Study on the Online Books Management System for Mobile Internet Cloud Platform

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Abstract

The mobile Internet makes people can access the Internet whenever and wherever possible, in the library and online browsing, due to lack of communication between the various interlibrary resources, which cannot be fully utilized, in order to solve this problem, this article constructed the online library management system based on cloud platform, this system can fully scheduling online book information, and realize the analysis of library needs and the needs of the population, and it has the function which is book recommendation.

Keywords: Mobile Internet, Cloud computing, Data Mining, Library Management, Book Recommendation

1. Introduction

With the development of wireless communication, especially the development of mobile technology, the fifth generation mobile communication system will be commercial in 2020, so the mobile devices, especially mobile phone, tablet computer. This makes people can whenever and wherever possible through the mobile terminal access to the Internet, so as to change the human way of life. In addition to the basic necessities of life has changed the human way, in the book to read, we can obtain information related to libraries through the mobile terminal, and can be retrieved in the database information outside the library, so as to make the information sharing to achieve greater range. And by each borrowing history, based on the cloud platform, the areas of interest and related papers and books recommend, which saves the user search takes time, and it can be based on user behavior to borrow a group of users to the most popular books and relevant information for ranking, thus to further promote the publication and distribution of books and publications [1]. The establishment of these services however this depends on the mobile Internet platform, which allows users to access the library interlibrary through this platform, and according to all the advantages of the library, to the mobile Internet platform to provide the most optimized data resources. The mobile Internet cloud platform itself is a new direction for the academic research and the hot issues based on the related data, parallel algorithm, computing resource allocation, to study many aspects of data prediction. But in some application research, especially the research of library management system is not involved, so this paper studied the application of cloud platform, aiming at the design, it is great theoretical and practical significance.

As shown in Figure1, the topology of mobile Internet, mobile Internet from the overall structure can be a mobile terminal, the mobile Internet and information processing platform. Among them, the mobile terminal and mobile Internet provides a hardware foundation for the information processing platform, and the information processing platform to provide users with a rich variety of services. The user can get the mobile Internet based information processing platform of data service. According to the information processing platform, there is a close relationship between the mobile library

development and the performance of mobile terminal, digital library, and the coverage of mobile Internet. However, with the development of technology, the mobile terminal has been greatly improved, intelligent mobile phone and tablet computer are positioning, gravity sensor, multi touch technology, which provides a hardware foundation for the online reading and the identity authentication of the mobile terminal. At the same time, because the main trunk networks of mobile Internet layout and update, its transmission rate is in the nature of the promotion, it can not only ensure the traditional voice business, such as streaming media, transmission of data can be achieved, for the mobile Internet access system, the skeleton of the five generation mobile communication system can meet the needs of mobile the text, images, audio, video transmission requirements [2-3]. From the above analysis we can get the following conclusions, online library based on mobile Internet has all the information transmission and access to information, but information processing platform for mobile Internet library serious lag in the hardware platform, the application of which seriously restricts the mobile Internet library, at the same time lead to national reading cannot be in full swing.
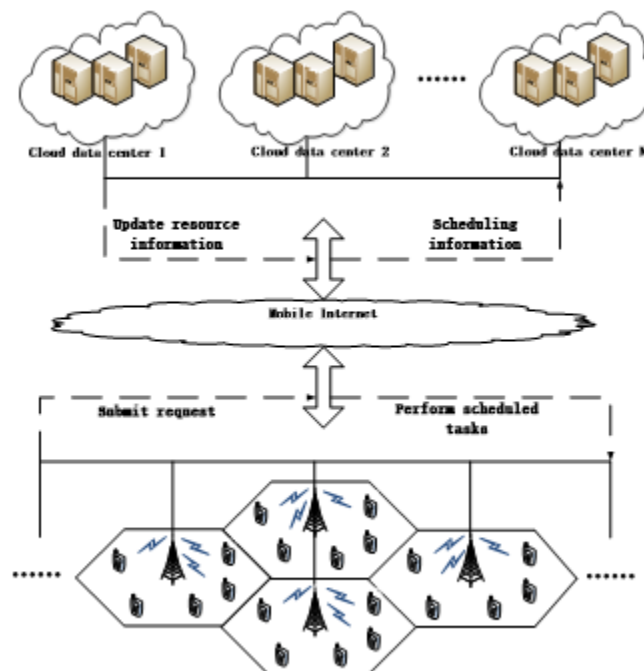
Figure 1. Mobile Internet Topology Map

