional air logistics enterprises is to choose the most suitable business areas based on resource capacity, most companies fall into this category .

(2) the profitability of the logistics services: Enterprises have their own business,

logistics and services from different sectors to make a profit. Airlines by providing airline transport services, charged freight shipping as its main source of profits; airport cargo terminal by providing goods in airport ground handling services earn revenue; air freight forwarding mainly through the organization of freight transport, cargo consolidator offers ground delivery earn revenue; other peripheral businesses through the provision of various services, such as customs agents, financial services, to create profits.

Investment (3) logistics facilities for air transport, the purchase of all-cargo aircraft or passenger aircraft belly space to rent, whether ULD during transport; for ground operations, whether to purchase a modern sorting system, ground transportation vehicles.

The airport is an important logistics nodes, play a decisive role in the development of air cargo and aviation logistics, if not out of Hong Kong airport ground operations and effective convergence, if the airport does not provide cargo aircraft taking off and landing conditions, if the airport does not have a cargo storage and processing facilities, the air cargo or air logistics are out of the question. On the other hand, the airport's route structure, the airport management has a direct impact on the efficiency and cost of air cargo. The current study is to analyze the air cargo distribution, typical airport objects, analysis objects and air cargo logistics services, mode of operation, structure and layout, and information technology and other issues.

2.2 Mobile Cloud Computing Research Status

The overall architecture of mobile cloud computing primarily by the wireless access network, the Internet and cloud composition. Radio access network responsible for establishing the communication between the mobile terminals and the Internet, similar to this part of the communication with the conventional wireless communication, a base station or an access node for establishing and controlling the air link, the server according to the user's location, identity, service requests, etc. providing information to the mobile network services. Network operators based on the user's home agent to perform AAA authentication, user and business data stored in the database. In addition, the radio access network is also responsible for user switching, radio resource scheduling, admission control of data delivery and so on. Internet is mainly responsible for the communication between the radio access network and the cloud, partly responsible for the user's service request to the cloud, on the other hand will effectively transmit traffic data provided by the cloud server to access network mainly by Cloud Cloud Controller and cloud data centers, composed of two parts, the cloud controller is responsible for accounting management, user service request management, virtual machine management, network communications, etc., and the cloud data is mainly performed according to the cloud controller to the VM allocation user requests business and storage-related business data. Cloudlet cloud data is also a complementary resource, by way of shared server resources near the user's LAN to set up a resource pool. Since the LAN transmission of information in only one hop, the user through the Wi-Fi use Cloudlet computing resources, has lower latency, thus Cloudlet seamlessly handling compute-intensive applications, such as computer vision, machine learning, policy judgments, etc.. However, Cloudlet before being put into the market, there are many practical problems to be solved. Mobile computing environment task migration many, here we introduce virtual machine migration, migration and dynamic load balancing. In distributed computing, grid computing and cloud computing via the Internet together to deal with the task environment may be some computer overloaded, has been in a busy state, while others are lightly loaded computer, often in the idle state the case, which greatly reduces the system-wide utilization of resources. Load balancing is the task across multiple computers, processes, disk or other resources are allocated to achieve optimum resource utilization, lower left foot's computing time load balancing is an important means of achieving efficient resource sharing and utilization, it has been distributed computing, grid

