

Research on the Construction of Meteorological Virtual Reality Intelligent Training System

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Abstract: With the continuous development of meteorological informationization, information technology has been fully infiltrated and it is profoundly affecting the modern development concept and mode of meteorological education and training. It must adapt to the characteristics of the new era, according to demand orientation, problem orientation and goal orientation. It is necessary to start and improve the ability of technological innovation. On the basis of the construction of the meteorological education cloud platform, we will continuously develop advanced, intelligent and practical training systems with key core technologies. The paper combines the experience of the Meteorological Cadre Training Institute of China Meteorological Administration (hereinafter referred to as “Cadre College”) in the construction of distance education training system, and conducts preliminary analysis and discussion on how to improve the ability of meteorological virtual reality intelligent training. All these researches with artificial intelligence technology can give better play to the construction benefits of the meteorological education cloud platform.

1. Introduction

It is an important task at the present stage to promote the modernization of meteorological services with the idea and method of informatization, intensification and standardization. However, meteorological informatization is not only the meteorological business informatization, but also in the concept, service, business, management, training and so on. In recent years, cadre colleges have built a meteorological distance education and training system to enrich educational resources. With the rapid development of meteorological education cloud platform construction, meteorological distance education is becoming more and more accessible.

Taking the construction of meteorological virtual simulation training platform as an example, when the cadre institute builds the platform, it strengthens the construction of virtual simulation training subsystem, such as automatic station, sounding, figure, etc. At the same time, it is striving to build a high-tech teaching environment which integrates the functions of scientific research, teaching, display and reporting, etc. The platform provides a full-featured training and R&D environment based on body sensefunction, human-computer interaction function, digital sand table experiencefunction, etc. At present, the cadre institute has built a radar virtual simulation training system development platform with advanced technology, comprehensive function, efficient

configuration, flexible combination and open sharing. Which is a shared development platform with key core technologies. By setting up the R&D environment, Cadre institute provides a platform with scientific research, engineering practice and application development for China meteorological administration business units, universities and related scientific research units. The platform can quickly realize the development of virtual simulation training system for instrument equipment, such as figure, radar, satellite, etc. At the same time, it can be widely used in many fields such as meteorological service technology research, publicity and popular science.

In recent years, big data, virtual reality and artificial intelligence have made rapid progress. New technologies have been applied in various fields. Artificial intelligence has twice entered the government work report and become an important part of national top-level design. Through many technical surveys and meetings, this paper analyzes and compares from the perspectives of high-tech enterprises, scientific research institutions, universities, etc. Combining with the latest technological progress, this paper intends to analyze and discuss how to improve meteorological training ability from the perspective of artificial intelligence technology, so as to better play the benefits of the construction of meteorological education cloud platform. Starting from artificial intelligence technology, this paper analyzes and discusses how to improve meteorological training ability.

2. Implement the planning plan and lay out intelligent meteorological training

The Marine Meteorological Development Plan (2016-2025) clearly points out that "the construction of marine meteorological training system will be based on the development of marine meteorological operations and providing high-quality talent for the related marine meteorological engineering." The Meteorological Radar Development Special Plan (2017-2020) clearly points out that "We need to build and improve corresponding radar maintenance training physical simulation system and virtual simulation system." The China Meteorological Cadre Training Institute Development Plan (2011-2020) and The Modernization of China Meteorological Cadre Training Institute Implementation Plan (2014-2020) puts forward specific planning objectives and implementation plans. In order to implement the planning scheme, the meteorological virtual simulation technology team laid out intelligent meteorological training, and they proposed the construction scheme of "meteorological mixed reality intelligent training system". Which include meteorological observation equipment virtual simulation training system based on Internet and meteorological observation equipment virtual simulation training system based on immersive. Inspired by the concept of "Internet + smart weather", cadre institute has built meteorological scene recognition training system and weather AI barrier-free training system. Cadre institute has established uniform standard and classified push mechanism, which realizes visual management of distance learning resources. Big data analysis technology can monitor and intelligently process the meteorological training data. Through the visual analysis technology we can excavate the potential law and the value.

The system structure can be divided into four layers: access layer, application layer, core layer and data layer, the meteorological virtual reality intelligent training system structure chartas is shown as the figure 1.

The access layer implements unified identity authentication and provides system application services to users through web services and API interfaces. At the same time, it also provides services for the meteorological distance education network, mobile learning center, marine meteorological training center, meteorological product adaptation, WeChat applet and other related sub-sites.

