Research on Asphalt Pavement Diseases and Construction Quality Control under the Background of Big Data

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Abstract: In the context of rapid social and economic development, the transportation industry is under increasing pressure, and the requirements of vehicles on roads are increasing. People are paying more and more attention to the quality of asphalt pavement. However, due to the threat of excessive diseases, the pavement is prone to water damage and cracks. Therefore, it is particularly important to strengthen the quality control of asphalt pavement construction and disease prevention. Based on this, this article conducts an in-depth study on asphalt pavement disease and construction quality control under the background of big data. Based on the big data mining technology, this paper realizes the research on the relationship between pavement disease problems and influencing factors such as air temperature, surface porosity and traffic load, summarizes and analyzes several problems in the construction process, and proposes common disease prevention measures. Research shows that to improve construction quality management, it is necessary to establish a construction information database based on scientific statistical methods, monitor key indicators in the construction process in real time, and control and manage the entire construction process. Once problems are found, effective measures must be taken to solve them in time to ensure that the construction can be carried out smoothly, thereby effectively improving the level of pavement construction.

Keywords: Big Data Technology, Asphalt Pavement, Construction Quality, Disease Prevention

1. Introduction
Asphalt pavement [1-2] is one of the most common pavement types in highway construction. As the main material of asphalt pavement, asphalt pavement has the advantages of comfort, wear resistance, sturdiness, high flatness, and easy maintenance. Moreover, the durability and anti-skid performance of asphalt pavements are high, making asphalt pavements more popular than other types of pavements. However, after the road is used, there will be road cracks and collapse due to the increase of road vehicles. Therefore, in addition to paying attention to the construction quality of asphalt paving,
attention should also be paid to road maintenance and repair. Diseases such as high temperature [3], road cracks [4], water damage [5], oil spills [6], potholes [7] and other diseases are all important reasons for the decline of road service levels. In addition to greatly reducing road performance and service life, it also reduces the comfort of the car. They can cause the most serious traffic accidents and endanger personal safety. In order to restore or improve the performance of the road surface, extend its service life, reduce the risk of accidents and ensure personal safety, certain medical measures must be taken before the road surface performance deteriorates to a certain extent. Therefore, timely and accurate prediction of the condition of the asphalt pavement is essential to determine the scientific decision-making of pavement maintenance and obtain better maintenance benefits. The information used in this article is structured information related to pedestrian performance. Distributed storage software [8] has been selected for professional processes, such as import, pre-development, query design, etc. SPSS software [9] is used for research analysis and sensitivity analysis. It is based on data mining, data model analysis and key performance prediction of asphalt pavement.

Therefore, this paper analyzes and studies the problems of asphalt pavement diseases and construction quality control on a large scale [10]. This paper chooses professional distributed storage software to process information related to road performance, and SPSS uses data mining and analysis data models to identify software for data mining and analysis, and realizes road disease problems and air temperature, surface porosity and traffic. Research on the relationship between load and other influencing factors, and put forward common disease prevention and control measures.

2. Common Diseases and Prevention Strategies of Asphalt Pavement

2.1 Common Diseases of Asphalt Pavement

1. Crack
Stone cracks often appear in the construction of asphalt pavements, such as structural cracks, horizontal cracks and longitudinal cracks. Due to various factors such as floor strength, vehicle load, climate and environment, the types of road cracks are also different.

2. Potholes and looseness
The current asphalt road construction technology takes into account the risk of water damage, and in principle there is no early water damage, but after a long period of temperature expansion and contraction and repeated vehicle loading, the road surface will be rutted and cracked. With the advent of the rainy season, water will gradually erode the asphalt overlay, scrape away minerals, reduce the adhesion and structural strength of the asphalt, and cause problems such as cracks and looseness.

3 Oil flooding and rutting
The oiling is due to the fact that the petroleum content of bitumen is very large and its porosity is very small. Rutting is carried out under repeated loading of vehicles. Asphalt is heated and expanded at high temperatures, filling up the road surface and causing oil to flood. At the same time, insufficient asphalt construction experience or incorrect asphalt mixing can also cause oil to spill on the road.

