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A Study of Big Data-based Dynamic Monitoring Methods for the Internet of Things

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Abstract: *Big data technology, a powerful tool for data processing and analysis, offers innovative ideas and methods for the dynamic monitoring of the Internet of Things (IoT). This paper introduces a dynamic monitoring method and system for IoT based on big data, which can be widely utilized in various fields such as smart homes, intelligent transportation, industrial production, medical care, and more. For instance, in smart homes, it can promptly identify and address issues with dynamic home appliances by monitoring their operational status and sensor data. In smart transportation, it can identify traffic congestion, accidents and other dynamic situations by monitoring traffic signals, vehicle traffic, and other relevant data, enabling prompt traffic guidance and rescue efforts. These big data-based IoT dynamic monitoring methods and systems offer high accuracy and real-time capabilities, effectively managing IoT devices. As IoT technology continues to develop, the application of big data technology in IoT dynamic monitoring will become increasingly widespread.*

Keywords: *big data, internet of things, dynamic monitoring*

1. Preamble technology

Internet of Things (IoT) technology, as a major hotspot in the field of information technology, is changing people's way of life and social production. However, with the wide application and growth in the number of IoT devices, how to effectively monitor and manage these devices has become an urgent problem to be solved[1]. As a powerful data processing and analyzing method, big data technology provides new ideas and methods for dynamic monitoring of IoT. In this paper, we will introduce a dynamic monitoring method and system of IOT based on big data. It is a kind of network that connects any object to the Internet through information sensing devices, in accordance with an agreed protocol, for information exchange and communication, in order to realize intelligent identification, localization, tracking, monitoring and management. Commonly speaking, the Internet of things is the "Internet of things connected", which contains two meanings: first, the Internet of things is the extension and expansion of the Internet, its core and foundation is still the Internet; second, the user of the Internet of things not only includes people, but also includes items, the Internet of things realizes the exchange of information and communication between people and items and items. Because of the wide range of applications of the Internet of Things, dynamic monitoring of the Internet of Things is needed, but in the existing technology, there is the problem of low reliability[2-3].

2. Design content

The purpose of this design is to provide a method and system for dynamic monitoring of Internet of Things (IoT) based on big data in order to improve the reliability of dynamic monitoring of IoT to a certain extent.

● Data collection: Firstly, the data of each device is collected in real time through the data collection module of the IoT device. These data include device operation status, network connection status, sensor data and so on.

● Data pre-processing: cleaning, denoising, standardization and other processing of the collected data to ensure the accuracy and completeness of the data[4].

● Feature extraction: Through big data algorithms, features related to dynamic behaviors, such as change trends, dynamic values, etc. are extracted.

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- Dynamic detection: using the extracted features, combined with dynamic detection methods in big data, such as density-based clustering algorithms, statistical-based dynamic detection algorithms, etc., to identify dynamic devices or behaviors.

- Early warning and response: For the detected dynamic equipment or behavior, timely issue early warning information, and take corresponding response measures, such as remote control, repair, isolation and so on.

In order to achieve the above purpose, this design embodiment adopts the following technical solution: a dynamic monitoring method for Internet of Things based on big data, comprising: determining system operation monitoring data clusters corresponding to the Internet of Things system to be monitored, system operation monitoring data in the system operation monitoring data clusters comprising a system operation log; determining an optimized dynamic analysis network corresponding to the system operation monitoring data clusters; optimizing the dynamic analysis The optimized dynamic analysis network performs dynamic analysis of IoT operation on the system operation monitoring data cluster in order to analyze the system operation identification data cluster corresponding to the IoT system to be monitored, and the system operation identification data cluster includes a plurality of system operation identification data, and the plurality of system operation identification data is used to reflect the operation dynamic prediction information that the IoT system to be monitored has at a plurality of operation monitoring levels[5].