The application layer provides users with a unified human-computer interface system for

application scenarios, including business training, on-the-job training, new technology training, industry training, examination evaluation training, One Belt And One Road training.

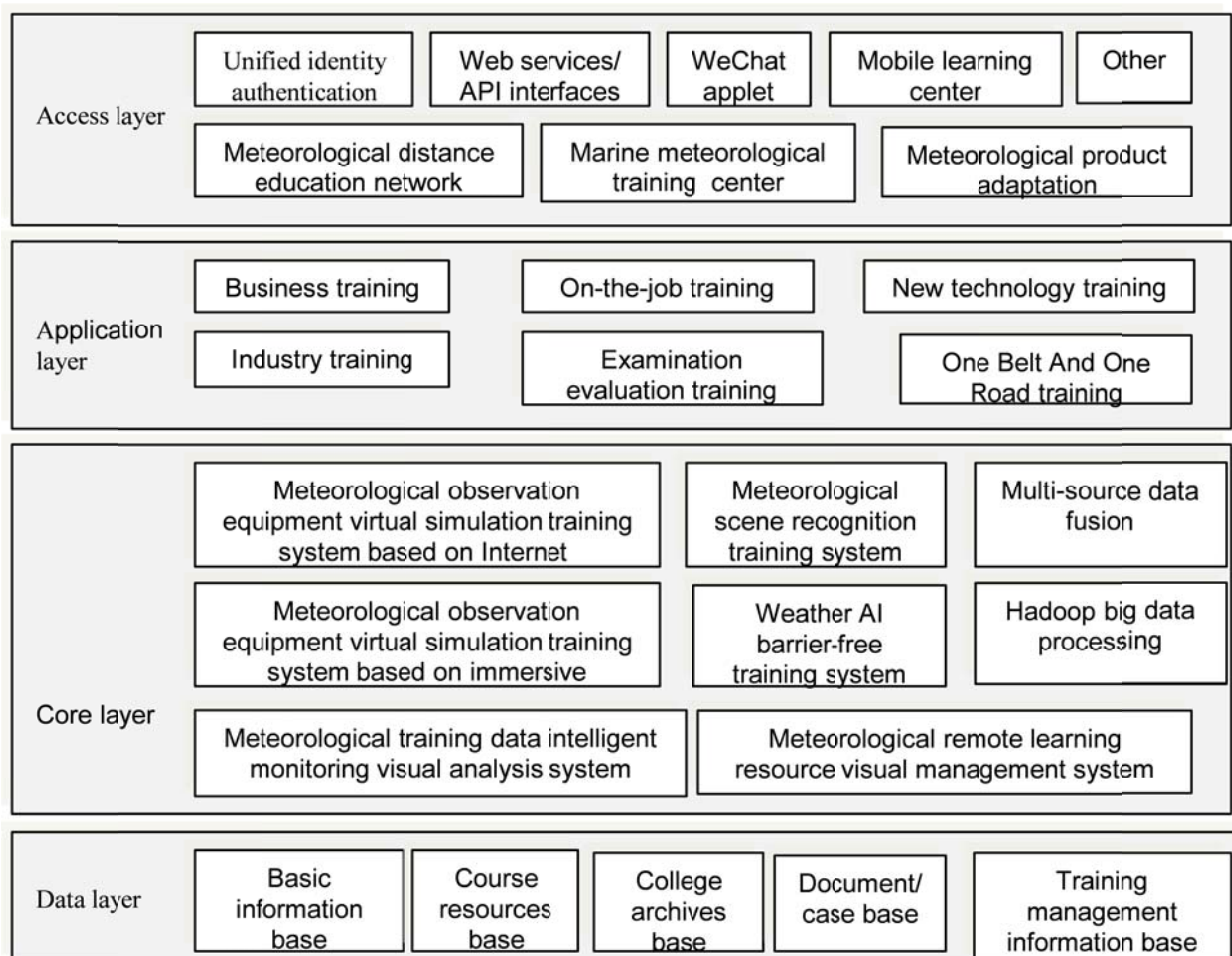


Figure 1: Meteorological virtual reality intelligent training system structure chart

The core layer is the analysis and integration of the application layer, which is mainly divided into four different training methods, including meteorological observation equipment virtual simulation training system based on Internet, meteorological observation equipment virtual simulation training system based on immersive, meteorological scene recognition training system, weather ai barrier-free training system. Meteorological remote learning resource visualization management system provides intelligent learning resource services. Virtual training management provides intelligent monitoring and visual analysis of learning process.

