

Big Data Analysis System for Smart Motor Vehicle Driver Training

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Abstract: With the continuous improvement of people's living standards, cars have entered the homes of ordinary people, and every year, Every year tens of thousands of students get their licenses. However, due to various reasons, there are still a series of problems in the subject examination. In order to improve the quality of motor vehicle drivers, scientific training and management are necessary. The development of big data provides more application platforms for intelligent learning. Studying training data in depth by using data mining and other technologies can provide more effective training programs for motor vehicle drivers and coaches. This paper introduces a big data analysis and analysis system for intelligent motor vehicle driver training, and puts forward an intelligent learning system architecture based on big data based on in-depth analysis of intelligent learning system model, Utilization through analysis of driving skills training data, hoping to improve the comprehensive quality of vehicle drivers and reduce heavy losses and casualties caused by frequent safety accidents through comprehensive driver training system.

1. Introduction

The arrival of the era of big data exerts a subtle influence on all areas of society, and the development of society puts forward new requirements for the training of motor vehicle drivers [1]. The teaching activities of intelligent learning are combined with learners' knowledge structure and discipline training objectives, which can fully show learners' individual characteristics. Data mining is the main application field of big data in intelligent learning system. Big data of motor vehicle driver training can directly reflect learners' learning status and individual needs differences. Through big data analysis, we can diagnose the level of learners' knowledge and ability, and combine the interests and hobbies of motor vehicle drivers to customize personalized learning content for motor vehicle drivers [2].

Under the tide of times change in the Internet industry, the combination of motor vehicle driver training in internet plus will rapidly produce a benign chemical reaction. Based on the big data framework, this paper analyzes the ecological mechanism of intelligent learning system, and proposes an intelligent learning system based on big data, which can make learners' learning activities more intelligent and personalized. To promote the reform of driving test industry and establish a scientific and efficient driver training system, so as to effectively promote the development of public transportation safety in China.

2. Abstract Description of Training Process

Driver training, like other training undertakings, must have a scientific school-running system, scheme, steps and measures, which can be abstractly called training function F . The factors involved in this process are called factors: let the trainees be X factor, coaches and managers be J factor, material facilities be S factor, and qualified trainees be Y factor.

The function form is:

$$Y = F(X, J, S) \quad (1)$$

The meaning of J is to use the method of F to process student X into Y through the optimized combination of equipment S . A set of best J_j and S_j values can be established for any x_j , so that the higher the value of Y , the better the scientificity of F_i . That is to say, the design goal of this intelligent management system is to pursue an optimal F_i and make Y the best, namely:

$$Y = \max_i \max_j F_i(X_j, J_j, S_j) \quad (2)$$

The teaching and management staff J is a factor of the function when analyzing the function F , but in terms of function, it is the master of the function. It is that it adopts the best teaching plan (F_i) and reasonably uses the facilities S to train the students X . Therefore, J is the implementer of solving F function, in which the values of X and S are passive, and only the value of J is active and active.

Based on the above description, according to the experience of training process, the author established the corresponding knowledge base, and designed and implemented this intelligent management system by using the principle of expert system.

3. Big Data System Architecture

Under the application background of big data, the implementation mechanism of intelligent learning system has made new progress. The intelligent learning system architecture based on big data proposed in this paper can be divided into data layer, information layer, control layer and application layer [3-4], as shown in Figure 1.