In the big data-based method for dynamic monitoring of the Internet of Things, the system operation monitoring data cluster includes system operation monitoring data corresponding to data dimensions other than the at least one preset data dimension; and, the optimized dynamic analysis network is formed by performing a network update operation on the candidate dynamic analysis network based on the late exemplary data, the late exemplary data includes a late exemplary system operation monitoring data cluster The late exemplary data includes a late exemplary system operation monitoring data cluster and exemplary identification data corresponding to a preset data dimension, the late exemplary system operation monitoring data cluster includes system operation monitoring data corresponding to a preset data dimension, and the candidate dynamic analysis network is formed by performing a network update operation on the original dynamic analysis network based on the late exemplary data, and the late exemplary data includes a plurality of exemplary data dimensions corresponding to the early exemplary system operation monitoring data cluster and corresponding exemplary data dimensions, and the candidate dynamic analysis network is formed by performing a network update operation on the candidate dynamic analysis network based on the late exemplary data. The pre-exemplar data includes the pre-exemplar system operation monitoring data corresponding to multiple exemplar data dimensions and the corresponding exemplar identification data clusters[6].

wherein the step of optimizing the dynamic analysis network to perform an IoT operation dynamic analysis operation on the system operation monitoring data clusters to analyze the system operation identification data clusters corresponding to the IoT system to be monitored, comprises[7].

The system operation monitoring data clusters are loaded into a feature space mapping unit included in the optimized dynamic analysis network, and the feature space mapping unit performs feature space mapping operations on the system operation monitoring data clusters to form each operation space mapping feature representation corresponding to each data dimension; the mapping feature integration unit included in the optimized dynamic analysis network performs mapping feature integration operations on each operation space mapping feature representation corresponding to each data dimension to output the operation feature representation corresponding to the IoT system to be monitored; in the pending identification data clusters corresponding to the preset data dimensions, the operational feature representations to be analyzed are matched. The optimized dynamic analysis network includes a mapping feature integration unit that performs a mapping feature integration operation on the operational spatial mapping feature representations corresponding to each data dimension to output the operational feature representations corresponding to the IoT system to be analyzed; among the pending identification data clusters corresponding to the preset data dimensions, system operational identification data corresponding to the operational feature representations to be analyzed are matched to form the system operational identification data clusters corresponding to the IoT system to be monitored; the preset data dimensions belong to the IoT system to be monitored in the data exchange dimensions, and the system operational identification data belongs to the data exchange dimensions of the system operational identification data. The predefined data dimension belongs to the dimension of the IoT system to be monitored in data exchange, and the system operation identification data cluster includes at least the system operation identification data corresponding to data exchange loss and the system operation identification data corresponding to data interaction distortion[8].

ISSN 2616-5775 Vol. 7, Issue 1: 42-51, DOI: 10.25236/AJCIS.2024.070107

3. A big data-based approach to dynamic monitoring of the Internet of Things

This design embodiment provides a big data-based IoT dynamic monitoring method and system, which can first determine a system operation monitoring data cluster corresponding to the IoT system to be monitored; determine an optimized dynamic analysis network corresponding to the system operation monitoring data cluster; use the optimized dynamic analysis network to perform an IoT operation dynamic analysis operation on the system operation monitoring data cluster in order to analyze the IoT system to be monitored The optimized dynamic analysis network is used to perform dynamic analysis of IoT operation on the system operation monitoring data clusters to analyze the corresponding system operation identification data clusters of IoT system to be monitored. Based on the foregoing, since the analyzed system operation identification data cluster includes a plurality of system operation identification data, the contents characterizing the operation dynamics are richer, and thus the reliability of the dynamic monitoring of the Internet of Things can be improved to a certain extent, thereby improving the problem of low reliability of the dynamic monitoring of the Internet of Things that exists in the prior art. [9]

3.1 The process of forming exemplary data at a later stage

In the big data-based method for monitoring the dynamics of the Internet of Things, the process of forming the later exemplary data includes: determining a cluster of earlier IoT operation information corresponding to an earlier time interval, and determining a cluster of later IoT operation information based on a predetermined data dimension in the later time interval, where the later time interval belongs to a time interval subsequent to the earlier time interval, and the cluster of earlier IoT operation information comprises a cluster of later exemplary system operation information corresponding to the predetermined data dimension corresponding to IoT system operation information; based on the in-post IoT operation information cluster, analyzing and forming the in-post exemplary system operation monitoring data cluster included in the in-post exemplary data; based on the in-post IoT operation information cluster, analyzing and forming the in-post exemplary data included in the in-post exemplary data dimension corresponding to the exemplary identification data.