2.2 Construction Quality Control Measures of Asphalt Concrete Pavement

1. The quality of asphalt mixture
If the raw materials are not suitable, the service life of the asphalt concrete pavement will be greatly reduced. Therefore, it is very important to improve the quality of asphalt mixture, so the type of asphalt should be selected according to the road grade, weather conditions and pavement type. Therefore, the competent authority should pay attention to the distribution of asphalt and do not mix it to prevent pollution.

2. Paving
When the truck enters the paving site, it is important to ensure that the load frame is clean and the tires are not loaded with dirt that pollutes the road. In the process of laying the floor, the material rack
should keep a distance of 10~30 cm from the partition. The cleaning agent should push the material rack forward and slowly remove the material. During this process, avoid touching the cursor. After the paving is completed, the vehicle must be cleaned up.

3. Rolling
For rolled asphalt paving, the rolling time is strictly determined by the test room according to the rotation time. Rolling is divided into three stages: initial rolling, additional rolling and horizontal rolling. Initial crushing is also called initial crushing, and the temperature during this process should not be lower than 80°C. It should be noted that high heat exchangers should be used as much as possible to ensure that the road does not crack during driving.

3. Experimental Thinking and Design

3.1 Experimental Ideas
This paper analyzes the problems of asphalt pavement disease and construction quality control behind big data. This paper chooses professional distributed storage software to process information related to road performance, and uses SPSS software to realize data mining and sensitivity analysis models, and realizes road disease problems and influencing factors such as temperature, surface void ratio and traffic load. Relationship study, summarizes and analyzes many problems in the construction process, and proposes common disease prevention and control measures.

3.2 Experimental Design
The availability of big data has greatly contributed to the current problems of asphalt paving and construction quality control. High-temperature rutting, cracks, water damage and oil flooding have greatly reduced road performance, shortened road service life, and also weakened the comfort of car driving, worsening traffic accidents and endangering personal safety. In order to restore or improve the performance of the road surface, it is important to take some preventive measures before reducing the risk of accidents and ensuring personal safety.

The database is divided into four sections to store the collected pavement performance data, which are structure, climate, traffic, and pavement performance. This article attempts to establish the relationship between asphalt pavement diseases and temperature, traffic volume, and air voids. However, choosing too many specific indicators is not conducive to data analysis and model establishment. Therefore, the indicators that have the greatest impact on the disease are selected from each module as the independent variables, diseases and influencing factors of the prediction model are shown in Table 1.

| Database category | Related data |
|-------------------|--------------|
| Rut               | Including imaging records and manual supplementary testing of diseases, |
| Temperature       | Data of rutting, profile curve, deflection, coefficient of friction and drainage |
| Traffic           | Atmospheric temperature, humidity, rainfall, solar radiation, wind speed and wind direction information |
| Surface layer porosity | Annual traffic volume and traffic axle load estimates and auxiliary measurement data of lane traffic characteristics |

4. Discussion
4.1 Discussion on Management Measures of Big Data Technology in Intelligent Asphalt Pavement Disease and Construction Quality Control

Asphalt quality control is more than simple management. The pavement base layer is the main load-bearing layer that transmits vehicle loads. Its stability and compressive strength directly determine the quality of the road. It is necessary to adopt scientific construction technology, the improvement of construction technology and the acceptance of construction. It is important to have a general process control system, use scientific statistical data, and combine building materials to perform a comprehensive job. In order to improve the quality of construction, it is important to establish a database based on scientific statistical data to monitor key indicators in the construction process in real time and to monitor the entire construction process. Once problems are discovered, effective measures must be taken to resolve them in time. Ensure that the construction can be completed efficiently, thereby improving the level of floor construction. Therefore, the prevention and control of sidewalk diseases are mainly based on three aspects: First, asphalt is the main material for modern road construction. When choosing asphalt raw materials, it should depend on the local climate, geography and economic conditions, otherwise construction quality problems will occur; the second is to upgrade road construction equipment in the sidewalk construction link, and according to the mixing ratio, uniformity, packaging, flatness, and rotation The key process indicators such as temperature are strictly adjusted to operators. Finally, in terms of maintenance, road paving also has a certain impact on the quality of raw materials, and problems that have been found on the sidewalk require timely maintenance and treatment.

