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Research on Deep Learning Programming Methods and Systems Based on Digital Mirror Platforms

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Abstract: *This paper introduces a deep learning programming method and system based on a digital mirror platform. It involves several key steps: acquiring equipment operation data from various terminal equipment across diverse business processes, including the process numbers of each suboperation. We then compare and analyze the data modeling of this equipment operation data from different terminal equipment. Based on the analysis results, we determine if the terminal equipment requires upgrading or optimization.*

Keywords: *Digital Mirroring Platform, Deep Learning, Programming Methods*

1. Preface

In the process of terminal equipment operation, it is often necessary to detect whether the terminal equipment needs to be upgraded and optimized, at present, the method of terminal equipment optimization and upgrading is usually based on the operation data of the terminal equipment, through the technicians to manually carry out the code upgrading, and manually optimize the code of the terminal equipment, which needs to spend high labor costs, resulting in the optimization and upgrading of the terminal equipment with low efficiency, and affecting the operation effect of the terminal equipment. The optimization and upgrading of terminal equipment is less efficient and affects the operation effect of terminal equipment[1].

2. Content of the project

The main objective of this paper is to provide a deep learning programming method based on a digital mirroring platform, aiming at solving the technical problems of low efficiency of business process and equipment optimization and upgrading as well as high labor cost in the prior art[2].

In order to achieve the above purpose, this paper provides a deep learning programming method based on a digital mirror platform, the deep learning programming method based on a digital mirror platform includes: obtaining the equipment operation data of each suboperation process in the business processes of different terminal equipment, wherein the equipment operation data includes the process number of each suboperation process; performing data modeling and comparative analysis of the equipment operation data of the suboperation processes of different terminal equipment, and determining whether the corresponding terminal equipment needs to be upgraded and optimized based on the analysis results; if so, then based on the trained time sequence programming model, the equipment operation data of each suboperation process is compared and analyzed. Comparison and analysis after modeling, and based on the analysis results to determine whether the corresponding terminal equipment needs to be upgraded and optimized; if so, based on the trained timing programming model, deep learning programming of the equipment operation data of each sub-operational process, automatic generation of the target runtime code, and distributed upgrading of the target runtime code to the corresponding terminal equipment, in which the timing programming model is based on the pre-collected data of each sub-operational process corresponding to the business process of different terminal equipment. The timing programming model is constructed based on the pre-collected equipment operation data of each sub-process corresponding to the business process in different terminal devices[3].

The steps of acquiring the equipment operation data of each sub job process in the business process of different terminal devices include: acquiring the equipment operation data of each sub job process

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reported by different terminal devices based on the preset communication protocol. The steps of comparative analysis after data modeling of equipment operation data of each sub job process: based on the equipment operation data of each sub job process, combined with 3D digital twin simulation technology, fusion analysis is carried out to obtain the analysis results. The steps of upgrading the target running code to the corresponding terminal device in a distributed manner include: classifying the algorithm engines corresponding to the sub workflow of the business processes of different terminal devices through the preset AI algorithm middle console; Based on the engine classification results, the target running code is upgraded to the sub workflow of the corresponding terminal device through the preset device upgrade method[4].

If yes, then based on the timing programming model, deep learning programming of the equipment operation data of each sub-operational process, automatically generate the target runtime code, and the target runtime code distributed upgrades to the corresponding terminal equipment, in which the timing programming model is based on the pre-collected business process of different terminal equipment corresponding to each sub-operational process of the equipment operation data for the construction of the steps prior to the digital mirror-based The deep learning programming method based on the digital mirror platform also includes: obtaining the business processes of different terminal devices, and collecting the training equipment operation data of each suboperation process in the different business processes; based on the training equipment operation data of each suboperation process, training the initial model to be trained, and obtaining the timing programming model[5].

After the step of performing deep learning programming on the equipment operation data of each suboperation process based on the time sequence programming model, automatically generating the target operation code, and upgrading the target operation code to the corresponding terminal equipment in a distributed manner, it also includes: marking the version number corresponding to the target operation code, and storing the target operation code and the corresponding version number; obtaining the operation results of debugging and optimizing the target operation code based on the target operation code through the terminal equipment; if the operation results are abnormal, controlling the algorithm engine to perform rollback processing to roll back the operation code corresponding to the previous version number, and optimizing the operation code through the developers to optimize the operation results corresponding to abnormal results. If the operation result is abnormal, the algorithm engine is controlled to perform rollback processing to roll back the operation code corresponding to the previous version number, and the abnormal operation code corresponding to the abnormal result is upgraded by the developer, so as to upgrade the upgraded operation code to the terminal device.