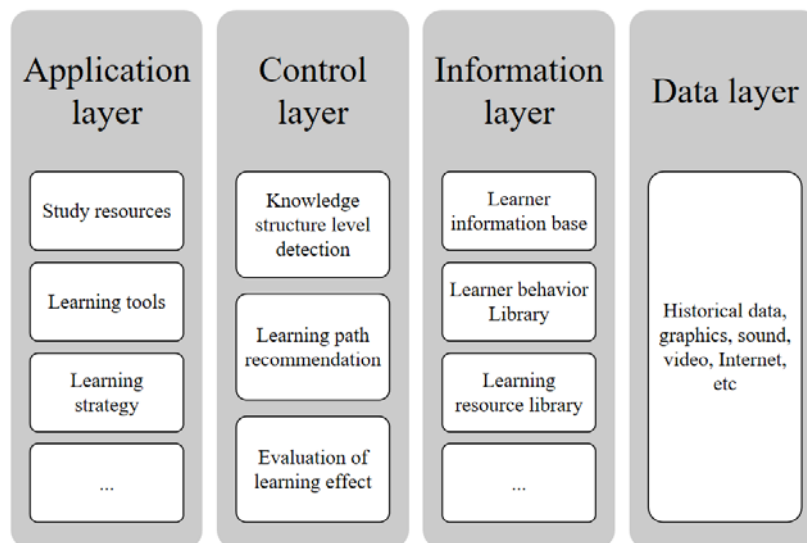


Fig.1 Big Data System Rack

(1) Data layer

The data layer stores structured and semi-structured original data, and the data acquisition mode is through the interface module. The source of the original data can be historical data, sound, image, video, click stream and so on.

(2) Information layer

What is stored in the information layer is a meaningful data set. Use ETL and other technologies to clean, transform and integrate the original data stored in the data layer, refine it into effective information and store it in the database of learner information base, learner behavior base, domain model base, learning resource base, learning tool base and learning guidance strategy base [5]. At the same time, the process of data collection and refinement is continuous, incremental information is constantly formed, and the contents of each database are constantly updated.

The data of this system is based on the differential positioning judgment of GPS vehicle terminal, transmitted to the information center through 4 G network, and stored in the cloud server according to the project training data.

(3) Control layer

The control layer is the core application of intelligent learning system. The adaptive engine can realize individual learning for learners according to the learner characteristic model and domain model. During the learning process, the learning effect is evaluated constantly, so as to realize the continuous improvement of engine rules and achieve the goal of engine self-evolution.

(4) Application layer

The application layer is used to provide services for users, who can be learners, coaches, domain experts and tool developers, providing them with learning resources, learning tools, learning paths and learning strategies.

The application layer is a three-layer structure based on C/S mode, which is developed with DELPHI.

4. System Construction Scheme Design

4.1 System Functional Architecture Design

By using cloud server storage mode, subject 2 and subject 3 skills training data are SOCKET communication mode through network mode. The system includes subject 2 management, subject 3 management, training log management, coach information management, achievement management, data analysis, early warning analysis and expert evaluation.

4.2 Management of Data Information

Only distributed storage, data platform management is not enough, but also data information management in cloud computing software test application [6]. Cloud computing technology can show high efficiency and agility in data information processing. Under these two characteristics, it can analyze and feed back the results to the recommendation model again. The learning path recommendation model is continuously optimized by particle swarm optimization, so as to consolidate the learning achievements of motor vehicle drivers and provide data support for subsequent learning.

4.3 System Database Design

Data is the core of driver training management system. Generally speaking, the workload and capital investment of database design and construction account for 70% of the whole system. The quality of database construction is related to the quality of the whole system construction, so database design is the key to the system design.

(1) Driving training record data

During the driving training, the trainees will use IC cards to insert cards for authentication every time they get on and off the coach car. Record every boarding time, learning time length and total time length of each trainee, record every learning mileage, total learning mileage, stopping time and other data information, and then the driving school uploads the training records of each trainee through the coach card and saves them in the driving school database [7]. Because these data are inherited from recorder software, there is no need for special processing in driving school management system.

(2) Driving school management data

According to the business process and function analysis, it is necessary to establish various tables except system users, including student information table, coach information table, driving school information table, vehicle basic information table, training log table, examination information table, abnormal information table, Theory study schedule, theory study temporary table, operation log table, early warning information table, comprehensive evaluation table, etc.