According to the above situation, whether can be the library management platform of traditional Internet directly into the mobile Internet? The answer is obviously negative. We need analysis disadvantages of Library management of the existing traditional Internet platform. First of all, lacking of a unified interface connection between libraries, so that resources cannot be shared, or difficult to achieve real sharing; secondly, user access is difficult, because the library server belong to different networks, the user access speed will be very slow sometimes; thirdly, each library can serve the project have rigid which have not intelligent. Can only provide the basic functions of online retrieval, such as lending; fourthly, according to the authentication is complex, and the user object is not clear. So, these restrictions severely restrict the development of the Internet library, people did not really feel the influence that the Internet brings to the library *etc*. In view of the above problems, the construction of digital library, mobile Internet need to be able

to achieve the following requirements, in order to make the data resources of the library can be given full play, at the same time it can attract a large number of readers in the reading, it really change people's way of reading and knowledge acquisition channels. First of all, it should eliminate the boundaries between the library break interlibrary jump, it makes the user feel is a library with a library, a museum to do more effect; secondly, for different library resources which should provide more services, processing online reading, can also provide the original data link, the evaluation and Book Keyword search and more complex retrieval service, for the majority of the readers service; thirdly, it should have more intelligent services, through artificial intelligence, information for readers and attention resources are analyzed, and the recommended reading books provide tailored services for readers publishing books; fourthly, according to the information exchange platform, books in each category on the list, but also in some academic papers and academic rank, thus expanding the influence of excellent works, and promote the new research achievements of scholars published timely.

However, all these need the help of a large amount of data operation, according to the characteristics, only cloud computing can be distributed to various operations of different network nodes to a large amount of data, so as to improve the computational performance of the network, for a variety of library management services. The traditional data mining algorithm and the way it is not suitable for analysis and prediction of big data, while the traditional method can cloud computing for massive data mining and parallel computing, but cannot adapt to the mobile Internet access at any time now. It needs to meet the tourism data structure design method according to the characteristics of cloud computing and mobile internet. With the development of computing and communication capabilities of mobile devices, while the storage capacity has been greatly improved, such as intelligent mobile phone, notebook computer and tablet computer *etc.* Statistics show that, by 2015, mobile devices will exceed wired equipment, which has become the main equipment to access the internet. The change from the terminal access problems affect the distributed computing resource pool, the mobile Internet access network and the core of the mobile Internet and its computing resources and storage resources and the number of nodes are different from the traditional Internet, which requires resource scheduling in different ways, at the same time as the business application of Intelligent Mobile phone and tablet computer *etc.* there are many devices, sensing devices and sensor data, such as gravity, direction and GPS positioning information, can provide the spatial distribution information, thus bringing convenience to resource scheduling. At the same time, cloud computing can make mobile Internet access to the following three aspects: first, resources can be stored in the network resources; second, can be obtained by computing resources in the network; third, to obtain other access nodes in the network application service resources.

This paper is based on the above three points, one can build in the mobile Internet cloud platform, based on the cloud platform, which can provide a variety of management books, and combined with the characteristics of cloud computing, we can adopt the way of big data mining, data on the platform, and from different angles, such as novels, prose and all academic fields on the books, papers and other publications rank promotion, and according to the characteristics of user groups, to carry out scientific research and analysis of the hot social concern.