3.2 The network update process of the candidate dynamic analysis network

In the method for dynamic monitoring of the Internet of Things based on big data, a network update process of a candidate dynamic analysis network includes: determining configured master screening parameters and slave screening parameters; performing a network update operation of the candidate dynamic analysis network based on the late exemplary data, and, based on the master screening parameters, screening system operation monitoring data corresponding to preset data dimensions in the late exemplary system operation monitoring data cluster, and based on the slave screening parameters, screening other system operation monitoring data corresponding to other data dimensions in the late exemplary system operation monitoring data cluster filtering, and filtering, based on slave filtering parameters, system operation monitoring data corresponding to other data dimensions in the late exemplary system operation monitoring data cluster[10].

3.3 The process of forming the exemplary data of the previous period

In the method for dynamically monitoring the Internet of Things based on big data, the process of forming exemplary data in the early stage includes: determining an exemplary Internet of Things operation information cluster corresponding to each exemplary data dimension; determining identification data corresponding to each exemplary Internet of Things operation information in the exemplary Internet of Things operation information cluster, so as to form exemplary clusters of identification data corresponding to each exemplary data dimension; analyzing an importance characterization parameter of each identification data in the exemplary cluster based on the operation duration and operation information validity parameters of each identification data corresponding to each example Internet of Things operation information; analyzing an importance characterization parameter of each identification data in the example cluster based on the operation duration and operation information validity parameter of each identification data. Based on the operation duration and operation information validity parameters of the exemplary IoT operation information corresponding to each identification data in the exemplary cluster, the importance characterization parameter of each identification data in the exemplary cluster is analyzed; based on the importance characterization parameter of each identification data in the exemplary cluster, the identification data filtering clusters corresponding to the exemplary data in the previous stage are analyzed; and the target number of filtered identification data is determined in the screening clusters to form the exemplary cluster corresponding to the dimension of each exemplary data; in the screening clusters of the exemplary IoT operation information, the target number of filtered identification data is identified. In the identification data filtering cluster, a target number of filtered identification data is identified to determine the target exemplary identification data corresponding to the previous exemplary data, and, based on the target exemplary identification data, a cluster of exemplary identification data corresponding to the previous exemplary data is formed; and based on the other filtered identification data and the cluster of exemplary IoT operation information that are not determined to be the target exemplary identification data in the identification data filtering cluster, the cluster of previous exemplary system operation monitoring data corresponding to the previous exemplary data is determined. Exemplary system operation monitoring data cluster. In the big data-based dynamic monitoring method of the Internet of Things, in the identification data screening cluster, a target number of screening identification data is determined to be the target exemplary identification data corresponding to the previous exemplary data, and, based on the target exemplary identification data, the step of forming a cluster of exemplary identification data corresponding to the previous exemplary data, comprising: determining a target number of screening identification data, to be determined as the target exemplary identification data corresponding to the previous exemplary data, and forming a cluster of exemplary identification data corresponding to the previous exemplary data. in the identification data screening cluster, identifying a target number of screening identification data to be identified as the target exemplary identification data corresponding to the prior period exemplary data; labeling the target exemplary identification data to be labeled as the relevant exemplary identification data corresponding to the prior period exemplary data; identifying the irrelevant exemplary identification data, the irrelevant exemplary identification data being based on at least one of the first exemplary identification data and the second exemplary identification data. The first exemplary identification data belongs to relevant exemplary identification data corresponding to exemplary data other than the previous exemplary data; the second exemplary identification data belongs to identification data in the pre-constructed identification database; and based on the relevant exemplary identification data and the non-relevant exemplary identification data, a cluster of exemplary identification data corresponding to the previous exemplary data is determined.