The data layer realizes data access, including basic information base, course resource base, document/case base, college archives base and training management information base.

3. Build an intelligent training system relying on artificial intelligence technology

Artificial intelligence is a discipline that simulates human thinking process and intelligent behavior through the computer, such as learning, reasoning, thinking, planning and so on. So, the first step of combing artificial intelligence technology with meteorological education training is to solve the problem of personalized learning activities. It is necessary to master enough background information, data modeling analysis and intelligent decision calculation, can we achieve the

expected effect of promoting personalized learning.

With the wide application of deep neural network and the breakthrough in brain science research, the key team of weather virtual simulation technology has built a training system based on real scene recognition technology under the big data, cloud computing and other related technologies. The system introduces virtual human sign language broadcasting technology and develops a weather barrier-free training system. The system provides a human-computer interaction system with clear information expression for students and the public. Which improves the efficiency and effectiveness of training.

3.1 Construction of meteorological scene identification training system

With the support of meteorological observation equipment, 3D visualization technology and virtual reality technology, the meteorological scene recognition training system can provide an effective way for the front-line technical personnel, such as accurate identification of observation equipment, real-time skill training, on-site fault diagnosis, etc. The system not only guarantees the intuitiveness, accuracy and timeliness of teaching, but also has some functions such as automatic filling of equipment data set, augmented reality bullet screen, and so on. Which can effectively promote the substantial improvement of training efficiency.

3.1.1 The application of deep learning implements scene recognition technology

The most popular application of deep learning is the convolution neural network in large-scale image recognition. Deep learning emphasizes that the parameters in the model are obtained by learning from the data.

1) Network model of deep learning

For the convolutional neural network, the construction of network layer is the key to improve the image recognition rate. Alexnet network model is selected in this paper, Alexnet model construction schematic diagram is shown as the figure 2.

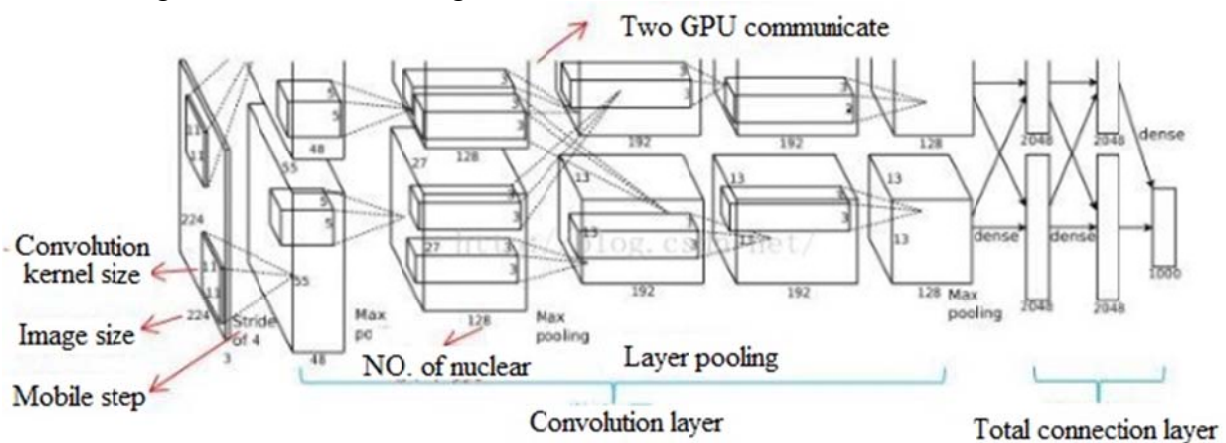


Figure 2: Alexnet model construction schematic diagram

The Alexnet model includes an input layer, a convolutional layer, and a total connection layer. The system calculates the maximum expected score through the learning process. The learning process is to adjust the weights in these ways, so that the good feedback can be obtained through the network training. We treat this problem as an optimization problem with the goal of getting the best feedback.

2) Learning results of the deep learning model (server-side)

In the network model of deep learning, we add a large number of tagged image training data, and

take it as the target to be predicted by the system in the test. Deep learning is not the learning of the human brain. For machines, images are pieced together pixel by pixel. The convolutional neural network will perform convolution processing for each pixel of the input image. By adjusting the internal parameters of the model, it can predict the result of the test image after a long time of learning.