2. Related Works

2.1 Research Status of Mobile Libraries

The application of mobile library can be traced back to the 90s of last century, Finland Helsinki University of Technology Library of the application of the LIBLETTM system,

this system can not only provide short message service, but also consider the wireless application protocol and other access technologies. Japan's Toyama University Library in 2000 developed a I-MODE based mobile phone books inquiry system of OPAC, the first mobile phone library prototype system, then I-MODE for mobile phone readers to provide online bibliographic retrieval, recall, booking, renew, instant notification service [4-6]. Sogang University in South Korea in 2001 launched the mobile library through the mobile phone can access to library materials. University in Korea, students can query through the intelligent mobile phone library if there are empty seats, recipes canteen *etc*. J2ME is USA SUN for embedded, consumer electronic product launch platform, it can be designed as a mobile library system can be installed on the mobile terminal client software, the reader can wireless mobile service provided by the software to access the library. The mobile library project of Athabasca University in Canada, *i.e*. M-library was proposed at the IADISmlearn conference in 2005. This website uses hypertext preprocessor language, through server-side scripts to identify different browsers. Through the analysis of the client browser, the server can determine the client's operating system is windows CE or Palm OS. Then, the system will select the appropriate style table (stylesheet) and the display mode; the digital information will be adapted for different browsers and re format for reading. In July 6, 2009, OCLC announced, WorldCat mobile application pilot extended to Europe, users can use mobile devices to the WorldCat member library collection. At present, Holland, Germany, Britain and France, mobile phone users can access. WorldCat mobile access from the mobile terminal through the pilot Web application, allowing users to search and find them in the vicinity of the library provides books and other materials. Www.WorldCat.org is the world's largest online resources website, the pilot program in the mobile America and Canada have proved to be a huge success. Advanced global positioning ability let WorldCat help users through mobile phone found in the local library. The rapid development of mobile Internet American is a representative of the mobile library application in the universities and research institutions. In 2012 January, is part of the university library are accessible via the Internet USA's official website, to understand the application of American mobile library service.

Many aspects affect the current domestic technology in the mobile Internet to bring out the future development mode of the library, but the mobile Internet technology in the research and practice of construction of mobile library system is relatively small. Study on the practice of mobile library literature appeared after 2007. If you have published the "GW by using 3G communication technology to build the future of mobile phone library", Xin Xu published "on the construction of mobile phone library service system based on 3G", Feng Gao write " the realization of mobile 3G technology in library online information retrieval system based on the technology ", Liang DU published " construction of mobile phone library based on 3G technology ", Liang Wang published " Digital Library under the overall design and function realization is support by 3G technical ", Chunyan Wang published "the design and implementation of mobile information service system based on 3G technology in the library ", Xueping Liu published "the design and implementation of information service system based on 3G technology of mobile phone library". More than seven papers for the third generation mobile communication system, the mobile Internet environment, the mobile library construction of this system model, the functional module design and the whole organization structure put forward the overall design scheme. Wei Fang *et al* published "The design and realization of mobile library system based on the integration of resources ", it is the earliest mention of relying on the resource integration platform to build mobile library literature. This paper describes the use of Eli Beth's META-LIB TWIMS of the Tsinghua University mobile library system combined with mobile Internet technology. With the development of mobile library technology practice research gradually thorough,

relevant literature relates to the specific structure, language, interface and prototype. Jingwei Li published "a mobile library service based on layered and heterogeneous MANET system" in September 9, 2010, the National Library in the 101 anniversary of the occasion, launched a new version of the mobile portal website "WAP handheld map of china". So far, the development of China Mobile Library has cross on a new level. Peking University released a new version of its mobile library in March 30, 2011. In November 28, 2011, the Tsinghua University library officially launched a new version of the mobile library. In 2012, the first edition of the mobile library service, Beijing Institute of Technology has introduced a new generation mobile library system. Compared with the old version, the new system is more suitable for 3G mobile network environment at present, service is more diverse, not only contains the library OPAC service content retrieval, also provides part of the digital resources of mobile reading function. In addition to the practice of library research scholars, technology research, a number of IT companies also actively involved in the mobile library. Which is the most representative of Beijing scholar company and Beijing superstar company. From the above research status at home and abroad, most of the software development are realized based on WAP, the main concern is the problem of the mobile phone access to the library website, and no further thinking, how to use this advantage, provide more diversified and customized service.