The preset communication protocols include one or more of 2G, 3G, 4G, 5G, CAT1 network transmission, CAT4 network transmission, NB-IOT narrowband Internet of Things, LORA low-power remote wireless communication, MQTT message queue telemetry transmission, HTTP, TCP, UDP transport layer protocols[6].

3. Deep Learning Programming System

This paper also provides a deep learning programming system based on a digital mirroring platform, the deep learning programming system based on the digital mirroring platform being a virtual system, the deep learning programming system based on the digital mirroring platform being applied to an artificial intelligence IoT platform, the artificial intelligence IoT platform being connected to at least one terminal device, the deep learning programming system based on the digital mirroring platform comprising[7].

Acquisition module for acquiring the equipment operation data of each suboperation process in the business process of different terminal devices, wherein the equipment operation data includes the process number of each suboperation process.

The analysis module is used to compare and analyze the equipment operation data of different terminal equipment after data modeling, and determine whether the corresponding terminal equipment needs to be upgraded and optimized based on the analysis results[8].

Deep learning programming module, for if yes, based on the trained timing programming model, deep learning programming of the equipment operation data of each suboperation process, automatically generating the target operation code, and distributively upgrading the target operation code to the corresponding terminal equipment, wherein the timing programming model is based on the equipment operation data of each suboperation process corresponding to the business processes in different terminal

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equipment collected in advance. The timing programming model is constructed based on the pre-collected data of each sub-process of business processes in different terminal devices[9].

4. Deep learning programming equipment

This paper also provides a deep learning programming device based on a digital mirroring platform, the deep learning programming device based on the digital mirroring platform being a physical device, the deep learning programming device based on the digital mirroring platform comprising: a memory, a processor, and a deep learning programming program based on the digital mirroring platform stored in the memory, the deep learning programming program based on the digital mirroring platform being executed by the processor to realize the steps of a method of programming based on the digital mirroring platform as described above. Steps of the deep learning programming method based on the digital mirroring platform.

This paper also provides a storage medium, the storage medium being a computer-readable storage medium, the computer-readable storage medium storing a deep learning programming program based on a digital mirroring platform, the deep learning programming program based on the digital mirroring platform being executed by a processor to realize steps such as the above-described deep learning programming method based on the digital mirroring platform[10].

5. Deep Learning Programming Methods

This paper provides a deep learning programming method and system based on a digital mirroring platform, compared to the technical means adopted in the prior art of manually upgrading and optimizing equipment by developers, this paper first acquires equipment operation data of each suboperation process in the business processes of different terminal equipment, wherein the equipment operation data includes the process number of each suboperation process, realizing that, through the artificial intelligence Internet of Things platform Collect the equipment operation data of the business process, and the collected data is the specific sub-operation process of the corresponding terminal equipment, so that after the subsequent deep learning automatic programming, the sub-operation process of the terminal equipment can be determined based on the process number of the automatically programmed operation code, and the equipment operation data of the different terminal equipment can be compared and analyzed after data modeling, and based on the results of the analysis, it can be determined whether the corresponding terminal equipment needs to be upgraded and optimized, and if so, it is possible to determine whether the corresponding terminal equipment needs to be upgraded and optimized. Based on the analysis results, determine whether the corresponding terminal equipment needs to be upgraded and optimized, and if so, based on the trained timing programming model, carry out deep learning programming on the equipment operation data of each suboperation process, automatically generate the target operation code, and upgraded the target operation code to the corresponding terminal equipment in a distributed manner, in which the timing programming model is constructed on the basis of the equipment operation data of the suboperation processes corresponding to the business processes in the different terminal equipments collected in advance. It realizes that by splitting the business process into sub-processes, the model learns the operation data of specific sub-processes of different business processes, improves the accuracy of the timing programming model, and then automatically programs the equipment operation data of each sub-process corresponding to the business process through the deep learning of the timing programming model, eliminating the need for manual programming, which greatly reduces the labor cost and improves the efficiency of the optimization and upgrading of equipment, and increases the efficiency of the optimization and upgrading of equipment. Optimization and upgrading efficiency is greatly reduced, and the automatically generated operation code is upgraded to the corresponding terminal equipment in a distributed manner with high code portability, thus improving the intelligence of terminal equipment management.