(3) Analysis of data

Comprehensive statistics, reports and analysis can be made on the data such as examination pass rate, passing rate of driving school, number of examiners, passing rate of examination items, deduction points of examiners, deduction points of sub-examination rooms, number of examiners, passing rate of examiners, number of examiners in driving schools and passing rate of driving schools.

(4) Logical structure of database

The logical structure of the database of the system is designed by using the user requirements obtained from data requirement analysis. The database design in the process of system design is realized by Oracle 11g.

4.4 Terminal Function

(1) Actively upload data;

(2)GPRS blind area data supplementary transmission function;

(3) Alarm: including alarms such as robbery prevention, power failure, speeding, crossing the border, not starting the vehicle according to formal procedures, parking over time, and not driving within the specified time;

(4) Dispatching and emergency help;

(5) Remote control, remotely operate the vehicle, and control the running track and condition of the vehicle from time to time;

(6) Automatic storage alarm: it can record and store the over speed and out-of-bounds situations outside the normal working hours in detail and give an alarm after the system is started normally;

(7) Record of accident suspect data: By expanding the adapter of the vehicle, the brake, left and right direction lights, front and rear doors and other vehicle states can be input. We can remotely control the locking and air conditioning operations of vehicles;

(8) Remote upgrade and self-check function: It allows the vehicle-mounted terminal to carry out system upgrade and self-check of the vehicle-mounted terminal software and equipment without being present remotely, which is convenient for the maintenance of the terminal, saves a lot of unnecessary expenses, saves time and improves the maintenance efficiency of the terminal;

(9) Upload operation data: the driving school records detailed information for each vehicle and uploads it in time, so that the coach can know the information of the vehicle in time, and when there is a problem with the vehicle, the fault point of the vehicle can be judged at the first time. Upload the student's class hours in time, and according to the statistics of class hours, it will determine the progress of the students, whether the class hours have been completed and whether they have reached the examination qualification;

(10) Power saving control mode;

(11) Car phone, that is, when something goes wrong, it will contact the outside world through the car phone at the first time;

(12) Reserve an extension connection, which is a node prepared for subsequent addition of hardware equipment or software equipment;

(13) Short message and real-time clock function.

5. System Function Realization

5.1 Implementation of System Function Module

In order to meet the business needs of different users and show the flexibility and ease of use of the system, we designed the business logic layer in detail. The driving training management system mainly includes the following modules: driving school information management, driving school coach management, driving school vehicle management, driving school student management, related statistical reports and so on. The functions mainly cover the inquiry, statistics and management of basic information of driving schools, coaches and trainees.

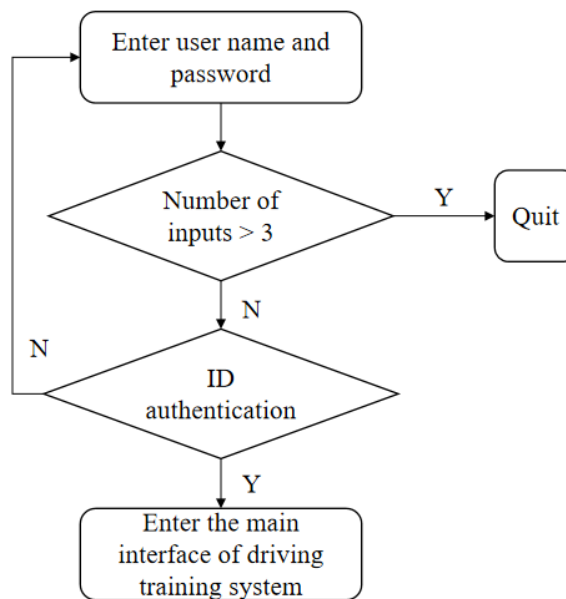


Fig.2 Flow Chart of System Login Part

When running the system, the first step is to log in to the user login interface as shown in Figure 2. Only those who enter the correct user name and password can enter the system. To protect the password and steal the password for others, the number of passwords entered is set. If the number of passwords entered continuously reaches three times, the system will automatically shut down for a period of time.