2.2 The Data Frame of Cloud Platform

Cloud computing is proposed and the tourism commercial promotion, promotion of tourism information, intelligent and customized tourism. So gradually in 2010 the concept of "cloud computing" was put forward, which promotes the development of cloud computing data, but it is based on the framework of the traditional Internet, the real-time data and business diversity are not mobile Internet and compared. Cloud computing is proposed to spread to various areas in the application; the application is a very important field of tourism. At present, cloud computing is mainly composed of IaaS, PaaS and SaaS service model, and the various types of XaaS (X represents at least more than 3 cases) model to define. At the same time, in order to define the application model of cloud computing, cloud computing is usually divided into the public cloud, private cloud and hybrid cloud. According to the International Data Corporation statistics, cloud computing in just a few years, which has been applied in various fields, and it has brought huge economic value. At present, the famous cloud computing platforms such as Google Apps Engine, Amazon EC2, Microsoft Office live, NetSuite Suiteflex, IBM Lan Yun, and the professional application of cloud: cloud manufacturing, cloud simulation platform, network cloud platform, cloud computing, cloud computing, scientific education platform based on. People in the academic circles of cloud computing launched a wealth of Research Trust / security research, cloud environment resource assessment modeling and Simulation of cloud computing, cloud service quality and system structure *etc.* In [7], the concept of cloud computing platform and the author analyze and summarize, from the perspective of the concept of the platform and what is cloud computing; in [8], the author summarizes the architecture and key technology of cloud computing, cloud computing and the latest research progress; and in [9], the author comprehensively summarizes the practical principle and research status of cloud computing. Travel in the cloud, according to the IaaS framework, and the calculation function of configuration function groups' characteristics on the distribution of tourism resources, tourism and to analyze the data of the user. It constitutes the basis for the framework of the whole tourism cloud; in the PaaS framework, IaaS framework can be extended based, adaptive ability and application ability obviously has been expanding, application platform can be constructed on the basis of various. In the two frameworks is based on SaaS framework, it can further optimize the

business system, this system can according to different requirements, namely different data structures, which can get high precise customized software.

The principle and technology of cloud computing, and distributed computing based on Internet mode to build a tourism meet the needs of the parties of tourism informatization frame structure, and according to the needs of the parties for new mode of tourism information dynamic deployment, configuration, reconfiguration and cancellation of service in tourism cloud platform built on; at the same time, but also to meet the cloud computing according to high reusability, the calculation, load balancing and scalability and other characteristics can be rented. Should also include virtual tourism resources of the parties, and the virtual tourism resources is security application and reuse credible; usually virtualized resources can include storage virtualization, virtual device virtualization, application virtualization, platform virtualization and desktop virtualization server. 1) Server virtualization: it is made of one or a plurality of virtual physical servers into a plurality of complete, reliable server for different needs; it is also the basis of IaaS, which can be used to provide/rented server support for different needs. 2) Memory virtualization: it is the unified management of storage resources of the whole tourism cloud system, which provides a unified storage space, so as to separate the different needs of users, and unified collaborative optimization, data storage management of the whole tourism cloud; 3) Application virtualization: it is the tourism cloud by cloud (different user groups) abstract the application depends on the underlying system and hardware, and formed an independent and integrated application, so as to relieve the coupling relationship between the application and operating system, hardware. In the domestic market, aiming at the various channels of data source analysis, only a very small part of the consulting company started with the use of questionnaire survey on the behavior data of mobile Internet users to conduct research, collect and research through the desktop, but according to the number of channels often will generally have periodic lack of continuity, data collection is long, regional factors influence for the questionnaire, the accuracy is poor, resulting in the actual data source as the desktop of the effect is not ideal. At the same time, although the distribution channels through the download platform part of intelligent mobile phone App can also get downloads, App analysis using statistical data, but due to the iOS App Store data are not publicly available, Android Market platform has many download branch channels at home, the feedback effect is bound to the one sidedness of very large it is hard to see the real, comprehensive data, comprehensive high consistency. At the same time, through in-depth analysis, intelligent mobile phone users to download the App from the actual installation, use the App activation process, the user's loss rate still has a very high proportion, so rely solely on downloads to judge the user's actual behavior, and to determine the actual mobile Internet user behavior trend will have serious problems, a lot of large deviation, it is difficult to obtain the final real and objective data result. It is based on the characteristics of the mobile Internet, the demand for library management, this paper developed a cloud management platform, this paper will make software development for the next computing resource allocation and forecast data cloud platform.