computing and cloud computing a hot issue in the field of research. Load balance homogeneous system is relatively simple, has been extensively studied. In a heterogeneous cluster system, because of the diversity and dynamic behavior of nodes and node type of task, resource type, load balancing problem is more complex. Load balancing is one of a classic combinatorial optimization problem, the difficulty with the issue fairly, is a complete problem. It was roughly balanced each node is through load balancing load distribution and redistribution of tasks and resources to achieve on each node, thereby improving overall system performance. Load balancing has two meanings: First, the large number of concurrent access or data traffic share to multiple nodes were treated, reducing user wait for the response time; secondly, to calculate the weight load on a single server is shared by the plurality of processing nodes , improve the resource utilization of each node. Load balancing algorithm design objectives are: to improve the utilization of system resources in order to increase system throughput and reduce the average response time of the request. Algorithm used to balance the system load from the function can be divided into two categories: load-sharing algorithms and load balancing algorithms. According to the particle size of the load balancing algorithm scheduling it can be divided into two categories: load balancing algorithm based on task scheduling and load balancing algorithm based resource scheduling. Four strategies load load balancing algorithm to measure policies, strategies, tactics and trigger load balancing operations strategy. Load measurement strategy: Strategies used to describe the system load status of each node, based on the node status node workload and available resources and information to make. Information strategy: decide when and how to collect load information, when and how to distribute the load and how to load information management. Collecting information may preclude the use of a periodic manner, can also preclude the use of event-driven mode; can be used to spread information periodically broadcast mode, it can preclude the use of information when there is demand by a user poll manner; management information can Bian with centralized management mode, it can also preclude the use of distributed management approach. Triggering policy: used to decide when to trigger a load balancing operations. Policy may trigger threshold-based approach can also be event-driven and other means. Load balancing operations strategy: This is the load balancing algorithm is the most important strategy, it can be broken down into the following sections: targeting strategies, distribution strategies and options strategies.

3. Distribution optimization based on the mobile Internet Air Logistics

According to the analysis of aviation logistics problems, in order to facilitate the modeling and solving of related concepts studied in this chapter summarize, abstract and simplify:

(1) goods unconditionally to the distribution center and the owner of the location determination. If you do not consider limiting the transport network traffic, then from the Air Cargo Terminal Ground transportation to the customer's time is determined.

(2) Cargo handling at the time of fixing air cargo station, including unloading, sorting, temporary storage and other operating time.

(3) Delivery time is available after loading cargo handling time.

(4) Delivery time is equal to the total cargo handling time, waiting time and the time and transportation. Since the cargo handling time and transport time is determined, the delivery time is determined by the wait time.

(5) the owner can determine the time of arrival of goods and cargo air cargo station in accordance with AWB and bills of lading.

(6) The maximum load for each delivery vehicle is constant, the amount of each shipment does not exceed the carrying capacity of the truck. Transport vehicles only single customer delivery cargo.

Use p- median model to study the distribution of single objective optimization problem point in time. The model is called p- median select service centers in p n nodes, thereby p a service center for the other n-p a service object minimize the total cost of service. Common logistics facility location problem p- median model, the problem is: ① select the appropriate facility location; ② customers assigned to the appropriate facilities to go. The p- median point of time for decision-making model, choose p time points for cargo distribution in the n-th node in order to achieve the least number of distribution, the shortest delivery time or transportation costs lowest goals. According to the above modeling idea, variables and parameters are set as follows:

(1) the decision variables

$x_{ij} \in \{0,1\}$ $x_{ij} = 1$ represents j the arrival of the goods batch was placed in the i-th distribution activities; otherwise equal to 0;

$y_{ij} \in \{0,1\}$ $y_{ij} = 1$ represents the i-th distribution point in time is selected, and 0 otherwise.

T_{ij} represents j the arrival of the goods at the i-th batch delivery in delivery time, including waiting time, processing time and shipping time. If you know the arrival time and the time point selection and distribution of goods, T_{ij} is determined; m is the total alternative delivery point in time; n to Arrive batch; T represents the maximum acceptable delivery time; c_1 the lowest freight, c_k express k different discount points charged freight rates, c_q the largest freight shipping weight is the maximum node;

According to the analysis optimization goals, establish a minimum transportation cost model

$$\min Z_3 = \sum_{i=1}^{m} \left[\left(\sum_{k=2}^{q-1} c_k z_{ik} \right) \left(\sum_{j=1}^{n} w_j x_{ij} \right) + c_1 z_{i1} + c_q z_{iq} \right] \quad (1)$$

$$\text{s.t.} \quad \sum_{i=1}^{m} x_{ij} = 1$$

$$T_{ij} x_{ij} \le T$$

$$x_{ij} \le y_{ij}$$

According to this optimization problem, using the structure of the mobile cloud computing, this structure in the literature [5] have, and optimize based on genetic algorithms, which optimize the process shown in Figure 1.