3.4 Mapping feature integration units

In the big data-based dynamic monitoring method for Internet of Things, the mapping feature integration unit includes a feature internal integration unit, a feature external integration unit, a feature correlation integration unit, and a feature linear integration unit; the mapping feature integration unit included in the optimized dynamic analysis network carries out a mapping feature integration operation on each of the mapping feature representations of each operation space corresponding to each of the data dimensions in order to output a mapping feature integration operation on each of the operation space mapping feature representations of each of the data dimensions corresponding to each of the monitoring Internet of Things systems. The step of analyzing the operational feature representations to be analyzed, comprising: performing an integration operation on each of the operational space mapping feature representations corresponding to each data dimension to output an internal mapping feature representation corresponding to each data dimension; a feature external integration unit that performs an integration operation on each of the internal mapping feature representations to output an external mapping feature representation corresponding to the IoT system to be monitored; a feature association integration unit that associates local feature representations in the external mapping feature representations with local feature representations in the external mapping feature representations to be monitored, and a feature correlation integration unit that performs a correlation operation on local feature representations in the external mapping feature representations to be monitored. The feature association integration unit performs an association analysis operation on the local feature representations in the external mapping feature representations to output corresponding association analysis feature representations, the external mapping feature representations comprise a plurality of local feature representations, the object of the association analysis operation comprises at least two local feature representations in the plurality of local feature representations, and each of the two local feature representations in the plurality of local feature representations has the same feature representation dimensions, and the feature representation parameter of each local feature representation belongs to the external mapping feature representation, and the feature representation parameter of each local feature representation belongs to the external mapping feature representation. The feature representation parameters in each of the local feature representations belong to the feature representation parameters in the external mapping feature representation; a feature linear integration unit that performs a linear

ISSN 2616-5775 Vol. 7, Issue 1: 42-51, DOI: 10.25236/AJCIS.2024.070107

integration operation of the external mapping feature representation and the correlation analysis feature representation to output a feature representation of the IoT system to be monitored that is to be analyzed.

3.5 Characterization of the mapping of each run space corresponding to the data dimensions

In the dynamic monitoring method of the Internet of Things based on big data, the mapping feature representation of each operation space corresponding to each data dimension is integrated to output the steps of the internal mapping feature representation corresponding to each data dimension, including: determining the significance evaluation parameters of each operation space mapping feature representation corresponding to each data dimension; The mapping feature representation of each operation space corresponding to each data dimension is weighted and integrated based on the corresponding significance evaluation parameters to form the corresponding internal mapping feature representation of each data dimension; In addition, the feature external integration unit integrates each internal mapping feature representation to output the steps of external mapping feature representation corresponding to the IoT system to be monitored, including: the feature external integration unit determines the saliency evaluation parameters corresponding to each internal mapping feature representation; The feature external integration unit conducts weighted integration operation for each internal mapping feature representation based on their corresponding significance evaluation parameters to form the corresponding external mapping feature representation of the Internet of Things system to be monitored. In the dynamic monitoring method of the Internet of Things based on big data, the steps of determining the optimized dynamic analysis network corresponding to the system operation monitoring data cluster include: determining the candidate dynamic analysis network, and the candidate dynamic analysis network is formed by updating the original dynamic analysis network based on the previous example data, Previous example data includes previous example system operation monitoring data cluster and corresponding example identification data cluster corresponding to multiple example data dimensions; Determine the later exemplary data, which includes the later exemplary system operation monitoring data cluster and the exemplary identification data corresponding to the preset data dimensions, and the earlier exemplary system operation monitoring data cluster includes the system operation monitoring data corresponding to the preset data dimensions; Load the later exemplary system operation monitoring data cluster to the feature space mapping unit of the candidate dynamic analysis network, and use the feature space mapping unit to map the later exemplary system operation monitoring data cluster to form the feature representation of each operation space mapping corresponding to each data dimension; The mapping feature integration unit included in the candidate dynamic analysis network performs mapping feature integration operation on the mapping feature representation of each operation space corresponding to each data dimension to output the corresponding operation feature representation to be analyzed; Based on the sample identification data corresponding to the operation characteristics to be analyzed and the preset data dimensions, the candidate dynamic analysis network is updated to form an optimized dynamic analysis network corresponding to the preset data dimensions. This design embodiment also provides a dynamic monitoring system of the Internet of Things based on big data, including a processor and a memory. The memory is used to store computer programs, and the processor is used to execute computer programs to achieve the above dynamic monitoring method of the Internet of Things based on big data.

4. Specific experimental modalities

As shown in FIG. 1, the present design embodiment provides a dynamic monitoring system for the Internet of Things based on big data. Among other things, the IoT dynamic monitoring system may include a memory and a processor, as shown in FIG. 1.