3. Proposed Scheme

This article developed a library management system based on cloud platform, this system can deal with the data characteristics and data transmission characteristics of library management, computing resources on cloud platform in the cloud platform data distribution and prediction of software design, but the design for the application of traditional hand machine, this is no longer here, there is detailed description of the software development of the mobile Internet.

3.1 Computing Resource Allocation Based on Data Software

We can see that based on the cloud platform intelligent library management system consists of 6 layers and 2 service modules from the architecture, 6 layers respectively as the data source, data integration, data storage, data analysis, information display and business applications, 2 service modules for the entire system to provide security service and access control service.

1) Data source

The system supports multiple types of data source access, which mainly include two categories: the first category is related to business data and the intelligent management system, including the relevant data of library login user, the relevant acquisition system data of user browsing, the data of buying system, the data of classification system; the second is the external data, including book information providers data released from the system, authoritative data organization to get this type of data.

2) Data integration

The layer through the parallel ETL technology will be the data source layer through the data extraction, conversion, and a series of loading process is loaded into the data storage layer. For different types of data sources we provide a different ETL interface, and ETL process parallelism can be set according to need.

3) Data storage

The data stored in the cloud data warehouse, data warehouse using distributed cloud storage technology to meet the massive data storage requirements, not only economic, safe and reliable, and easy to expand. In order to satisfy the users of real-time and non-real-time data processing needs, cloud data warehouse is divided into two parts: ODS and distributed data warehouse, which ODS used to meet the needs of real-time.

The data storage, distributed data warehouse to meet the demand of real-time data storage. Between the ODS and the distributed data warehouse through the interface to meet the specific needs of the data exchange.

4) Data analysis and processing

The data analysis layer of cloud data in data warehouse provides three types of treatment: query, OLAP multidimensional analysis, data mining and machine learning. Query used to meet user demand for real-time data, these data are stored in the ODS data storage layer; multidimensional OLAP analysis, parallel computing technology based on multidimensional analysis, to meet the user OLAP on massive data demand analysis; data mining and machine learning provide clustering, outlier analysis, prediction, correlation analysis *etc.* various types of parallel data mining algorithms, user support mining data from the mass of the unknown, valuable knowledge, so as to provide the basis for decision making.

5) Information show

Information presentation layer mainly adopts simple appearance, landscaping tools FusionCharts as the display mode, dynamic index and parameter display, including histogram, pie chart, line chart, real-time map, scale diagram and other chart display form.

6) Business applications

The application layer provides business oriented intelligent multi-level electricity application, including the amount of cost analysis, book borrowing analysis, literature analysis and user behavior analysis and recommendation.

7) Service module

The service module of the system provides the system security and access control service. From the security application system security, identity authentication, application security audit, data storage, data integrity, confidentiality, non-repudiation, resource control, application of software fault tolerant data backup and recovery and other aspects

of security; access control service provides a flexible allocation mechanism for access system resources, and ensure the safe use of the system resources.