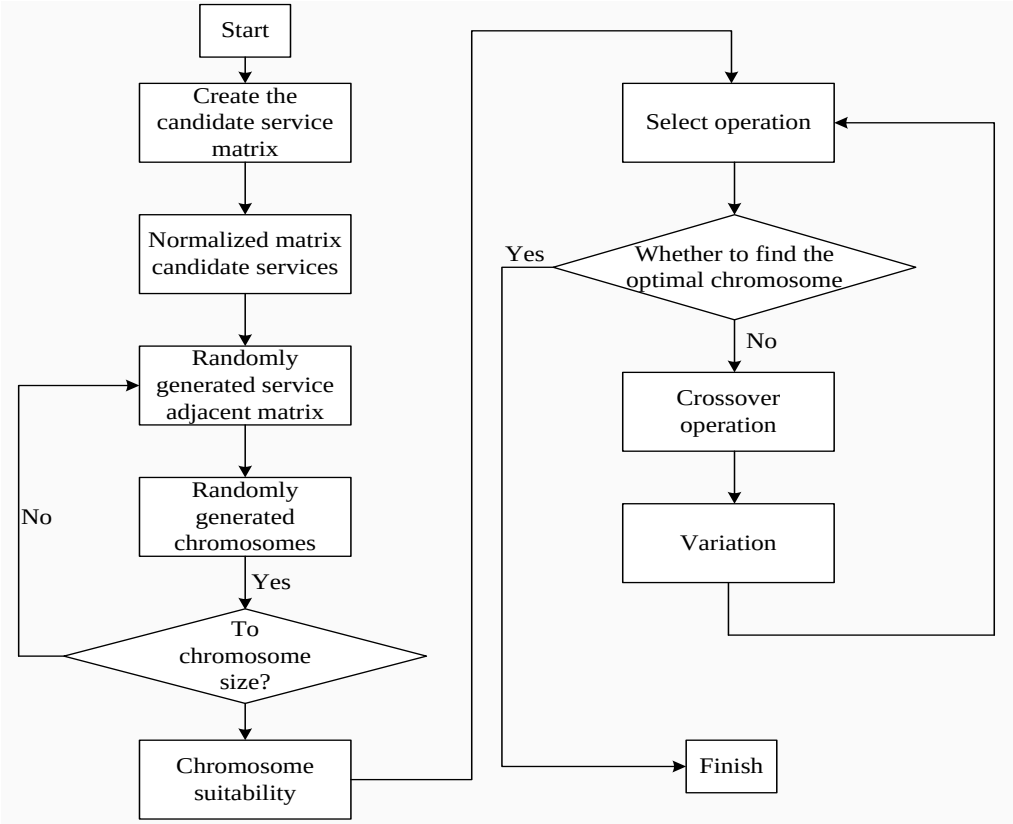

Figure 1. A Genetic Algorithm for Hybrid Granularity Resource Optimization

4. The Simulation Experiment and Result Analysis

Figure 2 processes for scene:

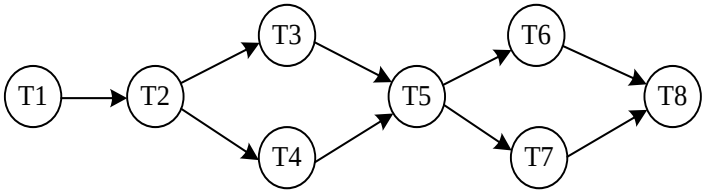

Figure 2. One Business Flow Sample

Task 3 and 4 to choose relationship, 7 6 and quest for parallel relationship. Chromosome string expressed as T1 T2 T3 T4 T5 T6 T7 T8, length is 8.Each activity to have 10 candidate service node, each service has four attributes. The T5 for process composite resources.

For the above eight task node of a business process instance, task T_i candidate services said $S_i = \{S_i^1, S_i^2, ..., S_i^{10}\}$, i = 1,...,8.The setting of the ith a task can be the first j a service instance for S_i^j, S_i^j of them have four attributes {c, t, r, b}.