6. Specific modalities of realization

This example provides an in-depth learning programming method based on the digital twin DaaS (data as a service) platform. In the first example of this in-depth learning programming method based on the digital image platform, referring to Figure 1, the in-depth learning programming method based on the digital image platform includes:

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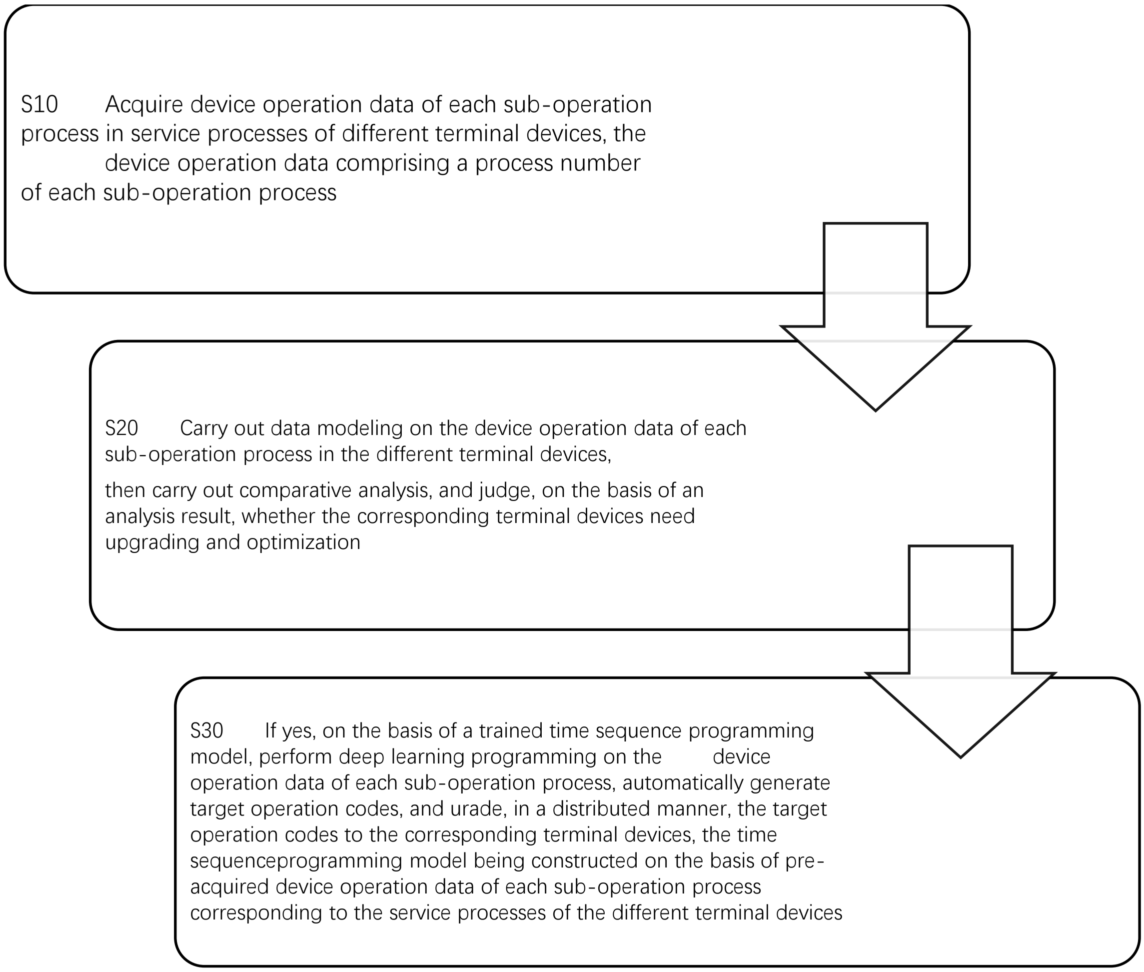

Fig. 1 Flowchart of Deep Learning Programming Method

Step S10, acquire the equipment operation data of each sub workflow in the business process of different terminal devices, wherein, the equipment operation data includes the operation number of each sub workflow;

In the instance, in-depth learning and programming are applied to the artificial intelligence Internet of Things (AIOT) platform, which can be applied to intelligent transportation, intelligent security, intelligent medicine, industrial Internet of Things and other fields. The AI Internet of Things platform includes the device layer, and the AI Internet of Things platform connects at least one terminal device through the device layer, and the terminal device includes intelligent transportation equipment Industrial intelligent robots, network terminal devices, human intelligent wearable devices, engineering intelligent machinery equipment, agricultural intelligent machinery equipment, CNC machine tools, intelligent sensors, intelligent collectors, intelligent cameras, intelligent transmitters and embedded intelligent systems.