The ETL layer shall meet the following specifications:

(1) for extracting data to the HBase data table support available from the Oracle database and WebService data source;

(2) Supporting the HBase data write back to the Oracle;

(3) Supporting the parallel of ETL process, this can set parameters by the degree of parallelism;

(4) Supporting the incremental of ETL process, according to the fixed field of continuous incremental extraction of data, but not every time total extraction of all data;

(5) Supporting the optimization of HBase rowkey, date conversion, string concatenation, taking substring of string, a variety of data conversion rules;

(6) Supporting to discard the abnormal data, stop running, log and other exception handling way.

Based on the ETL flow chart of MapReduce computing framework shown in Figure2
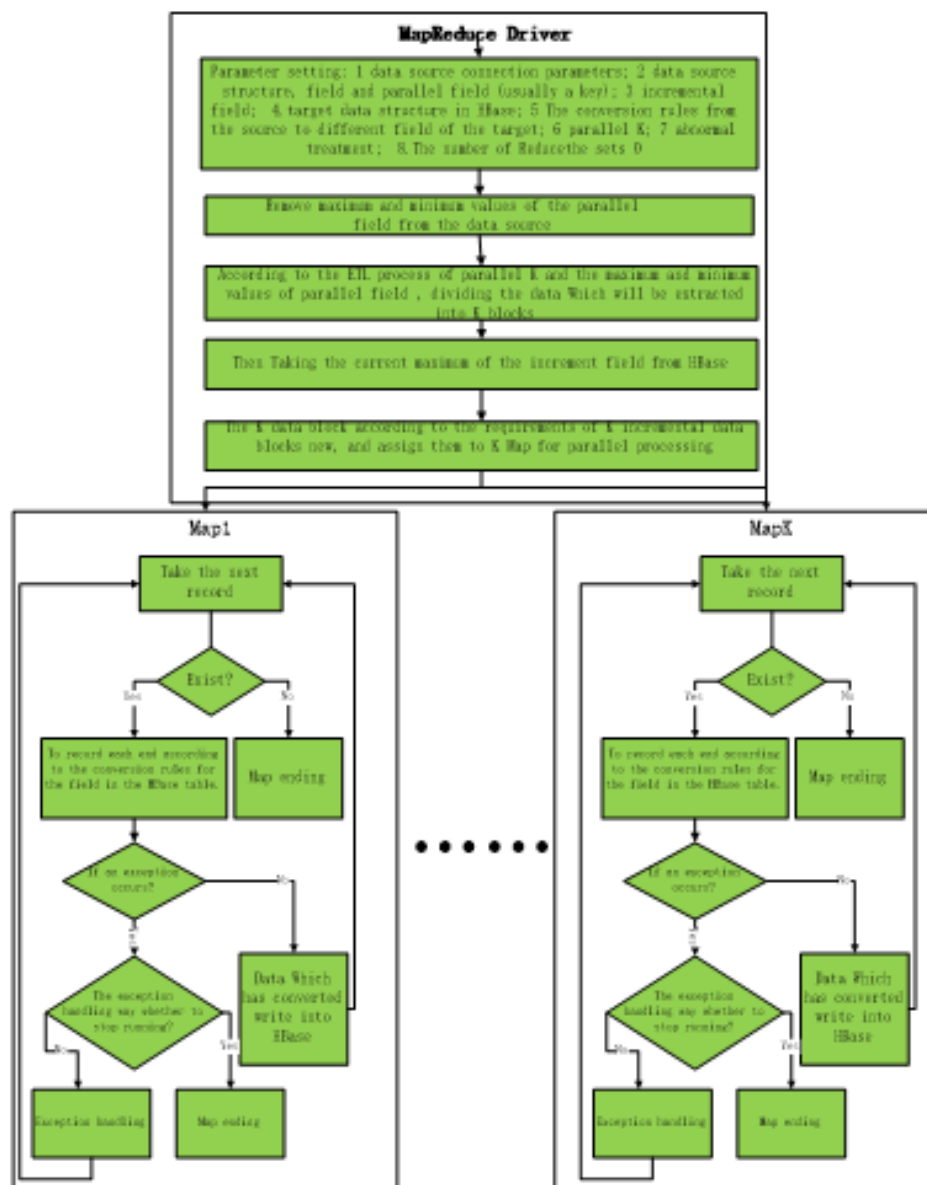