![Common diseases of asphalt pavement](image-url)

**Figure 1.** Distribution of common diseases on asphalt pavement

As can be seen from Figure 1, common diseases of asphalt pavement include horizontal cracks, longitudinal cracks, water damage, scratches and undulations. Once it is used on the road due to traffic jams and other factors, it can be seen that various situations will occur, such as road cracking and demolition. The causes of cracks include untreated construction joints, insufficient gaps, poor bonding, and insufficient asphalt. According to the quality standard suitable for the local climate and use requirements, rutting and shifting reduce the smoothness of the road surface, which will cause traffic accidents when the road reaches a certain depth, thus affecting the use of the road. Therefore, in asphalt paving, we must not only pay attention to the construction quality, but also the road maintenance and repair.
Distributed storage software performs specialized big data processing on road performance-related data, and uses SPSS software to implement data mining and analysis data modes through factor analysis and sensitivity analysis. As can be seen from Figure 2, all rutting monitoring points The occurrence of severe rutting is distributed in 8 provinces of my country. Among them, Anhui, Jiangxi, Hunan and Shandong account for the larger occurrence of severe rutting in each state. Among them, Anhui has the highest degree of severe rutting and is nearly twice as high as nearly two times, while Shanghai and Shenzhen have the least severe rutting.

4.2 Suggestions for Prevention and Treatment of Asphalt Pavement Diseases

In order to ensure the rationality and scientificity of asphalt in the prevention and control of asphalt pavement, it is important to adopt different prevention strategies according to different diseases of the pavement.

1. Do cover maintenance. In the process of protecting the asphalt concrete pavement, it is required to do a good job in maintenance of the overlay and ensure the integrity of the pavement. Relevant personnel must scientifically deal with road damage when overlapping, and then improve the road surface, road structure and the overall quality of the project to achieve good maintenance results and meet traffic needs.

2. Strengthen water damage treatment. If the asphalt pavement is damaged by water in front of the cover, it will cause certain risk to the bearing capacity and strength of the pavement, and these parts of water must be excavated, because the water stored in the bridge floor structure will not be released correctly, and the pavement must be re paved. If water damage occurs after covering, the surface of the structure should be actively repaired, and the asphalt floor should be excavated and treated with one layer.

3. Strengthen drainage treatment. A reasonable design was made on the side slope of the sidewalk. Even if it rains heavily, the rainwater on the road will flow into the drainage ditch, thus preventing the road surface water infiltration in the road structure. When the asphalt structure is affected by the rapid drainage of rainwater, if the rainwater on the road surface is discharged by the water barrier, local water storage will occur and the rainwater runoff will increase. It is important to strengthen road drainage from different directions to prevent local floods.
4. Strictly supervise the quality of the construction phase. In the design of asphalt paving, the designer should design the floor according to the actual performance, carefully study the construction index, strictly control the quality, and combine the actual life with the paving scientific research to avoid the unreasonable construction before. In addition, clarify the quality supervision requirements of each construction process to ensure that the quality meets the specified requirements.

5. Conclusions
In the research of asphalt pavement disease problems and construction quality control based on big data, this paper realizes the relationship between pavement disease problems and influencing factors such as temperature, surface void ratio and traffic load based on big data mining technology. The database is divided into four major sections: stores the collected pavement performance data, including structure, climate, and traffic and pavement performance. This article attempts to establish the relationship between asphalt pavement diseases and temperature, traffic volume, and air voids. However, choosing too many specific indicators is not conducive to data analysis and model establishment. Therefore, the indicators that have the greatest impact on the disease are selected from each module as predict the independent variables of the model, summarize and analyze several problems in the construction process, and put forward the prevention and control measures of common diseases. The research results show that improving construction quality management is very important. Once it is discovered that scientific statistical knowledge is effective, it can be combined with building materials to establish a database with scientific statistical methods, receive scientific building technology, improve building technology, accept and control the entire construction process, and control and manage the entire construction process. Effective measures must be taken to ensure timely completion, so as to effectively improve road construction.

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