The workflow of different terminal devices is different, each terminal device is configured with corresponding equipment identification, the business process includes multiple sub-operation processes, and each sub-operation process is configured with its own corresponding process number, and the whole business process includes multiple processes or multiple operation links, so that the sub-operation processes of the corresponding terminal devices can be determined through the identification of the equipment as well as the process number, for example, in the field of industrial Internet, the business process of terminal devices can be power-on, preheating, loading raw materials, polishing and aging, etc. In the field of intelligent medical care, during the physical examination of users, the body of the body is loaded with raw materials, polishing and aging. For example, in the field of industrial internet, the business process of a terminal device can be a number of sub-processes such as powering on, warming up, loading raw materials, polishing and aging, etc. In the field of intelligent medical care, when a user undergoes a physical examination, the results of the examination of a number of parts of the body can be used as sub-processes.

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Obtaining the equipment operation data of each suboperation process in the business processes of different terminal devices, specifically, after the terminal devices are connected to the artificial intelligence IoT platform, obtaining the corresponding business processes of different terminal devices through the artificial intelligence IoT platform, collecting the equipment operation data of each suboperation process in the business processes when the terminal devices execute the corresponding business processes, and reporting the equipment operation data of each suboperation process to the artificial intelligence IoT platform through the data communication protocol between the terminal devices and the artificial intelligence IoT platform. Through the data communication protocol between the terminal device and the AI IoT platform, the equipment operation data of each sub-process is reported to the AI IoT platform.

Wherein the step of obtaining equipment operation data for each suboperation process in the business process of different terminal devices comprises.

Step S11, based on the preset communication protocol, respectively acquire the equipment operation data of each sub job process reported by different terminal devices.

It should be noted that the preset communication protocols include at least one or more of 2G, 3G, 4G, 5G, CAT1, CAT4, NB-IOT, LORA, MQTT, HTTP, TCP, UDP and CoAP protocols.

Specifically, in the process of executing each suboperation process of the corresponding business process through different terminal devices, the equipment operation data of each suboperation process reported through different terminal devices are obtained in real time.

Step S20, carry out data modeling and comparative analysis on the equipment operation data of different terminal devices, and judge whether the corresponding terminal devices need to be upgraded and optimized based on the analysis results;

After data modeling and comparative analysis of the equipment operation data of different terminal devices, determine whether the corresponding terminal devices need to be upgraded and optimized based on the analysis results. Specifically, the collected equipment operation data are preprocessed such as cleaning and filtering, and the preprocessed equipment operation data is fused and analyzed in combination with 3D digital twin simulation technology to obtain the analysis results, Based on the analysis results, judge whether the corresponding terminal equipment needs to be upgraded and optimized. For example, in the industrial Internet, connect the terminal equipment to the artificial intelligence Internet of Things platform. After receiving the access instruction corresponding to the terminal equipment connecting to the artificial intelligence Internet of Things platform, collect the equipment operation data of each sub workflow in the corresponding business process of different terminal equipment, Assuming that the business process corresponding to the terminal equipment includes 50 processes, collect the equipment operation data corresponding to the 50 processes in the business process, and conduct modeling analysis in combination with the 3D digital twin simulation model, so as to determine the equipment operation status of different processes in the terminal equipment business process through the equipment operation data of different processes. In addition, in the AI view of smart medicine, By connecting medical equipment to the artificial intelligence Internet of Things platform, it is possible to collect user's corresponding films and film reports stored in the detection report database, so that when users watch films, they can model and analyze according to the detection reports of different parts in the detection report database in combination with the 3D digital twin simulation technology, In order to accurately determine the user's detection results based on the comprehensive analysis of multiple parts, further, the AI camera is connected to the AI Internet of Things platform. After receiving the access command corresponding to the AI camera connected to the AI Internet of Things platform, the image data captured by different AI cameras can be collected, and then in the AI camera monitoring of intelligent traffic, The captured images corresponding to different cameras in the same area can be combined with the 3D digital twin simulation technology for data modeling and analysis, so as to accurately monitor vehicles.

