Application of Big Data in Water Ecological Environment Monitoring

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Abstract. Water ecological data is an important part of national geographic information data and an important reference data to protect national environmental protection. China's water ecological data has a long history, but historical reasons also lead to a certain lag in the management of water ecological data. In this paper, some problems of water ecological data are found in the research of AHP, and the corresponding countermeasures are put forward. It is believed that in the near future, water ecological data will be further supported by big data technology for in-depth data mining, so that its application scenarios are more, and it can better guide national construction.

Keywords: Big Data, Water Ecological, Environment Monitoring

1. Introduction
Aquatic environment refers to the external environmental medium for the survival of aquatic organisms. By flowing water and still water environment. The latter is like ponds, lakes, swamps and reservoirs, while the former is like rivers, streams, springs and ditches[1]. The physical and chemical properties of different aquatic environment are different. In still water environment, the water does not flow, and the stratification and zonation of water temperature, gas and nutrients are obvious. Water environment, water flow, surface and bottom mixing are relatively uniform, generally no obvious stratification phenomenon[2]. The salt content of sea and fresh water is obviously different, and the osmotic pressure of water is very different. The community structure and function of organisms living in different water environment are also obviously different. Generally, saltwater organisms without special physiological adaptation and regulation function cannot exchange living environment, or they will die immediately.

The pollution of life and industry as well as all kinds of unreasonable fishery measures have led to the deterioration of the inland natural water environment, which is mainly manifested in eutrophication[3], sedimentation at the bottom of the lake, the decline of the diversity of fish and plankton and benthos, the decline of aquatic vegetation, the slowdown of fish growth rate, the reduction of fish breeding area and the intensification of fish miniaturization.

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2. Data Collection of Aquatic Ecology
Aquatic ecology mainly includes water quality environmental monitoring, including heavy metal content, free radical content, oxygen content, pH value, harmful ion content (fluorine, phosphorus, sulfur, ammonium, chromium, lead, etc.), trace element content (selenium, strontium, potassium, calcium, etc.), organic matter content, etc. Including microbial content, including algae, zooplankton, bacteria, etc. Including fish ecosystem information.
At the same time, aquatic ecology also includes the monitoring of water fluid environment, including the water temperature, the water flow velocity with laminar flow, etc.

Most of these data are collected by special probes, but some information, such as fish ecosystem information, needs to be observed manually for data collection.

The collected data is sent to IDC machine room of data warehouse for unified management after preliminary data arrangement by SCM system near the probe, so as to realize data integration of the whole basin. As shown in Figure 1.

Figure 1. Water Ecology Data Collection System

3. Mining and Application of Water Ecological Data
At present, the main service directions of water ecological data are as follows: first, it serves for environmental protection projects to ensure that the water environmental data can be measured in a controlled way; second, it serves for fisheries, i.e. on the basis of water environmental data, it pays more attention to the nutritional value of water bodies; third, it serves for engineering evaluation, i.e. environmental evaluation and geological disasters in the fields of water conservancy engineering and coastal engineering Evaluation provides data support for environmental protection strategies of water conservancy projects and coastal projects.
For IDC project of water ecological data mining, it is basically similar to other big data projects. By processing the local data based on cloud computing and artificial intelligence, the data can be classified, counted and visualized. As shown in Figure 2.
Like other data processing processes, through the data preprocessing process, data is extracted from the data warehouse to form a database for data mining, on the basis of which data mining is carried out. The process of data mining includes data analysis under various mathematical models, data interpretation of neural network system and fuzzy matrix system based on original data and analysis results, and finally forming service database. The service database drives the HTTP system of water ecological monitoring system and the relevant servers of APP system to provide relevant services. This is the idea of building production environment for water ecological data analysis.

4. Problems and Countermeasures of Water Ecological Big Data System

The construction of water ecosystem based on Library and information science began in the period of Beiyang government. At that time, the main cities of our country had built water ecological epidemic prevention system and water ecological monitoring system. After the founding of the people's Republic of China, China has further expanded the scope and strength of water ecological detection. Water ecological detection networks have been established in Songhua River Basin, Haihe River Basin, Yellow River system, Huahe River Basin, Yangtze River system, Pearl River system, Grand Canal basin and other major river and lake systems. On the basis of traditional library and information science, a large number of literature collation work has been carried out, which reserves valuable data for today's water ecology research. After the advent of the Internet era, the application scope of big data, cloud computing and artificial intelligence in information management has gradually increased, and the water ecological big data system has been gradually built. At present, the system has formed a perfect big data system under the organization of the environmental protection department and the joint support of major domestic universities.

However, there are many problems in this system:

4.1. The automation of signal acquisition still needs to be promoted

In the past 200 years, China's water ecology data collection work is mostly carried out by man. The data is obtained through the artificial experiment data in the laboratory, and the data card is constructed and the database is formed by hand transcribing. Today, most water ecological monitoring sites still use this method for data collection. Even if many automatic probes are used, the probe data still need to be confirmed and verified according to the manual test data.

4.2. The security of data management needs to be improved

Like most government big data and government big data, the database of water ecological data is
stored in Alibaba cloud's Wan net machine room. Most of these data warehouses do not have special security design. If it is government official website data or government data, its security requirements are not high, but water ecological data belongs to GIS data, which belongs to the first level of classified level. If the storage security of these data cannot be effectively guaranteed, it is likely to cause GIS data leakage.

4.3. There is still room for improvement of data mining scheme
At present, the mining scheme of water ecological data still adopts the construction idea of water ecological big data in the 1990s for most of the mining work. The application proportion of machine learning strategies such as artificial intelligence in data mining is not high. Some of the water ecological data are mined by a third-party organization, or the original data is directly provided to the relevant universities and other scientific research institutions. In the annual water ecology report of the environmental protection department, there is no in-depth mining data, only simple statistics, reliability, validity and regression analysis are carried out for the data.

5. Summary
Water ecological data is an important part of environmental protection big data, environmental protection data is an important part of GIS data, so water ecological data is an important element of national geographic information data. Because of the early start-up time of GIS big data work, many of the working methods that have been used are in sharp contrast with the current big data environment. It is believed that in the near future, with the development of big data, water ecological data will gradually keep up with the times, realize a leap forward technology improvement, and also provide more data application scenarios for the society.

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