Each of the tasks in the business process instance node number in sequence. Because each of the given service portfolio includes service nodes have the same number, using decimal integer coding. Gene location of the value of the corresponding service number, if the corresponding task node is not in combination, was 0.Each gene in [0, 10] of a random integer, representing the task takes resources number. Such as chromosomes X

(4,1,2,3,7,6,3,8), in turn, said T1 to T8 resources used in the eight tasks are respectively S_1^4、S_2^1、S_3^2、S_4^3、S_5^7、S_6^6、S_7^3、S_8^8

First generate candidate service initialization data, including each candidate service QoS values, as a chromosome generated choreography of genetic data. When carried out in accordance with the business process chain chromosome generated randomly generated first planned path, then the effective bit gene random configuration corresponding candidate services, the distribution of the corresponding QoS values. Handling of T5 this process composite resource is also the assignment as a whole, so the same as the other single granularity resources processing method. Here, the Cost value range of (14.0, 25.0), the Time scope for (1.0, 1.0), the scope of Reliability for (0.3, 1), the scope of the Availability for (0.3, 1), a total of 60 data generated [14-15].

Initialize the data as shown in the table below:

Table 1. The Initialization of Data

Num	Cost	Time	Reliability	Availability
1	16.16	9.16	0.57	0.75
2	17.24	3.95	0.51	0.69
3	16.34	5.89	0.58	0.44
4	15.19	1.25	0.53	0.90
5	15.88	8.99	0.44	0.72
6	18.67	1.02	0.42	0.73
7	11.18	4.63	0.63	0.82
8	12.24	7.83	0.81	0.84
9	14.99	8.98	0.96	0.86
10	17.30	2.93	0.53	0.97
…	…	…	…	…

Table 2. The Initial Chromosome

Num	Chromosome	Fitness
1	0108000403050301	6.20619
2	0810080008040509	7.98338
3	0707090008050508	6.00695
4	0505000201030807	8.82471
5	1001030007041009	7.28265
6	0605001005100707	7.98591
7	0403050007071007	7.57525
8	0201080001061010	6.95108
9	0705030006040303	9.73355
10	0302000307010304	7.10281
…	…	…

Data set: the crossover probability of 0.6, the mutation probability is 0.07, the QoS factor weights were 0.3, 0.5, 0.2 and 0.3, time constraints, 55, 125 cost constraints, reliability, availability, no constraint. Experiment plan: basic service data unchanged, only change the number of iterations, each number of iterations run 10 times, take the results of the average.

Table 3. Experimental Statistics Data

iterative times	chromosome	fitness	total price	total time
50	0705020009030607	10.20	91.23	29.77
100	0410040010040701	9.80	94.80	23.15
150	0710000509010303	10.79	88.89	26.29
200	0710000201030303	10.90	90.14	23.85
250	0705000209040703	11.15	83.92	22.52
300	0710000208030303	10.82	90.51	24.12
350	0701000201040703	10.96	87.87	20.14
400	0701000309030303	10.75	86.70	28.61
450	0705000209040303	11.01	83.22	26.08
500	0705000201010303	10.90	90.32	23.98
550	0705080009010303	10.66	87.44	28.83
600	0705020009030303	10.83	86.74	27.86
650	0710000201030303	10.90	90.14	23.85
700	0710010010040303	10.76	85.76	25.68
…	…	…	…	…
1000	0705000310040303	10.73	83.81	27.92
…	…	…	…	…
1500	0705040001040303	10.50	85.78	25.90
…	…	…	…	…
2000	0705000208030303	10.86	85.97	24.25