In this regard, the steps for comparative analysis of equipment operation data for each suboperation process after data modeling are as follows.

Step S21, based on the equipment operation data of each sub work process, combined with 3D digital twin simulation technology, conduct fusion analysis to obtain the analysis results.

Based on the equipment operation data of each sub work process, combined with 3D digital twin simulation technology, fusion analysis is conducted to obtain analysis results. Specifically, based on the equipment operation data of each sub work process, digital modeling analysis is conducted through 3D

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digital twin simulation technology to obtain analysis results.

Step S30, if yes, based on the trained timing programming model, carry out in-depth learning and programming for the equipment operation data of each sub workflow, automatically generate the target operation code, and upgrade the target operation code to the corresponding terminal equipment in a distributed manner, The timing programming model is built based on the equipment operation data of each sub workflow corresponding to the business process in different terminal devices collected in advance.

If yes, based on the trained timing programming model, in-depth learning and programming will be carried out for the equipment operation data of each sub workflow, the target operation code will be automatically generated, and the target operation code will be distributed and upgraded to the corresponding terminal equipment, The timing programming model is built based on the equipment operation data of each sub work process corresponding to the business process in different terminal devices collected in advance. Specifically, if it is, it proves that the terminal device needs to be upgraded and optimized, and then based on the timing programming model, the equipment operation data of each sub work process can be deeply learned and programmed, Thus, the target running code corresponding to each sub workflow is automatically generated, and the target running code is intelligently upgraded to the corresponding terminal device through the distributed form, so that the terminal device can perform operation mode based on the target running code, and improve the operation effect of the terminal device. For example, follow the example of step S20 above, The business process corresponding to the terminal equipment includes 50 processes (startup, preheating, loading of raw materials, polishing and aging, etc.), in which, assuming that the startup time in the traditional industrial Internet is 8 seconds, the preheating time is 1 minute, and the loading of raw materials is 5 minutes, based on the equipment operation data of each sub business process in the business process, in this paper, in-depth learning and programming is carried out through the timing programming model, Thus, the terminal equipment can be automatically optimized, which can make the terminal equipment assume that the startup time is 1s, the warm-up time is 0s, and the time for loading raw materials is 1min, thus greatly improving the operating efficiency of the equipment. In the traditional terminal equipment control, professional technicians are required to control and upgrade and optimize the terminal equipment, After modeling and analyzing the equipment operation data corresponding to each process of the business process in the terminal device directly, an upgrade package is generated through the timing programming model, so that ordinary personnel can also optimize the operation of the terminal device, greatly reducing the labor cost of the enterprise. In addition, in AI movies in smart medicine, detection is often only based on the detection report of a single part of the user. It has limitations. In this paper, the parameters of the terminal equipment are automatically optimized according to the test report database through the timing programming model, so that the user's test results can be accurately determined based on the comprehensive analysis of multiple parts, and the accuracy of AI viewing can be improved. In addition, the automatic programming is based on the test report database and the timing programming model, So that medical film reports do not need to be analyzed by medical experts, and ordinary doctors can also view film reports directly based on the time series programming model and automatically in-depth learning the optimized medical terminal equipment, greatly reducing human costs and resources. Furthermore, in the AI camera monitoring of intelligent transportation, it is necessary to obtain the image data taken by intelligent cameras for analysis, In this paper, different AI cameras are connected to the artificial intelligence Internet of Things platform to collect the corresponding image data of different AI cameras. Understandably, when the vehicle is driving to this area, the image data of license plates taken by different cameras in this area can be collected to obtain 360 ° omnidirectional image data, After in-depth learning and programming through the timing programming model, the terminal equipment is intelligently optimized and upgraded,In order to quickly obtain the image data taken by different intelligent cameras and conduct modeling analysis, so as to achieve rapid and accurate vehicle monitoring. In addition, the image data of cameras are collected comprehensively through the AI Internet platform, and after modeling analysis combined with the 3D digital twin simulation technology of data, automatic programming optimization is carried out through the timing programming model, There is no need for professional technicians to monitor and analyze the image data of the camera, thus greatly reducing the labor cost. Therefore, in this paper, the terminal equipment is connected to the AI Internet platform in advance, so as to transmit the equipment operation data of the terminal equipment based on the preset communication protocol, and automatically optimize the parameters of the terminal equipment based on the timing programming model, It not only improves the operation efficiency of terminal equipment, but also greatly reduces the cost of human resources.

wherein the step of distributively upgrading the target runtime code to the corresponding end device comprises.