3.1.2 The system design

As a highly interactive training system, the main function of meteorological scene identification training system are the visual display of meteorological observation equipment and query and analysis of human-computer interactive. Based on the basic database and user database, cadre institute has been established the meteorological observation equipment training system based on deep learning scene recognition technology. The function diagram of meteorological scene recognition training system are shown as figure 3.

Deep learning training. The core framework of meteorological observation equipment identification is based on the equipment data set collected in advance. The deep learning technology was used to carry out the training. The system solidifies and saves the data of the completed training model.

Pyramid pooling. It supports automatic input of images from mobile phone camera, computer camera and binocular camera acquisition equipment, and it supports all formats and pixel sizes as prediction of deep learning model.

Deep learning model optimization. Model optimization is very important for traditional machine learning and deep learning, and a series of difficult challenges need to be solved in the training. We can apply the optimization algorithm to stochastic gradient descent, only in this way, can we get more accurate recognition rate.

Accurate device identification. Based on deep learning scene recognition, after training data of "ten thousand" data volume, the accuracy rate of the system can reach more than 95% and the recognition efficiency is high. Through the model training in the recognition stage, the user can quickly and accurately identify the observation equipment.

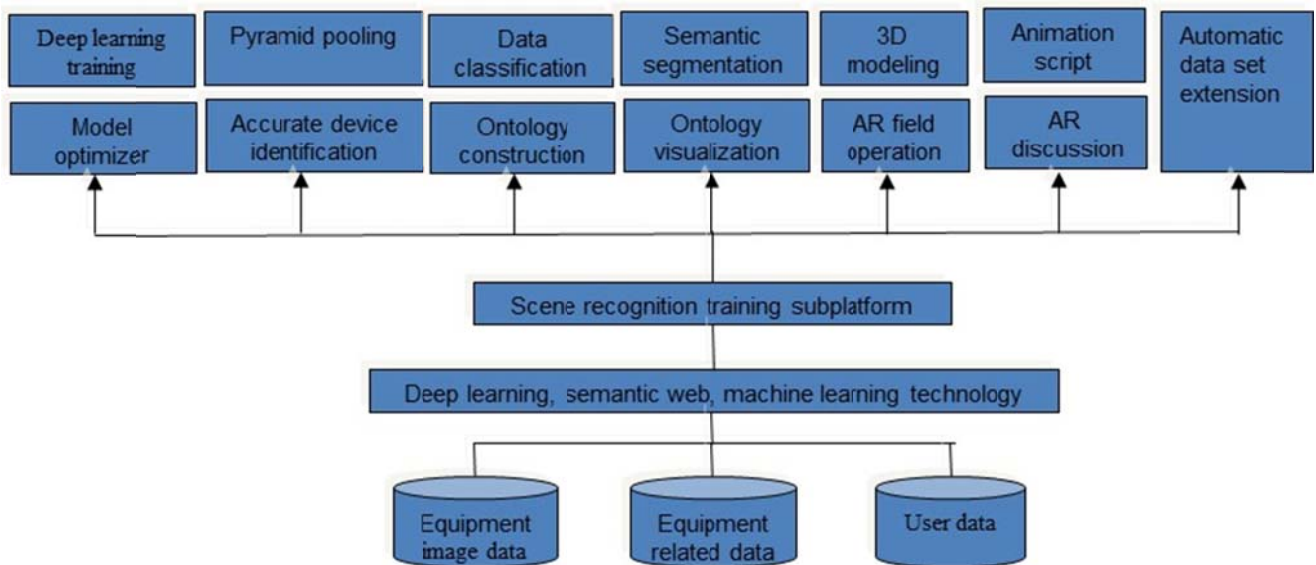


Figure 3: The function diagram of meteorological scene recognition training system

3.2 Construction of weather AI barrier-free training system

As an intelligent human-computer interaction system, the weather AI barrier-free training system realizes speech recognition, natural language processing, intelligent reply, sign language expression and comprehensive visualization through virtual human gestures, expressions and other traditional media means.

In this way, we can achieve the goal of barrier-free communication between people and intelligent systems. Marine meteorological artificial intelligence barrier-free training system diagram is shown as the figure 4.

Sign language recognition. Users can not only input questions to the system by voice, but also by sign language. The system recognizes sign language by reading and processing user sign language video.

Speech recognition. We recognize the voice input to the system by the user. Users input the problems they want to understand through voice, and the system can realize the processing and recognition of voice.

