Retraction

Retraction: Design and Research of Smart Hydrological Monitoring Network Based on Internet of Things (IOP Conf. Ser.: Earth Environ. Sci. 821 012027)

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This article has been retracted by IOP Publishing following an allegation that raises concerns this article may have been created, manipulated, and/or sold by a commercial entity. In addition, IOP Publishing has seen no evidence that reliable peer review was conducted on this article, despite the clear standards expected of and communicated to conference organisers.

The authors of the article have been given opportunity to present evidence that they were the original and genuine creators of the work, however at the time of publication of this notice, IOP Publishing has not received any response. IOP Publishing has analysed the article and agrees there are enough indicators to cause serious doubts over the legitimacy of the work and agree this article should be retracted. The authors are encouraged to contact IOP Publishing Limited if they have any comments on this retraction.

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Design and Research of Smart Hydrological Monitoring Network Based on Internet of Things

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Abstract. Aiming at the low monitoring efficiency of the current hydrological monitoring network and low accuracy of monitoring data, this paper studies and designs a smart hydrological monitoring network based on the Internet of Things with satellites, drones, radars, and mobile broadband Internet as the core. This article describes the hardware structure and functional structure of the smart hydrological monitoring network, and describes the process of the system how to analyze the big data obtained through the Internet of Things to improve the accuracy and efficiency of monitoring data.

1. Introduction
With the development of information technology, hydrological monitoring methods have changed from manual observation at the initial stage to the current comprehensive application of contact and non-contact automatic measurement. Hydrological measurement and reporting has evolved from manual, single-site measurement and reporting to an automatic hydrological measurement and reporting system that integrates automatic collection, transmission, and real-time processing. Hydrological data management has also changed from building infrastructure by each unit to purchasing public services such as clouds [1-3]. The hydrological monitoring system will also evolve into an air-space-ground integrated smart hydrological monitoring system based on the Internet of Things with satellites, drones, radars, and mobile broadband Internet as the core.

2. The overall structure of the smart hydrological monitoring network
The Internet of Things (also known as the sensor network) strives to embed and equip various status sensors into the monitoring components of various facilities to form a network of sensors, and connect the sensor network with the Internet to realize human society and physical systems The online integration of the network achieves real-time monitoring of personnel, machines, equipment and infrastructure in the network to comprehensively improve resource utilization and productivity levels, and improve the relationship between man and nature [4-7]. The basic characteristics of the Internet of Things are mainly manifested in comprehensive perception, real-time transmission, and intelligent control [8].

2.1. Basic structure
The smart hydrological monitoring network mainly includes hydrological monitoring equipment such as near-surface rain radar, fixed station, mobile patrol vehicle, mobile terminal, etc., as well as data collection, transmission, storage and processing composed of the Internet of Things, cloud technology, and big data technology. The virtual environment also includes groundwater level (water quality)
sensing, soil moisture sensing, geological radar (geometric radar) measurement, isotope tracing and other groundwater monitoring networks. All kinds of hydrological sensors (including fixed and mobile) generally form a hydrological information perception network based on the Internet of Things, and are connected to sub-centers and data centers through the Internet or a dedicated hydrological network. The smart hydrological monitoring network uses the existing hydrological data collection sub-centers and data center information aggregation system. The more important difference is the addition of data integration and integration functions in the data center, relying on cloud storage and computing technology to achieve space-based and air-based and integration of data from the smart hydrological monitoring network provide an information basis for hydrological big data analysis and conventional hydrological applications [9-10].

The basic structure of the smart hydrological monitoring network is shown in Figure 1.

Figure 1. Schematic diagram of the smart hydrological monitoring network structure

2.2. Hardware architecture
The hardware architecture of the hydrological monitoring system based on the Internet of Things technology mainly includes three main parts: hydrological element sensing terminal nodes (water level gauges, water temperature gauges, dissolved oxygen meters, etc.), gateway routing nodes (central and edge gateways), and remote central monitoring nodes. Each kind of node performs different functions. The system structure is shown in Figure 2.

The hydrological sensing terminal node includes data collection (sensor: mainly refers to water level, water temperature, PH value, dissolved oxygen sensor, etc.), data processing and control (microprocessor, memory), communication (wireless transceiver) and power supply modules, mainly designed. The requirements are low power consumption, high reliability and self-organizing network function.

The gateway routing node realizes the functions of self-coordination networking and information processing of the sub-network segment of the entire hydrological monitoring IoT area. In the hydrological monitoring network based on the Internet of Things, the gateway routing node is responsible for initializing and dynamically configuring the subnet: assigning an address to each terminal node in the subnet; sending query commands to the subnet segment nodes regularly; automatically adding new network nodes, and at the same time Update the routing table. Remote monitoring refers to the method of operating a remote computer through the network.
Figure 2. Schematic diagram of the topology of the hydrological monitoring system based on the Internet of Things

3. Quality control of smart hydrological monitoring network
The accuracy of hydrological monitoring data is of great significance to the entire smart hydrological monitoring network. Through quality control of the massive monitoring data obtained by the Internet of Things technology, the monitoring results of the smart hydrological monitoring network can be more accurate.

3.1. Quality control methods of hydrological monitoring data
The quality control of hydrological monitoring data is mainly based on real-time inspection, which includes climatological limit value inspection, climatic extreme value inspection, data internal consistency inspection and data time consistency inspection.

3.1.1. Climatological limit value check. Refers to the element value that is impossible from the perspective of climatology, and the observation record should be checked within the climatological limit value.

3.1.2. Extremum gas check. Refers to the inspection of whether the hydrological monitoring data record is beyond the extreme climatic value. Climate extremes refer to meteorological records with a small probability of occurrence in a certain time range at a monitoring site at a fixed location.

3.1.3. Internal consistency check. Refers to the inspection that the relationship between the hydrological element records observed at the same time must conform to a certain rule.

3.1.4. Time consistency check. Refers to the inspection of whether the recorded changes of hydrological data have specific laws within a certain time range.

3.2. Other inspection methods
The inspection of the sampled value and the measured value is completed in the automatic weather
station collector. After the above quality control is completed, the smart hydrological network will transmit the measured value to the main computer station for further quality control. According to the statistical values of long-term climate data, the climate observation threshold is set during the monitoring process. If the measured value exceeds the climate threshold, it is marked as a suspicious value. In addition, according to the observation data, the internal consistency between multiple elements is manually checked. For example, if there is no precipitation in the weather phenomenon, and the rainfall is not zero, the rainfall observation is an error value.

4. Comprehensive Evaluation

By comparing the massive data collected by the Internet of Things with the expected results, the quality control effect obtained by the smart hydrological monitoring network can be further strengthened. The collection and transmission of hydrological monitoring data are mainly completed by the three parts of sensor, RTU and channel.

The entire evaluation index system mainly includes two aspects: the importance index of the monitoring site and the status index of the monitoring site, as shown in Figure 3. The importance of the monitoring site's importance index is to distinguish the difference in importance of the sites, and to evaluate the impact of each site on the overall monitoring network. The higher the weight of the site, the impact of the failure on the entire network during operation.

![Figure 3. Comprehensive assessment index system for hydrological monitoring network operation state](image)

5. Conclusion

The rapid development of modern information technology provides effective technical support for the smart hydrological monitoring system. The future smart hydrological monitoring system will make full use of the Internet of Things technology to expand the field of hydrological information services, comprehensively transform and improve service capabilities, and provide the necessary data foundation support for smart water conservancy.

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