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Step S31, classify the algorithm engines corresponding to the sub workflow of the business processes of different terminal devices through the preset AI algorithm middle platform;

Step S32, based on the engine classification results, use the preset device upgrade method to upgrade the target running code to the corresponding terminal device's sub workflow.

It should be noted that the preset device upgrade methods include OTA upgrade methods, where OTA (Over the Air Technology) upgrade refers to the technology that terminal devices download the upgrade package on remote servers through wireless networks to upgrade systems or applications.

Different terminal devices are configured with corresponding algorithm engines in the AI algorithm center of the AI IOT platform, and the business process of a terminal device includes multiple sub work processes. Therefore, the algorithm engines corresponding to different word work processes need to be classified, so that the algorithm engines based on the, The operation code of in-depth learning programming is upgraded to the sub work flow of the corresponding terminal device through the OTA upgrade method.

Wherein, after the step of performing deep learning programming on the equipment operation data of each suboperation process based on a timing programming model, automatically generating a target operation code, and distributively upgrading the target operation code to the corresponding terminal equipment, further comprising.

Step A10, mark the version number corresponding to the target running code, and store the target running code and the corresponding version number;

It should be noted that, for each run code generated automatically by the deep learning automatic programming, it is necessary to store the run code obtained by the programming, and mark the version number of the run code, and additionally, in the storage process, the run code of the last deep learning programming will not be overwritten, but will be stored together to the artificial intelligence IoT platform. In one embodiment, in order to alleviate the space of the platform, the running code of a predetermined number of times of deep learning programming may be stored, for example, the running code of the first 3 times of deep learning programming from the current deep learning programming may be stored.

Step A20, obtain the running results of debugging and optimization based on the target running code through the terminal device;

Obtaining the operation results of debugging and optimization based on the target operation code of the terminal equipment. Specifically, after obtaining the target operation code of the terminal equipment, the terminal equipment carries out pre-running based on the target operation code and obtains the operation results to determine whether the optimization and upgrading of the terminal equipment is successful.

Step A30, if the running result is abnormal, control the algorithm engine to roll back the running code corresponding to the previous version number, and upgrade the abnormal running code corresponding to the abnormal result through the developer to upgrade the upgraded running code to the terminal device.

Specifically, if the running result is abnormal, it proves that the target running code obtained by deep learning programming is abnormal, and then controls the algorithm engine corresponding to the abnormality to carry out rollback processing, so as to roll back the running code corresponding to the previous version number, thus making the terminal equipment run in accordance with the running code corresponding to the previous version number, avoiding the defect of the interruption of the operation of the terminal equipment, and then notifies the developers to carry out manual upgrading of the abnormal running code corresponding to the abnormal result, and upgrades the upgraded running code to the terminal equipment, thus completing the upgrading and optimization operation of the terminal equipment. The developer is then notified to manually upgrade the abnormal runtime code corresponding to the result and upgrade the upgraded runtime code to the terminal device, thus completing the upgrade and optimization of the terminal device.

7. Deep learning programming methodology implementation

This example provides a deep learning programming method based on a digital mirroring platform, compared to the technical means adopted in the prior art of manually upgrading and optimizing equipment by developers, this example first obtains the equipment operation data of each suboperation process in the business processes of different terminal equipment, wherein the equipment operation data