Specifically, the memory and processor are directly or indirectly electrically connected to realize data transmission or interaction. For example, one or more communication buses or signal lines can be used to realize electrical connection between each other. The memory may store at least one software functional module (computer program) that can exist in the form of software or firmware. The processor can be used to execute the executable computer program stored in the memory, so as to realize the dynamic monitoring method of the Internet of Things based on big data provided by this design embodiment (such as the following).

ISSN 2616-5775 Vol. 7, Issue 1: 42-51, DOI: 10.25236/AJCIS.2024.070107

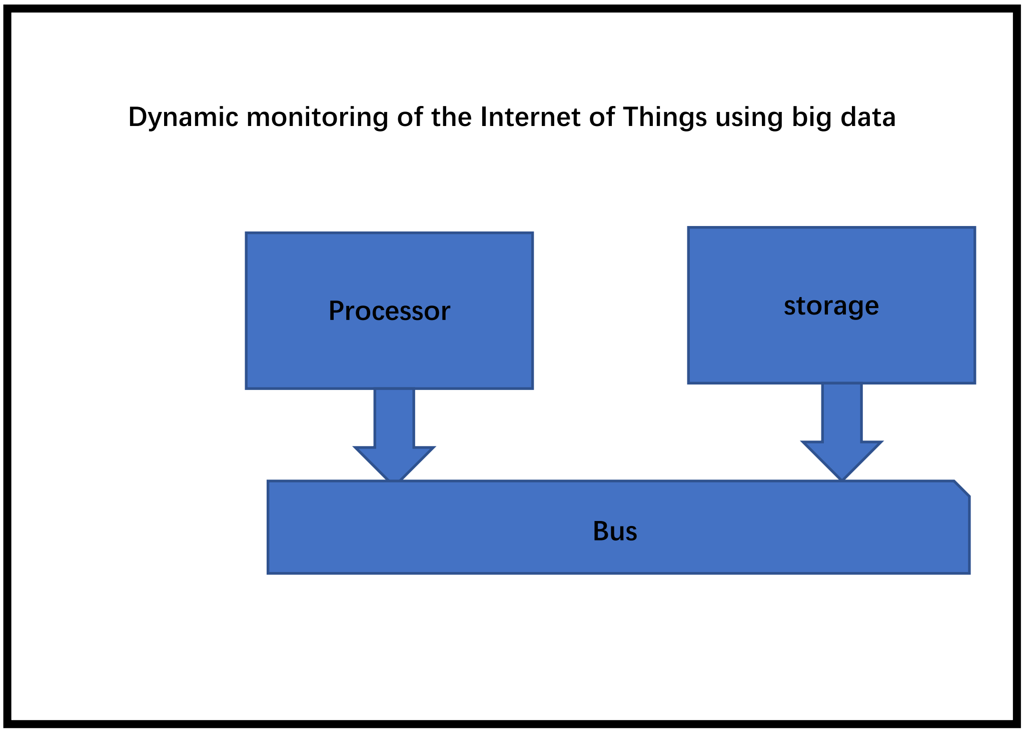

Fig. 1 Block diagram of the architecture of a dynamic monitoring system for IoT based on big data

Specifically, in some of the possible experiments, the memory may be, but is not limited to, random access memory, read-only memory, programmable read-only memory, erasable read-only memory, electrically erasable read-only memory. The processor may be a general-purpose processor, including a central processor, a network processor, a system-on-a-chip, etc.; it may also be a digital signal processor, a special-purpose integrated circuit, a field-programmable gate array or other programmable logic device, a discrete gate or transistor logic device, or a discrete hardware component.

Specifically, in some possible experiments, a big data-based IoT dynamic monitoring system could be a server with data processing capabilities.

The present design embodiments also provide a big data-based dynamic monitoring method of the Internet of Things, which can be applied to the above-described big data-based dynamic monitoring system of the Internet of Things. Therein, the method steps defined in the process related to the big data-based dynamic monitoring method for the Internet of Things may be realized by the big data-based dynamic monitoring system for the Internet of Things.

4.1 The process of realizing a dynamic monitoring system for IoT with big data

Specific processes are described in detail.

Step S110, determine the system operation monitoring data cluster corresponding to the IoT system to be monitored.

