Application of Big Data in Land Engineering

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Abstract. Big data has been widely used in more and more fields due to its characteristics of many types, large amount of data and fast transmission speed. However, the application of big data in land engineering is just emerging. Induction and analysis of related documents and reports, list of big data in the reclamation of cultivated land management, project planning and schedule control decisions, and the land engineering the conditions needed for the development of the big data are discussed in this paper, in order to promote big data technology application in the land engineering, eventually to promote land engineering data value, promote the land management to further improve the quality.

1. Introduction
As a product of the development of high and new technology in the new era, big data has been widely used in science, medicine, business and other fields, attracting more and more attention. However, the application of big data technology in the field of land engineering is rarely studied and is still in its infancy.

Big data of land engineering is the application of big data technology, concept and thinking in the field of land engineering, and is an important way to collect, sort out and analyze multidisciplinary data sources. Through the classification and analysis of land engineering information, the big data of land engineering can obtain the evaluation index of each link in the engineering operation process, provide data reference for the subsequent development of land engineering, and then realize the efficient management and utilization of land engineering data information. Therefore, big data technology has a good application prospect in land engineering, which will become an important means to extract the value of land engineering data, promote the improvement of land consolidation quality, and accelerate the transformation and upgrading of agricultural economy.

2. Big data
Big data refers to those data that are too large to be analyzed and processed by human brain or even mainstream software tools. Big data technology can capture, manage, process and organize data within
a reasonable time to help human beings make business decisions [1]. Big data analysis method and the traditional analysis method is one of the biggest difference is that the objects are all the data, rather than the data sample, its biggest characteristic is to do not pursue the complexity of the algorithm and accuracy, and the pursuit of can efficiently on the analysis of the whole data set. It has Volume, Variety, Velocity, Value these four characteristics.

(1) Volume. In the real world, can be seen everywhere all kinds of sensors, these devices at any time to collect the data of different format, with the accumulation of time, the data from TB development to PB and ZB, can be called a massive, massive and even excess.

(2) Variety. With the development of Internet, Internet of things and sensor network, data sources and formats are complex and diverse. Traditional structured data, semi-structured data and unstructured data constitute the entire data network. Data related to agriculture alone include meteorological indicators, soil indicators and other categories, and each category contains multiple sub-indexes [2].

(3) Velocity. The development of network hardware and software devices has significantly accelerated the movement of data from endpoints to processors and memory.

(4) Value. Another feature of big data is that the value density is inversely proportional to the data volume. Although there is a lot of data, there is often little that is useful. The exponential growth in the volume of data makes it more difficult to obtain useful information, and a stream of data with significant value may be only a second or two long [3].

3. Application of idea

3.1. Management decision on reclamation of cultivated land

(1) Farming managements

The reclaimed farmland is geographically dispersed, with varied terrain and different environments. Therefore, it has become an important task in the management of reclaimed farmland to collect soil, crops, meteorology and other variable information in a multi-directional, networked, rapid and efficient way to predict irrigation and fertilizer application. China has rich theoretical basis and practical experience in the field of farmland spatial information rapid acquisition technology. Mature instruments include TDR soil moisture tester, conductivity tester, pH tester and other soil characteristic indicator sensing instruments. By using the soil environment sensing technology, the data of soil moisture, soil respiration, carbon dioxide concentration, soil temperature and humidity, wind speed and rainfall etc. collected by the speedometer are processed intelligently through the embedded system.

The traditional data collection and real-time data collection methods are combined for analysis to "square the vein" of soil, and the results are highly reliable. The big data decision support system can automatically judge whether crops are short of water or not according to the penman formula and the water balance equation, and calculate the irrigation water required by the crops [4]. Be able to determine fertilizer type, fertilizer amount and fertilizer plan based on crop growth and soil condition through data analysis and calculation. It can provide a reasonable ratio of elements for soil improvement according to nutrient content and distribution.

(2) Crop yield estimated

Land reclamation is to ensure high and stable crop yield. 3S technology can be used to accurately calculate the regulation area, grasp the crop growth situation, estimate the planting area and crop yield.

Remote sensing technology can collect electromagnetic radiation information of ground objects from satellites, aircraft or other aircraft to identify the earth's environment and resources. The use of remote sensing technology to monitor crop growth, including seedling conditions, growth conditions and changes in crop image data, can provide timely information for field management, provide a basis for early yield estimates, and allow time for possible large-scale food shortages or surpluses. Based on machine vision, structural light scanning, ultrasonic and other acoustic methods, partial information collection of plant ground [5] also provides a large amount of image data for crop yield estimation.
(3) Heavy metal pollution evaluation

The traditional methods of soil heavy metal pollution mainly include laboratory monitoring method and field rapid monitoring method. The laboratory monitoring method has high precision, but it is labor-intensive, time-consuming for sampling and analysis, and has a small scope of application. Although the field rapid monitoring method can obtain information in a large area, continuously and high-density, it is mostly in the qualitative or semi-quantitative test stage. The rapid detection of heavy metals and the development of remote sensing technology make it possible to evaluate heavy metal pollution intelligently. The maturing of the remote sensing technology to promote the use of inversion of vegetation and soil monitoring method to evaluate heavy metal pollution, feature spectrum characteristics are susceptible to soil composition, atmospheric effect, vegetation, etc. The influence of environmental noise, through enhancing spectrum information extraction technology, improve the accuracy of remote sensing information extraction, big data technology is able to intelligently on the soil heavy metal pollution evaluation.