Figure 2. The ETL Flow Chart of Mapreduce Computing Framework

The core of the scheduling algorithm mainly depends on

$$T_{l_i} = d_{ij} \Big/ \left(P_i * \rho_{l_i} \right)$$

(1)

Where ρ_{l_i} represents computing capacity of this task node, but because of bandwidth limitations, the need to consider the transmission time node information transmission, transmission time is T_{cl_i} (including the transmission time before and after treatment), the total time for the completion of this business is T_{z_i}. According to the computing services provided by virtual machine, the energy consumption of each virtual machine computing service computing unit is E_{l_i}, due to the propagation system is different, according to the system network, the energy needed of unit data transmission (including the required energy of uplink and downlink data) is E_{cl_i}, so the required energy of transmission is

$$E_{zl_i} = E_{cl_i} d_{ij} + E_{l_i} t_1$$

(2)

According to the definition of the above model, resource allocation can be needed by defining the optimization model, in the past, often takes the business processing time, the time delay processing business, which is also an important indicator of the fifth generation mobile cellular communications, but also an important index required for handling business energy consumption aiming at the problem, this paper puts forward the optimization of energy consumption, energy consumption and taking into account the processing delay problem, it puts forward the following optimization problems

$$\min \ E_z$$
$$s.t. \ \ T_{z_i} \le \eta_i$$

(3)

Where, E_z is the consumption energy for all tasks, it can be shown by (4)

$$E_Z = \sum_{i=1}^{M} E_{l_i}$$

(4)

3.2 Data Prediction Based on User Behavior

User login to the system can be used for screening operation on the characteristics of different users, and can cross analysis will have different characteristics of user groups. The user feature dimensions selection case diagram is shown in Figure3. The main function of the user module of the user selected feature dimensions include from sex, marriage, age, educational level, personal monthly income, where the provinces, where the company, industry, occupation, dimension of these user characteristics of the mobile internet intelligent mobile phone equipment system the user selection, which can also be analyzed according to the user's reading habits, areas of concern, *etc.*, but before the need to conduct a detailed classification of the focus areas, in order to make the analysis of the data and user behavior has practical significance. And can be selected for App and website or industry classification results for analysis of a number of cross compound.
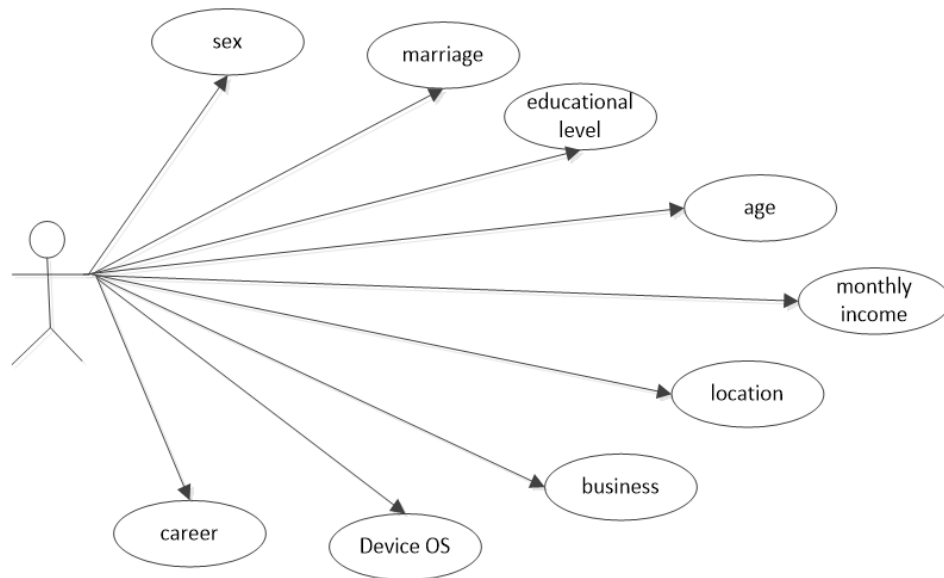
Figure 3. User Information Feature Selection