In this design embodiment, the big data-based IoT dynamic monitoring system can determine a system operation monitoring data cluster corresponding to the IoT system to be monitored. The system operation monitoring data in the system operation monitoring data cluster includes the system operation log, which is used to record the operation process of the IoT system to be monitored, such as the operation process of the IoT terminals, IoT gateways and other IoT devices.

Step S120, determine the optimized dynamic analysis network corresponding to the system operation monitoring data cluster.

In this design embodiment, the big data-based IoT dynamic monitoring system can determine an optimized dynamic analysis network corresponding to the system operation monitoring data clusters. That is, the optimized dynamic analysis network is formed by network learning based on other operational monitoring data associated with the system operational monitoring data cluster.

Step S130, optimize the dynamic analysis network, and conduct the dynamic analysis operation of

ISSN 2616-5775 Vol. 7, Issue 1: 42-51, DOI: 10.25236/AJCIS.2024.070107

the Internet of Things operation on the system operation monitoring data cluster to analyze the corresponding system operation identification data cluster of the Internet of Things system to be monitored.

In this design embodiment, the big data-based IoT dynamic monitoring system may optimize a dynamic analysis network to perform IoT operation dynamic analysis operations on system operation monitoring data clusters to analyze the system operation identification data clusters corresponding to the IoT system to be monitored. The system operation identification data cluster includes multiple system operation identification data, and the multiple system operation identification data are used to reflect the operation dynamic prediction information of the IoT system to be monitored at multiple operation monitoring levels, such as whether it is dynamic or not.

Based on the above contents, namely, the previous steps S110, S120 and S130, the analyzed system operation identification data cluster includes multiple system operation identification data, which makes the content representing the operation dynamics more abundant, so it can improve the reliability of the dynamic monitoring of the Internet of Things to a certain extent, So as to improve the low reliability of the dynamic monitoring of the Internet of Things in the existing technology.

4.2 Optimized dynamic analysis network corresponding to clusters of system operation monitoring data

In some possible experiments, the above step S120, which determines the optimized dynamic analysis network corresponding to the system operation monitoring data cluster, can further include the following detailed implementation contents:

A candidate dynamic analysis network is identified, and the candidate dynamic analysis network is formed by performing a network update operation on the original dynamic analysis network based on the pre-exemplar data, which consists of multiple exemplar data dimensions corresponding to pre-exemplar system operation monitoring data clusters and corresponding exemplar identification data clusters, i.e., the learning of a data mapping relationship between the system operation monitoring data clusters and exemplar identification data clusters; and data mapping relationship between the system operation monitoring data clusters and the exemplar identification data clusters.

Determine the late exemplar data, the late exemplar data includes the late exemplar system operation monitoring data clusters and the exemplar identification data corresponding to the predefined data dimensions.

Load the late exemplary system operation monitoring data clusters into the feature space mapping unit of the candidate dynamic analysis network, and perform the feature space mapping operation of the late exemplary system operation monitoring data clusters into the feature space mapping unit to form the respective operation space mapping feature representations corresponding to the respective data dimensions as described in the previous section.

The candidate dynamic analysis network consists of a mapping feature integration unit that performs mapping feature integration operations on each runtime spatial mapping feature representation corresponding to each data dimension to output the corresponding runtime feature representation to be analyzed, as described in the previous section.

Based on the exemplary identification data corresponding to the operational feature representation to be analyzed and the preset data dimension, the candidate dynamic analysis network is subjected to a network updating operation to form an optimized dynamic analysis network corresponding to the preset data dimension, i.e., based on the difference between the operational feature representation to be analyzed and the exemplary identification data corresponding to the preset data dimension, the network parameters included in the candidate dynamic analysis network are optimized.

4.3 Analyzing the operational characterization representations and predefined data dimensions

In some possible experiments, the step of subjecting a candidate dynamic analysis network to a network update operation to form an optimized dynamic analysis network corresponding to a preset data dimension, based on an exemplary identification data corresponding to the operational feature representation to be analyzed and the preset data dimension, may further include the following detailed implementation.