Intelligent reply. After the system converts sign language sequence into normal language sequence, the system can search and give answers to the questions asked by users. At the same time, the system can also be converted into sign language sequence through natural language processing module, so that the system will truly achieve barrier-free human-computer interaction.

Sign language. The system supports the expression of ordinary language in sign language and visually displays the sequence of sign language to users through virtual people.

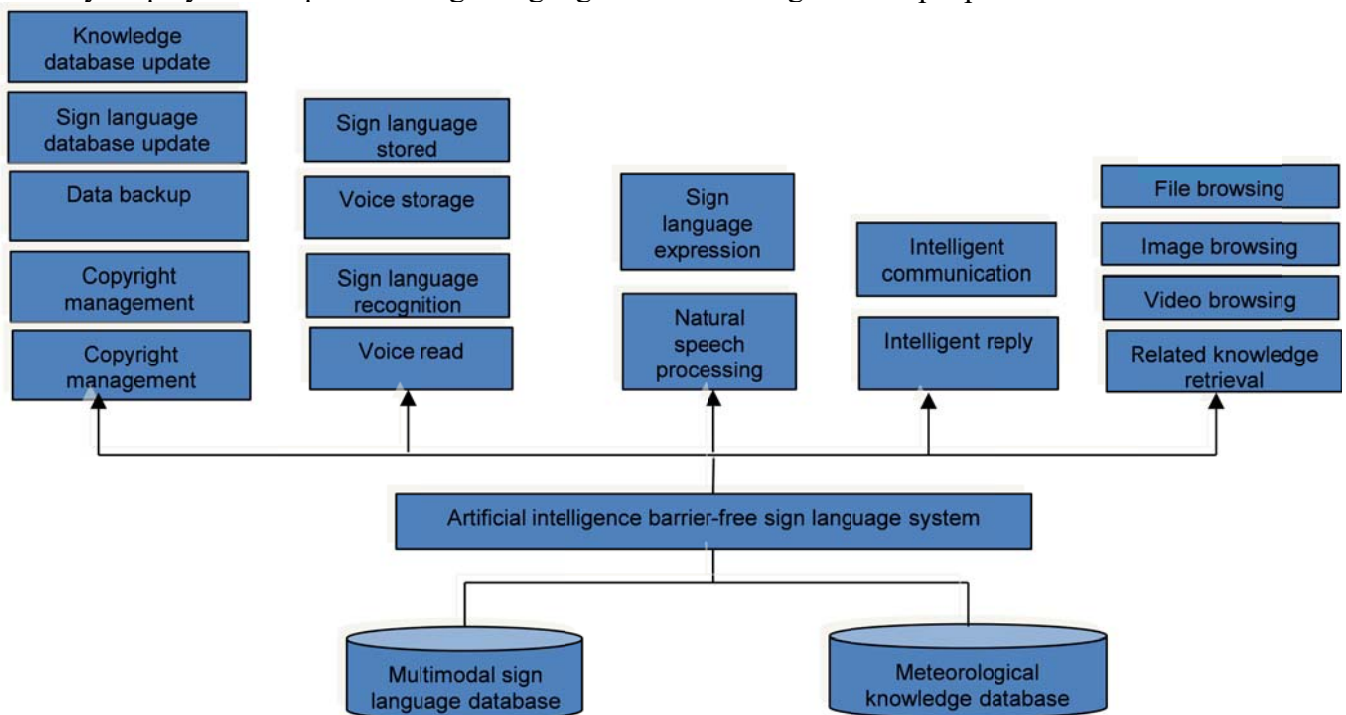


Figure 4: Marine meteorological artificial intelligence barrier-free training system diagram

4. Conclusions

Innovation is the inexhaustible driving force for the development of the cause. At present, the national war has provided us with new development opportunities, such as One Belt And One Road, civil-military integration, ecological civilization construction, and rural revitalization. So, we should

find the correct positioning and planning development point. We need to constantly strengthen the construction of training resources, and finally improve a set of network training curriculum system. The cadre institute actively explores the network training mode and the construction of virtual simulation training platform. Through improving the meteorological distance education and training and resource sharing platform, we will eventually form an internationally advanced meteorological distance education training system. With the integrated development of mobile Internet, virtual reality, artificial intelligence, micro-service and other technologies, we will strive for new breakthroughs in the field of "Internet + training". So, it is no longer a dream to effectively meet the growing personalized training needs of grassroots cadres and workers.

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