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includes the process number of each suboperation process, and realizes the collection of equipment operation data of business processes by an artificial intelligence IoT platform, and the collected data is detailed to the specific suboperation process of the corresponding terminal equipment, so that after the subsequent deep learning automatic programming, the operation code of automatic programming can be determined based on the process number. The equipment operation data of the business process is collected through the artificial intelligence IoT platform, and the collected data is detailed to the specific suboperation process of the corresponding terminal equipment, which makes it possible to determine the suboperation process of the terminal equipment based on the process number of the automatic programming of the automatic programming after the subsequent automatic programming of the deep learning, to compare and analyze the data of the equipment operation data of the different terminal equipment after the data modeling and to determine whether the corresponding terminal equipment needs to be upgraded and optimized, and if so, to determine the corresponding terminal equipment after the data modeling and to determine whether the corresponding terminal equipment needs to be upgraded and optimized. Based on the analysis results, it determines whether the corresponding terminal equipment needs to be upgraded and optimized, and if so, based on the trained timing programming model, it carries out deep learning programming on the equipment operation data of each suboperation process, automatically generates the target operation code, and distributively upgrades the target operation code to the corresponding terminal equipment, in which the timing programming model is constructed on the basis of the equipment operation data of the suboperation processes corresponding to the business processes of the different terminal equipments collected in advance. It realizes that by splitting the business process into sub-processes, the model learns the operation data of specific sub-processes of different business processes, improves the accuracy of the timing programming model, and then automatically programs the equipment operation data of each sub-process corresponding to the business process through the deep learning of the timing programming model, eliminating the need for manual programming, which greatly reduces the labor cost and improves the efficiency of the optimization and upgrading of equipment, and increases the efficiency of the optimization and upgrading of equipment. The efficiency of optimization and upgrading is greatly reduced, and the automatically generated operation code is upgraded to the corresponding terminal equipment in a distributed manner with high code portability, thus improving the intelligence of terminal equipment management.

Based on the first example herein, in another example herein, based on a time sequence programming model, deep learning programming is performed on the equipment operation data of each suboperation process, a target operation code is automatically generated, and the target operation code is distributedly upgraded to the corresponding terminal equipment, wherein the time sequence programming model is based on the equipment of each suboperation process corresponding to the business process in different terminal equipment collected in advance. Before the step of constructing the operation data, the deep learning programming method based on the digital mirror platform further comprises.

Step B10, obtain the business processes of different terminal devices, and collect the training equipment operation data of each sub work process in different business processes;

Step B20, train the initial model to be trained based on the running data of the training equipment of each sub workflow to obtain the timing programming model.

It should be noted that the learning objective of the training timing programming model is to allow the deep learning programming method based on the digital mirroring platform to mimic the behavioral process of the input data, and ultimately be able to form the correct output data. When the training is completed, these conversion rules are encoded into the network parameters of the neural network, and when the model is actually applied, the neural network performs feature extraction and representation of the input data, and learns to make predictions based on the results of the feature extraction, thus outputting the final code results.

Specifically, firstly, obtain the training equipment operation data of each sub-operational process in the respective business processes of the same terminal equipment, and then extract the feature information of the training equipment operation data, in order to iteratively optimize the network parameters of the initial model to be trained based on the feature information, and then determine whether the optimized initial model to be trained meets the training end conditions, in which the training end conditions include the conditions that the loss function has reached convergence or the number of iterations has reached a preset number of iterations, etc. If they are met, then the timing programming model is obtained, and if they are not met, then the execution step is returned to: obtaining the business processes of different terminal equipment, and obtaining a time sequence programming model. The training end conditions include the conditions that the loss function reaches convergence or the number of iterations reaches the preset number of iterations, etc. If the conditions are met, then the timing

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programming model is obtained, and if they are not met, then the execution steps are returned to the following: obtaining the business processes of different terminal devices, and collecting the training equipment operation data of the sub-processes of the different business processes.

This paper provides an example of a deep learning programming method based on a digital mirror platform, i.e., obtaining the business processes of different terminal devices and collecting the training equipment operation data of each sub-process of different business processes, and then based on the operation data of the training equipment of each sub-process, training the initial model to be trained and obtaining the temporal programming model, which realizes model training based on the equipment operation data of the sub-processes of different business processes, thus enabling the model to learn the operation data of specific sub-processes, thus improving the accuracy of the temporal programming model, and then based on the temporal programming model, it is possible to train a model for different terminal devices based on the timing programming model. The model training is based on the equipment operation data of each sub-process in different business processes, so that the model can learn the operation data of specific sub-processes, thus improving the accuracy of the timing programming model, and then the deep learning automatic programming of the equipment operation data of different terminal equipment based on the timing programming model can be carried out to improve the efficiency of the upgrading and optimization of terminal equipment.