Based on the relationship between the exemplary identification data corresponding to the preset data dimension and the relevant exemplary identification data and the non-relevant exemplary identification data, an actual characterization parameter of the exemplary identification data corresponding to the preset data dimension is determined, e.g., when the exemplary identification data corresponding to the preset data dimension belongs to the relevant exemplary identification data, the actual characterization parameter may be equal to 1, e.g., characterizing the data interaction distortion, and when the exemplary identification data corresponding to the preset data dimension belongs to the non-relevant exemplary identification data, the actual characterization parameter may be equal to 0, e.g., characterizing no data interaction distortion. has data interaction distortion, and when the exemplary identification data corresponding to the preset data dimension belongs to irrelevant exemplary identification data, the actual characterization parameter can be equal to 0, e.g., the characterization does not have data interaction distortion.

Perform feature space mapping operations, such as encoding, on the exemplary identification data corresponding to the predefined data dimensions to form the corresponding exemplary identification feature representation.

A quantity product calculation is performed on the exemplary identification feature representation and the operational feature representation to be analyzed to output the corresponding quantity product of the feature representations, and an exponential operation is performed on the quantity product of the feature representations, and finally, the result of the exponential operation is adjusted to form the corresponding estimation of the characterization parameter of the operational feature representation to be analyzed, e.g., the result of the exponential operation is calculated by summing the result of the exponential operation with a target value, and the ratio of the result of the exponential operation and the result of the summing calculation is calculated to obtain the corresponding estimation of the characterization parameter, the target value may be equal to 1; and For example, the result of the exponential operation can be summed with the target value, and then the ratio of the result of the exponential operation and the result of the summing calculation can be calculated to obtain the corresponding estimated characterization parameter, which can be equal to 1.

Determination of the first negative correlation value of the estimated characterization parameter and determination of the second negative correlation value of the actual characterization parameter, e.g. the sum of the first negative correlation value and the estimated characterization parameter may be equal to the target value, and the sum of the second negative correlation value and the actual characterization parameter may also be equal to the target value.

based on the actual characterization parameter, weighting the logarithmic result of the estimated characterization parameter to form a corresponding first weighting parameter, and, based on the second negative correlation value, weighting the logarithmic result of the first negative correlation value to form a corresponding second weighting parameter, and, fusing the first weighting parameter and the second weighting parameter to obtain a network update error parameter that the candidate dynamic analysis network has. Exemplarily, a sum value between the first weighting coefficient and the second weighting coefficient may be calculated, and the network update error parameter may have a negative correlation with the sum value, such as the sum value between the two is equal to 1; in other experiments, such as the exemplary identification data corresponding to the predetermined data dimensions may be a plurality of exemplary identification data, such as system operation identification data corresponding to the loss of data exchanges, system operation identification data corresponding to the distorted data interactions, and so on. identification data corresponding to data exchange loss, and system operation identification data corresponding to data interaction distortion, so that the obtained multiple network update error parameters can be further averaged to obtain the final network update error parameter for subsequent network update operations.

Along the direction of reducing the network update error parameter, the candidate dynamic analysis network is subjected to network update operation to form an optimized dynamic analysis network corresponding to the preset data dimensions.

4.4 Formation process of later exemplary data

In some possible experiments, the formation process of the later exemplary data may further include the following detailed implementation contents: determining the previous IoT operation information cluster corresponding to the previous time interval, and determining the later IoT operation information cluster based on the preset data dimension in the later time interval, which belongs to a time interval after the previous time interval. The front Internet of Things operation information cluster includes the operation information of the Internet of Things system corresponding to the preset data dimension, that is, the data recorded in the data exchange process of the corresponding Internet of Things system, which can be expressed in text.

Based on the previous Internet of Things operation information cluster, the later exemplary system operation monitoring data cluster included in the later exemplary data is analyzed. For example, the previous Internet of Things operation information cluster can be directly used as the later exemplary system operation monitoring data cluster.

Based on the post-IoT operation information cluster, the exemplary identification data corresponding to the preset data dimensions included in the later exemplary data is analyzed, for example, the post-IoT operation information cluster can be analyzed, such as extracting the information carried therein, such as the state information reported by the front-end that can characterize the operation dynamics, or the state information sent from the back-end that can characterize the operation dynamics, and if the corresponding state information is not extracted, it can be manually labeled to obtain the exemplary identification data. If the corresponding state information is not extracted, the data can be manually labeled to get the exemplary identification data.

