Research on Intelligent Management System of Tourism Safety Accidents Based on Big Data

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Abstract: This article combines cloud computing resource management platform: OpenStack with big data processing framework, Hadoop. It is designed an intelligent management system for tourism accidents, which can conduct comprehensive analysis, evaluation and intelligent early warning of the incentives of tourism safety accidents, can promote the construction of a smart supervision platform for tourism safety, accelerate the construction of a tourism safety rescue mechanism, and provide guarantee for the sustainable development of China's tourism.

1. Introduction

Tourism safety is a part that tourists can't ignore in tourism. How to discover and eliminate dangers during the journey is an urgent problem that all scenic spots in China need to solve. However, the traditional prevention and treatment methods for tourism safety accidents based on empirical judgment, on-the-spot consultation, accident rescue, etc. are often after the occurrence of the accident, and cannot effectively prevent the occurrence of the accident in advance. Moreover, the information on the accident handling of each tourist area is asymmetric, and there is a lack of a large Supported by data, the post-processing method is relatively passive.

Therefore, the purpose of this article is to study and design a low-cost, high-fault-tolerant, and intelligently scalable tourism accident management system. The system uses the open source cloud operating system OpenStack to manage the computing, storage and network resources, and uses the big data processing framework Hadoop to achieve the analysis and processing of massive tourism data. It also builds a unified management accident analysis and warning system for tourist attractions, with a view to providing a new idea for the prevention and treatment of subsequent tourist accidents.

2. System Technology Foundation

2.1 Cloud and OpenStack

Cloud computing is defined by the National Institute of Standards and Technology as a pay-as-you-go model. This model provides usable, convenient, on-demand, and efficient network access. A customizable computing resource pool (mainly Network, storage, application and service resources), these resources can be quickly provided to users.。

OpenStack provides a unified cloud platform for each independent tourist attraction, so that all relevant data such as personal information, geographic location information, and meteorological information generated in tourism can be processed in the "cloud edge" to achieve information sharing among scenic spots [4]. Cloud computing can provide a safe and stable distributed and scalable level of performance for the intelligent analysis and early warning system of travel accidents, making travel data analysis, processing and calculation more secure and centralized.

2.2 Microservices and Container Technology

The microservice architecture can deploy each service to run independently in each container, and the communication between each service is realized through the container. Container technology is a lightweight virtualization technology that provides a relatively independent

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operating environment by isolating and abstracting the resources on the host machine without building the entire operating system, thereby greatly reducing the loss of resources [5]. In short, container technology can greatly improve the performance of the system. When the early warning system needs to be changed, the microservice architecture is more suitable for the iterative work of the system.

2.3 Hadoop and Big Data

Hadoop is a big data processing framework that has been used in the production environment for many years. Its open source, high data fault tolerance, low cost deployment and many other features have become the first choice of big data for enterprises and individuals [6]. Based on Hadoop, massive data can be stored safely and effectively, and analysis and calculation can be performed within a limited time range, and an effective and ordered data collection can be mined from the messy data.

3. System Architecture Design

The tourism accident intelligent management system is composed of hardware and software deployed on it. The hardware mainly includes two parts. The one is physical cluster resources that support the operation of the entire system. The functions of accident data collection, data analysis and intelligent early warning are all through The form of the program runs on the physical cluster; The second is the sensor, which collects necessary geological information such as temperature and humidity through the sensor.

The software part is the core and the most complicated part of the entire system. The software part is the most important and complicated part of the entire system. OpenStack shields the details of the underlying hardware upwards, and provides cloud computing services for the system through KVM virtual machines / Docker containers. At the Hadoop layer, Kafka message queues distribute data to the HDFS big data file system / HBASE database for storage, and use MapReduce to schedule and calculate offline jobs. The top layer is the functional modules, which are the data collection module, data analysis module, intelligent early warning module and big data visualization module.

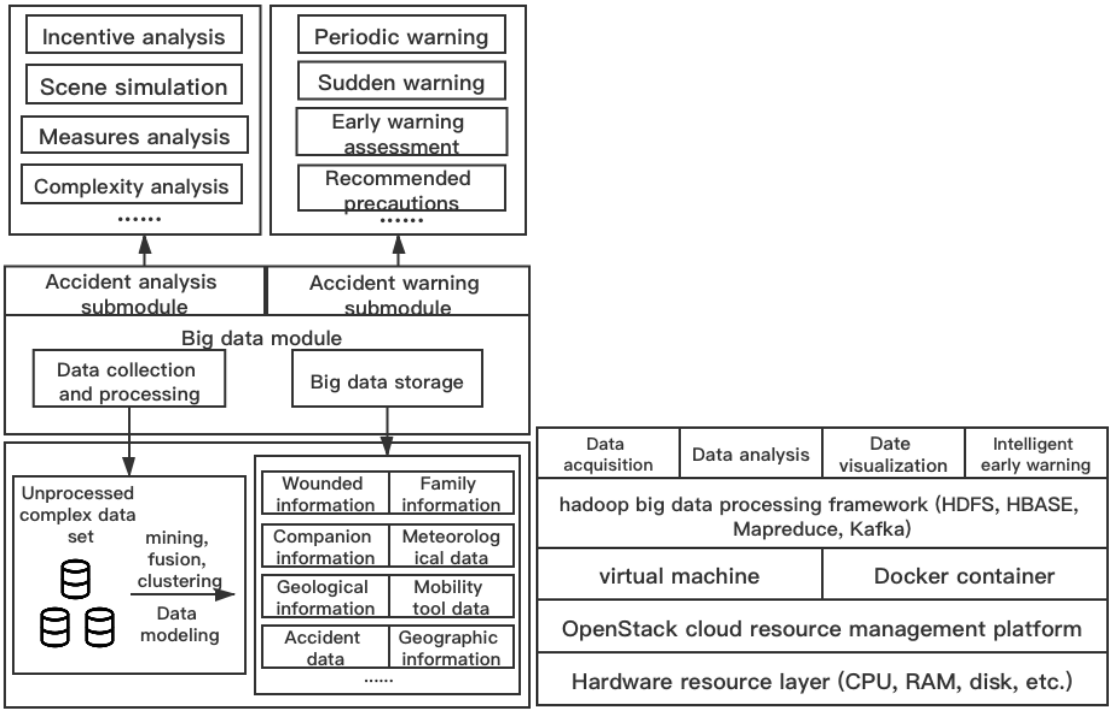

Figure 1 Overall architecture and main function diagram of the system.