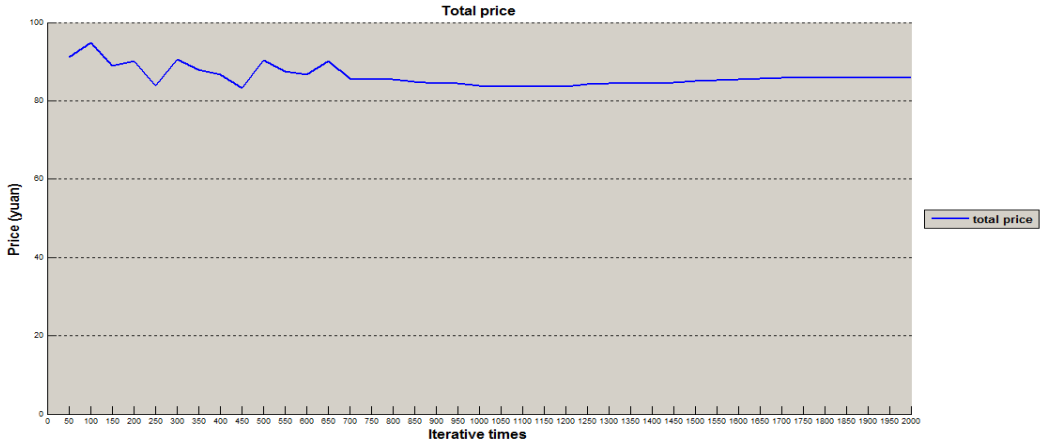

Figure 3. The Total Price of Different Iterations

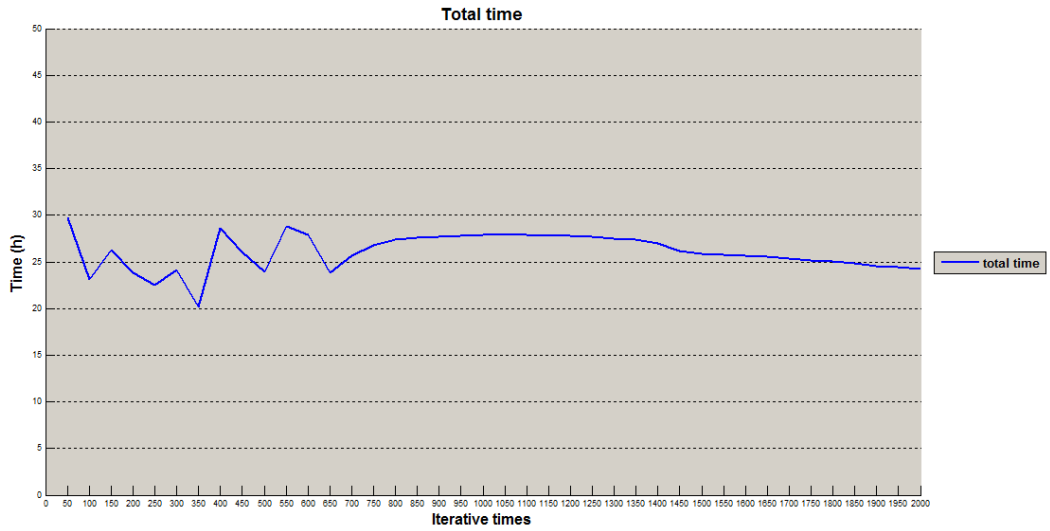

Figure 4. The Total Time of Different Iterations

Based on the data shown in Table 3 as shown in Figure 4, and 5 respectively the total price and the total time of contrast figure. Graphic shows that with the increase of the number of iterations, total prices leveled off near 900 generations, gradually and the total time gradually leveled off near 1400 generations. Because of the multi-objective optimization, multiple target need to strike a balance to obtain the optimal, as a result, both close to the stationary point is different. In addition, as a result of chosen data is relatively simple, if reasonable quantity increase data selection, graphic effect will be more obvious.

5. Conclusion

This article optimized based aviation logistics scheduling logistics cost minimization goal, but due to air logistics space span, can span many countries and regions, they need based on the fourth generation mobile communications and mobile Internet more as an information platform for cloud computing means of communication, for this platform, proposed aviation logistics based on genetic algorithm optimization scheduling algorithm that can be scheduled in a timely manner optimized to obtain better results. In this paper, the need for further research in large data mining and so on.

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