5.2 Driving School Information Management Module

For the convenience of the user, after the user enters the system, the system will be presented to the user in the form of a tree, so that the user can see at a glance what module he wants to find and go in directly. Of course, in order to prevent other people from entering to tamper with the system settings or other things, the system will also present diversity in different forms according to the user's needs.

The system supports accurate query, and you can enter the name of the driving school, and then click the "Query" button to query. Before the query, the basic information of all driving schools under the account will appear by default. Fuzzy query is also supported, but the time consumed by fuzzy query will increase, but the amount of data information given to us will be very large.

Site information: The system can query the site information of each driving school (the area of training site, the length of training road, the total area of teachers, the number of teachers, simulated pile positions, etc.). Customers can compare the information according to the information on the Internet and check whether the driving school standard matches the information of the motor vehicle driver training management system. At the same time, verify whether the information of the driving school is consistent with the actual situation. If there is any wrong information, you can report it anonymously.

Personnel information: you can check the detailed identity information of relevant professionals in each driving school. Customers can clearly see the driving school information, legal representative, some business conditions, contact numbers and other information will be presented in this column. This column is mainly set for the convenience of users, and compares the responses of different driving schools, so that customers can choose their own driving schools, which is the ultimate goal of setting this column.

5.3 Driving School Coach Management Module

Coach management in driving schools is divided into: coach information, coach working hours, complaint management, driver's license expiration reminder, coach certificate expiration reminder, coach age reminder and so on.

Coach information: enter the detailed list to inquire the coach details. Detailed information of coaches will be displayed here, including the time of obtaining driver's license, the permitted driving models and the valid years, etc.

Coach's working hours: according to the coach's working hours, working efficiency and accidents, the coach is assessed as qualified, and the unqualified coach is trained in time. If the coach fails to meet the standard twice, the coach's certificate will be revoked, and he is not allowed to be a coach again during the revocation period. Excellent coaches can be given some material rewards. Our purpose is to make coaches treat students patiently and responsibly, so that students can study in a better environment.

Complaint management: the complaint management module can check the complaints of trainees to coaches. During the study period, if there are irregularities or verbal conflicts in the training process of driving schools or coaches, they can make timely complaints here.

Driver's license expiration reminder: the driver's license expiration reminder module can view the appointment date of coaches, and the list of coaches displayed by default is the data of coaches whose driver's license expires after 2 months from the current time.

5.4 Driving School Vehicle Management

Click to enter the basic information sub-column, you can query the information of all registered vehicles at present, and you can also selectively query the information of all vehicles in a driving

school, so that students can pay attention to what to do after getting on the bus, and remind coaches that the vehicle is about to be maintained.

Driving school student management module can manage driving school equipment. User-defined query is supported. The license plate number, model and registration date of the equipment can be found by querying a piece of information of the equipment. Students can identify whether the car they have learned is safe or not and what level it belongs to.

Information printing mainly means that after a student finishes a stage of study, relevant information will be printed, and the student needs to confirm according to the test results. Finally, the information will be saved in the file for later inquiry. You can enter a student's name, query the relevant information, and press the "Print" button to print the student information.

6. Conclusion

With the continuous development of big data and cloud computing, the training of smart motor vehicle drivers has been promoted. The learning process of learners has been preserved to form massive training big data, which provides an important basis for training optimization. This paper summarizes and puts forward a smart learning system based on big data in previous studies, which is helpful to stimulate the learning interest of motor vehicle drivers, intelligently recommend personalized learning resources and learning routes, and assist coaches to adjust teaching plans reasonably. Systematic evaluation of trainees' training records, However, more empirical research is needed in the later system to ensure the accuracy and completeness of the recommendation model.

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