The deep learning programming device based on the digital image platform can include: processor 1001, such as CPU, memory 1005, and communication bus 1002. The communication bus 1002 is used to realize the connection communication between the processor 1001 and the memory 1005. The memory 1005 may be a high-speed RAM memory or a non-volatile memory, such as a disk memory. The memory 1005 may also be a storage device independent of the processor 1001.

Optionally, the deep learning programming device based on the digital image platform can also include rectangular user interface, network interface, camera, RF (Radio Frequency) circuit, sensor, audio circuit, WiFi module, and the like. The rectangular user interface can include display screen, input sub module such as keyboard, and optional rectangular user interface can also include standard wired interface and wireless interface. The network interface can include standard wired interface and wireless interface (such as WIFI interface).

The memory 1005, which is a computer storage medium, may include an operating system, a network communication module, and a deep learning programming program based on the digital mirroring platform. The operating system is a program that manages and controls the hardware and software resources of the deep learning programming device based on the digital mirroring platform, and supports the operation of the deep learning programming program based on the digital mirroring platform and other software and/or programs. The network communication module is used to implement communication between components within the memory 1005, as well as with other hardware and software in the digital mirror platform-based deep learning programming method.

In the digital mirroring platform-based deep learning programming apparatus, the processor 1001 is used to execute a digital mirroring platform-based deep learning programming program stored in the memory 1005, and implement the steps of a digital mirroring platform-based deep learning programming method described in any of the above.

8. Functional modules of the deep-learning programming device

This paper also provides an in-depth learning programming system based on the digital image platform. The in-depth learning programming system based on the digital image platform includes: acquisition module, which is used to obtain the equipment operation data of each sub workflow in the business process of different terminal devices, wherein, the equipment operation data includes the operation number of each sub workflow; The analysis module is used to compare and analyze the operation data of different terminal devices after data modeling, and judge whether the corresponding terminal devices need to be upgraded and optimized based on the analysis results; The in-depth learning programming module is used to, if yes, conduct in-depth learning programming for the equipment operation data of each sub workflow based on the trained timing programming model, automatically generate the target operation code, and distribute and upgrade the target operation code to the corresponding terminal equipment, The timing programming model is built based on the equipment operation data of each sub workflow corresponding to the business process in different terminal devices collected in advance. The acquisition module is also used to acquire the equipment operation data of each sub job process reported by different terminal devices based on the preset communication protocol. The

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analysis module is also used to conduct fusion analysis based on equipment operation data of each sub work process and 3D digital twin simulation technology to obtain analysis results. The deep learning programming module is also used to classify the algorithm engines corresponding to the sub workflow of the business processes of different terminal devices through the preset AI algorithm middle platform; Based on the engine classification results, the target running code is upgraded to the sub workflow of the corresponding terminal device through the preset device upgrade method. The deep learning programming system based on the digital image platform is also used to: obtain the business processes of different terminal devices, and collect the training equipment operation data of each sub work process in different business processes; Based on the running data of the training equipment of each sub process, the initial model to be trained is trained to obtain the timing programming model.

The deep learning programming system based on the digital mirror platform is also used for: marking the version number corresponding to the target running code, and storing the target running code and the corresponding version number; obtaining the running results of debugging and optimization based on the target running code through the terminal equipment; if the running results are abnormal, controlling the algorithm engine to carry out the rollback processing in order to roll back the running code corresponding to the previous version number and upgrading the abnormal running code corresponding to the abnormal results by the developer, so that the upgraded running code can be upgraded to the terminal equipment. If the result is abnormal, the algorithm engine is rolled back to roll back the previous version of the corresponding running code, and the developer upgrades the abnormal running code corresponding to the abnormal result to upgrade the upgraded running code to the terminal equipment.

9. Conclusion

By adopting the deep learning programming method and system based on the digital mirror platform, we have successfully solved the problems of low efficiency in business process and equipment optimization and upgrading, as well as high labor costs. The core of this method lies in acquiring equipment operation data from various terminal equipment across diverse business processes, including the process numbers of each suboperation. We then compare and analyze the data modeling of this equipment operation data from different terminal equipment. Through deep learning programming, we can automatically generate target runtime code, achieving efficient and automated equipment optimization and upgrading processes. Additionally, this method has high flexibility and scalability, adapting to various types and scales of equipment and business processes. Therefore, we believe that this method will play an increasingly important role in the field of equipment and business process optimization in the future, bringing significant economic and social benefits to enterprises and organizations.

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