4.5 Dynamically analyzing the network update process of the network

In some possible experiments, the network update process of the candidate dynamic analysis network, may further include the following detailed implementation: determining out the configured master screening parameters and slave screening parameters.

Perform a network update operation of the candidate dynamic analysis network based on the late exemplary data, and filter the system operation monitoring data corresponding to a preset data dimension in the late exemplary system operation monitoring data cluster based on the master filtering parameter, and to filter the system operation monitoring data corresponding to other data dimensions in the late exemplary system operation monitoring data cluster based on the slave filtering parameter; that is, in the process of performing the network update of the candidate dynamic analysis network based on the late exemplary data, in the process of updating the candidate dynamic analysis network based on the late exemplary data, the system operation monitoring data corresponding to the preset data dimension in the late exemplary system operation monitoring data cluster is selected based on the master screening parameter, i.e., the system operation monitoring data corresponding to the portion of the late exemplary system operation monitoring data cluster corresponding to the preset data dimension is sifted out; the system operation monitoring data corresponding to the preset data dimension is discarded after discarding the system operation monitoring data corresponding to the preset data dimension; the system operation monitoring data corresponding to the preset data dimension is sifted out based on the slave screening parameter. After discarding the system operation monitoring data corresponding to the preset data dimension, only the system operation monitoring data corresponding to other data dimensions are left in the late exemplar system operation monitoring data cluster, so it is possible to learn how the data of other data dimensions are mapped to the system operation identifier data cluster of the preset data dimension when the data of the preset data dimension is discarded, which reduces the dependence on the data of the preset data dimension. On the other hand, in the process of network updating of the candidate dynamic analysis network based on the later exemplary data, the system operation monitoring data corresponding to other data dimensions in the later exemplary system operation monitoring data cluster are selected based on the screening parameter from the filtering parameter, i.e., the part of the system operation monitoring data corresponding to other data dimensions in the later exemplary system operation monitoring data cluster is sifted out.When screening the system operation monitoring data corresponding to the other data dimensions, one or more data dimensions of the other data dimensions can be selected for screening.

Wherein the specific values of the master screening parameter and the slave screening parameter are not limited, and wherein the master screening parameter is smaller than the slave screening parameter, for example, in a specific embodiment, it is possible to set 30% of the master screening parameter to select system operation monitoring data corresponding to a preset data dimension in the exemplary system operation monitoring data cluster in the mid- to late-stage, 70% of the master screening parameter to select system operation monitoring data corresponding to other data dimensions in the mid- to late-stage, and 70% of the master screening parameter to select system operation monitoring data corresponding to other data dimensions in the exemplary system operation monitoring data cluster in the mid- to late-stage. Monitoring data corresponding to other data dimensions in the exemplary system operation monitoring data cluster. If the candidate dynamic analysis network was updated 100 times, the system operation monitoring data corresponding to the preset data dimensions in the later exemplary system operation monitoring data cluster were selected 30 times, and the system operation monitoring data corresponding to other data dimensions were selected 70 times.

5. Strengths and applications

The IoT dynamic monitoring method and system based on big data has the following advantages. Accuracy: Through big data technology, features related to dynamic behavior can be extracted from massive data, thus improving the accuracy of dynamic detection. Real-time: It can collect and process the data of IoT devices in real time, so as to discover the dynamic devices or behaviors in time. Flexibility: According to different application scenarios and needs, big data algorithms and models can be adjusted and optimized to meet different monitoring requirements.

The method and system can be widely used in the fields of smart home, intelligent transportation, industrial production, medical and health care. For example, in smart home, it can detect the dynamic home appliances in time by monitoring the operation status of home appliances and sensor data, and carry out corresponding processing; in smart transportation, it can detect traffic congestion, traffic accidents and other dynamic situations by monitoring the data of traffic signals and vehicle flow, and carry out corresponding traffic guidance and rescue work.

6. Conclusions

In summary, the big data-based IoT dynamic monitoring methods and systems have high accuracy and real-time, and can effectively monitor and manage IoT devices. With the continuous development of IOT technology, the application of big data technology in IOT dynamic monitoring will be more and more extensive.

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