3.2. Project planning and progress control decision-making

(1) Land engineering capability evaluation

Using big data to evaluate the capacity of land engineering can make the decision-making behavior of project planning and construction more reasonable. Land engineering evaluation based on GIS can collect data, it is classified according to graph data and attribute data entry data system, with engineering geological zoning maps, geological hazard zoning map, land engineering capacity series of diagrams and other graphic data and the corresponding attribute data as the database, the secondary development based on the software platform, to its function to a certain extend, get land engineering capacity information system. The establishment of land engineering capability information system can realize the input, storage, query, retrieval, analysis, display and other functions of various spatial and non-spatial geological data and information, providing a tool for land engineering planning, management and decision-making.

(2) Soil organic reconstruction method

As an engineering technique, soil organic reconstruction serves organic living organisms. It provides necessary conditions for supporting living organisms by studying soil at a certain depth and by means of technical means such as compounding, adding, subtracting and replacing [6]. Land engineering is the core of the soil organic reconstruction and land reclamation engineering system circulating sex, collaborative, lagging behind the project of science and technology is common phenomenon, and big data coupling to according to the target soil thickness, soil quality, soil structure and index accurately predict reconstruction scheme of the problems in the project, the expansion of scientific research, as early as possible to the soil organic refactoring approach to decision making, increase soil organic reconstruction experiment ability, choose the optimal way of reconstruction of soil, guide the engineering practice.

(3) Project planning, program optimization and schedule control

In the early stage of land regulation project planning and design, it is necessary to consider the choice of irrigation, water diversion channel and field road route. Due to the large scope of research, the designer has limited energy and can only choose by experience. With the rapid development of computer and network technology, as well as the improvement of precision and price of market sensors, the large-scale, omni-directional, multi-dimensional and multi-site engineering monitoring of land engineering has been realized. The optical fiber sensor, photography, GPS, measurement robot, differential interferometry synthetic aperture radar equipment and technology applied to the landform, cadastral survey and dynamic monitoring [7], the big data systems can be according to the technical standard and considering constraint conditions automatically search out a series of economic, environmental protection, the reasonable wiring scheme to provide the reference for the circuit design staff, in order to improve the operation speed, but also through the cloud computing technology route optimization calculation work arrangement on multiple nodes.

(4) Engineering early warning and prediction project planning
Big data technology research can provide great help for engineering prediction and early warning, emergency response and disaster assessment. After years of monitoring work, department of our homeland, the meteorological department has accumulated a large number of instances of geological disasters, the meteorological disasters, these instances involving data quantity, and fully mining the data, establishes the land example engineering disasters and big data processing measures, in use process technology, improve the information collection and forecast analysis and decision to disaster monitoring department of the new monitoring data analogy and analysis of disasters, quickly, timely, accurately to recommend the disasters prevention and treatment scheme, to a certain extent, improve the level of land engineering disaster prevention, early warning.

In the era of big data, cross-industry data can be used to solve the problem of project volume prediction. Residential water serious excess somewhere, for example, sharp decline in groundwater level, soil tillage capacity degradation at the same time, crop production, new town construction real estate resources surplus, according to the data generated by these phenomena, can predict the future trajectory, farmers to move to the town for more than a decade and the formation of the abandoned land quantity and area.

4. Requirements for big data development of land engineering

4.1. Professional personnel team
With the deep integration of big data and all walks of life, Guizhou University has set up majors related to big data science and engineering to train professionals in the direction of land engineering informatization for land engineering. In order to avoid the problem of paying more attention to collection than analysis in the application of big data technology, a professional data management team including data collection and processing personnel, data analysts, data communication and display personnel, etc. was established, who converted the data that was only information into valuable decision-making basis for the industry.

4.2. Data collection and management capabilities
Farmland sewage sludge in the field of current land engineering monitoring has basically achieved digitization, data acquisition equipment is not enough, but as a result of the construction phase data management ability is limited, makes the design results failed to adequately applications, is difficult to realize information integration and sharing the stage as a whole, restricted the big data in land in the field of engineering application, so before the engineering design, schedule management and other aspects of data collection and management ability needs to be strengthened.

4.3. Theory and practice develop simultaneously
Big data theory precedes practice, which is a problem in most big data technology application industries. The promotion of the concept of big data makes all disciplines and industries feel the urgent need for the in-depth use of data for the industry development and the enhancement of the core competitiveness of the industry, which leads to the over-conceptualization of big data.

4.4. Improve the degree of data platform integration
Agriculture, land, construction and other industries are actively collecting, occupying and utilizing data. However, most of the data are relatively independent among various industries, institutions, enterprises and governments, and there is a lack of connection between the data. As soon as possible, the data platform of land engineering industry should be established. With the top-level data platform, the information system of various industries should be gradually improved under the clear data architecture framework.

5. References
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