4. Simulation Results and Analysis

In this paper, the calculation and simulation of the cloud computing model for the mobile Internet, so it needs to build a cloud simulation platform, the cloud model platform used cloud computing simulation common platform CloudSim, which developed based on the distributed parallel calculations, using this platform can through computer simulation and data storage resources transfer, but lacking of link topology changes, according to the practical situation, this experiment which has been modified, according to the topological graph to modify its data transmission and transmission time. The simulation environment includes the configuration of computer environment. The computer simulation environment as shown in Table1

Table 1. The Configuration of VM

	processor	memory unit	hard disk
VM_1	1×2 GHz	4 GHz	500 GB
VM_2	2×2 GHz	8 GHz	1 TB
VM_3	4×2 GHz	16 GHz	2 TB
VM_4	8×2 GHz	32 GHz	4 TB

To achieve the model based on virtual tasks and scheduling, the core algorithm for the development of writing, the scheduling interval according to the simulation environment is different; it needs to be set up separately.

The resource utilization rate as show in Figure4, the proposed resource utilization rate was significantly higher than that of other schemes, we can see that the proposed scheme can have strong computing ability in business; tourism information which can be done fast data mining, thus obtained the mobile cloud platform of tourism information suggest high efficiency. As can be seen, the calculation efficiency of tourism mobile cloud platform provided is much higher.
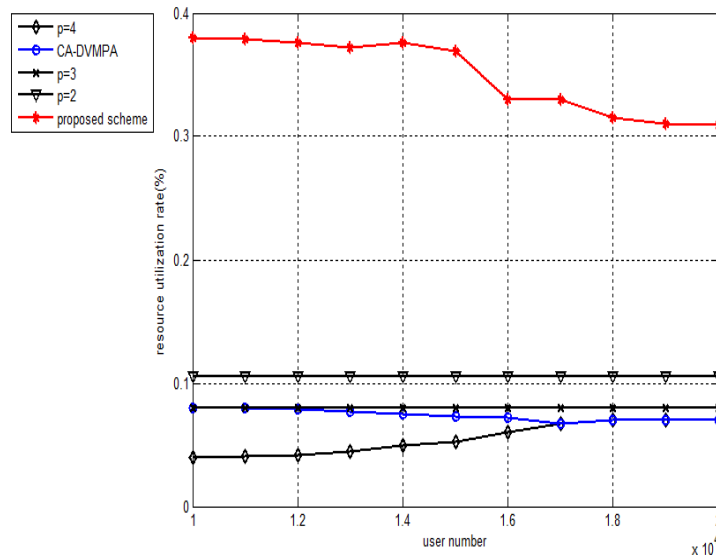

Figure 4. Comparison of Resource Utilization Rate

5. Conclusion

According to the characteristics of information and library management of mobile Internet, which constructed the manner of screening data, in the calculation of resource allocation, this paper adopts the optimizing energy efficiency scheme, taking the business processing time into account, through the simulation experiment platform, it can get the resource utilization rate has been greatly improved; at the same time, it put forward the data prediction of user behavior, and give full play to the advantage of the cloud platform, the experimental results show that the proposed scheme has high accuracy.

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