The main functions of this system are realized by the big data processing framework and various functional modules. First of all, data processing and storage are carried out through data mining, fusion, modeling, etc., and then the accident analysis sub-module is used to analyze, calculate, and model large amounts of data to capture accidents that are difficult to analyze, for reference by decision-makers. , And finally predict and warn possible future accidents on the basis of a large amount of historical data through the accident warning module。

4. System Sub-module Design

4.1 Data Acquisition Module

The data collection module is mainly composed of sensor and information input sub-module. The sensors are distributed in the scenic area and are used to collect the meteorological data, geological information and infrastructure information of the scenic area (for example: rope displacement, equipment load bearing) The module is used to record non-natural data at the time of the accident, such as wounded information, companion information, relative information, accident geographic location information, scenic area infrastructure information (such as elevator, bridge, ropeway maintenance or maintenance information), accident follow-up information Wait. Finally, these data are aggregated into a data set 。

4.2 Data Storage and Calculation Module

As a set of open source big data framework, Hadoop's free, secure and stable features make it the preferred solution for big data in many organizations and enterprises. This system combines components such as HDFS, HBASE, MapReduce, and Kafka in the Hadoop ecosystem into the intelligent analysis and early warning system of tourism accidents [7].

Kafka is a message queue that can be used as a "channel" for travel-generated data to enter the platform. When travel safety data is generated, Kafka can provide multiple message channels to enable various types of information to be simultaneously transferred to HDFS or HBASE for storage.

HDFS is a distributed file storage system. The data processed by MapReduce will eventually be stored in the HDFS file system. HDFS is a distributed file system for the intelligent analysis and early warning system of travel accidents. It uses multiple data nodes to save travel accident related information and file redundant backups to ensure data security.

HBASE is a data storage warehouse, and tourism-related information will eventually be stored in HBASE for mining and analysis, such as tourist personal information, ticket purchase information, accident information (such as accident location, accident element information), all data are Key-Value is stored in HBASE.

MapReduce is an offline computing framework that can be deployed on multiple physical machines to perform distributed calculations on massive amounts of data in a concurrent manner and generate calculation results in real time [8], using HBASE database and data in the HDFS file system for offline calculations and combining Machine learning algorithms, draw valuable information。

4.3 Tourism Accident Intelligent Analysis and Early Warning Module

The main function of the tourism emergency analysis and early warning module is to make accurate predictions of possible future emergencies through the collection and calculation of data, and formulate corresponding practical and feasible prevention plans so that managers can timely take precautions. Ultimately, the realization from the source of tourism emergency management and control.

This module is mainly divided into two parts: accident intelligence analysis and accident intelligence early warning. The accident intelligent analysis module will perform data mining and cleaning on a large number of accident-related data and perform mathematical modeling to obtain a

specific data cube. On the one hand, use the data cube to classify the accidents and visualize the data; on the other hand, quantitatively analyze the causes of the accidents, formulate corresponding accident prevention and treatment measures, and continuously feedback the accident intelligent analysis module according to the effectiveness of the measures With corrections to form a closed loop.

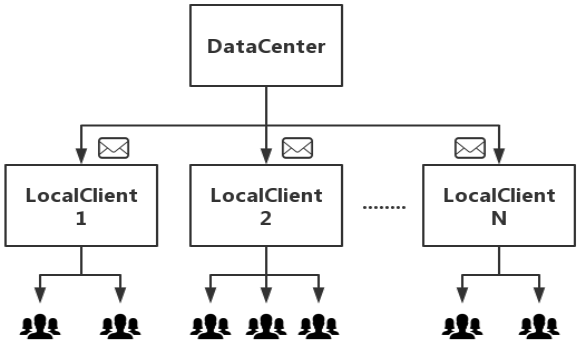

Figure 2 Example of early warning information distribution.

When the amount of data analyzed and generated by the intelligent analysis module reaches a certain scale, the intelligent early warning module will analyze and calculate these massive historical data to predict possible future accidents to provide reference for decision-makers. For example: the specific time point and the specific location of the scenic spot show a high incidence of periodic accidents. The data center distributes the warning information to the client of the corresponding scenic spot, and then the client distributes it to the person in charge of the scenic spot through SMS and other forms (Figure 2), The relevant person in charge of the scenic spot can take corresponding prevention and treatment measures based on the early warning information, thereby further reducing the incidence of accidents.

5. Conclusion

The intelligent management system for tourism accidents designed in this paper can mine valuable information from massive and scattered massive data, and analyze the hidden correlation between them. This method of quantitative analysis of accidents with the help of big data can not only accurately locate the causes of accidents and accurately prevent accidents, but also reduce the large amount of cost caused by blindly establishing accident prevention facilities and consulting experts. The author believes that the implementation of the system can completely solve the "data island" problem faced by traditional scenic spots in accident analysis and the insurmountable problems in accident prevention and early warning. This system will provide a strong guarantee for the sustainable development of China's tourism industry and the personal safety of the vast number of tourists.

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