Design of Customized Intelligent Manufacturing Information Interaction System Based on Virtual Technology

Xi Wang\(^1,*\)

\(^1\)Nanjing University of Posts and Telecommunications, Jiangsu, China

*Corresponding author e-mail: wangxi@njupt.edu.cn

**Abstract.** With the continuous development of information technology, system intelligence is leading the next round of "industrial revolution", especially the intelligent manufacturing industry has become the core of improving industrial productivity. Intelligent manufacturing involves each link in the manufacturing industry, which is the most critical part of intelligent manufacturing is intelligent production, through intelligent manufacturing related technology to optimize the production mode of manufacturing to promote the production state more flexible and integrated. Intelligent manufacturing is based on computer simulation technology and information and communication technology, optimize the production design of the factory and simplify the production process of the factory, the purpose is to reduce the waste of resources and improve the reasonable allocation of production resources.

**Keywords:** Virtual Technology, Customization, Intelligent Manufacturing

1. **Introduction**

In recent years, virtual reality has gradually penetrated into the field of manufacturing, and the key technologies of virtual reality include three kinds: 1. Virtual reality; augmented reality. 2. Mixed reality. Virtual reality generates virtual objects that do not exist in the physical world through computer graphics visualization technology, and places virtual objects in the physical world to make the virtual world become a part of the real world. Augmented reality transforms the real world into a virtual world, using computer image technology to simulate the entity information of the physical world. Mixed reality realizes the fusion of virtual environment and real environment to produce new visual virtual environment.

2. **The meaning of intelligent manufacturing based on virtual technology**

Virtual reality mainly involves computer graphics, sensors, image processing and pattern recognition, network transmission and other technical fields. "Virtual" refers to the use of computer generated to provide users with a sense of touch, vision, hearing and other artificial environment; "Reality" means that users can listen, walk, touch, and interact in this virtual environment just as they would in the real world.

Generally, the production system appears to be a mixture of complicated and connective systems. The design, production and activity of the system. In the design system, smart formulae describe the
application for the design of the product, the design of the product, the collection, the storage and the guarantee of the product. In addition, the simulation of smart technologies is used. In the programming system, the data base will be developed from simple data types to a variety of knowledge. The programming and programming of resources, small pollution and other specialist systems will be used; the production system will be automatic or semi-automatic. Smart in the production process, production status, detection of fault and inspection and collective use. According to system activity, neuro-network technology is used in control of the system and technology is distributed. Many agents and technologies are used around the world [1,2]. Intelligent technology will be widely used in monitoring production process, production status acquisition, fault diagnosis and inspection and assembly. From the perspective of system activity, neural network technology has been applied in system control, and virtual technology, distributed technology, multi agent technology and all-round technology are applied. Open system structure is adopted to make system activities parallel and system integration can be solved.

Thus, the IMS based on the Autonomous, Autonomous and Social Biology Organization, is based on the objective of completing the design, payment and control process of equipment management with flexibility and control design. The computer is changing the intelligent production, which aims to affect the environment [3].

3. Comprehensive characteristics of intelligent manufacturing system based on virtual technology

3.1. Self-discipline
Virtual reality can improve the efficiency of conceptual design in the product design stage, and in the research and development process, virtual reality technology can be used to simulate the production scene of the real workshop according to the layout of the workshop and the logistics process, and realize the simulation and optimization of the workshop processing technology. Virtual reality technology is one of the bases for the realization of digital twin workshop, and it is also the realization technology of virtual space of virtual and real fusion intelligent workshop. In short, the "virtual and real integration" of virtual reality and physical workshop will bring qualitative changes to the development of Industry 4.0.

This is the ability to collect and understand environmental information, analyze, judge and plan their behavior. The tools with the ability to self-operate called "smart machine" are said to be independent, it shows independence and personality, and it can even match operations and competition between them. It is a powerful foundation of knowledge and knowledge based on self-financing [4].

3.2. Human machine integration
IMS is not only a smart production system, but a smart system that is shown in three images. Smart machines are based on personal production. He can only do mechanical, predictive and judicial reasons, can only have logical thinking, at least think of the image, and can't inspire. Human experts can at the same time have three ideas.

So, it's not real to change human intelligence in the production process and to do the analysis, decision-making and decision-making process. On the one hand, the combination of human beings and computers, the main position It produces people in the system, and at the same time, with smart machines, it can play better people's abilities, and force people to show the same relationship, understanding, and Show equal collaboration, which allows them to show their actions and count each other at different levels.

So, in the smart production system, people play a better role with high quality and intelligence. Machine information and human information are connected and cooperate to comply with each other [5].

3.3. Virtual reality technologies
This technology supports the production of free software and is one of the key technologies to understand the production of human machines and higher levels. Signal processing, animation technologies, intelligent researchers, predictions, simulations and medium technologies such as one, using various audio-visual and sensory devices, display processes, and the future product, which can make people feel real, is that it can change people's desires. It's a new generation of intelligent connections that make machines human and human. It combines, it's a great feature of intelligent production [6].

3.4. Self-organization super flexibility
Each unit in the intelligent production system can build a better structure based on the needs of the work. Its activity is not only important in the operation, but also important in the structure. Therefore, it is very flexibility It's called a group of biological specialists.

3.5. Learning and maintenance
The intelligent production system can always weaken the base of knowledge in practice and learn self-training. At that time, it can identify itself during operations and be able to identify itself with this feature. The intelligent production system allows it to optimize and adapt to different environments.

4. Intelligent technology of intelligent manufacturing system

4.1. New sensing technologies
The sensor's technology with high sensitivity, accuracy, reliability and ability to change the environment, new sensor technology, with new principles, New materials, new technologies, weaknesses and technologies [7].

4.2. Modular and embedded control system design technology
The technologies of various hardware structures, the core operating system, and the software technology of the open system, the language of configuration, the interface of human and software, and the software technology of the machine. Engineering to understand the metadata format.

4.3. Advanced control and optimization technology
Assessment technology for many industrial productivity levels, model technology for large data, technology for large operating purposes, technology for the simulation of large complex equipment systems, Planning various movements from electronic transmission and other mobile control technology.

4.4. System coordination technology
The whole scheme design technology and installation and debugging technology of complex automation system of large-scale manufacturing project, the design technology of unified operation interface and engineering tools, the unified event sequence and alarm processing technology, and the integrated asset management technology [8].

4.5. Fault diagnosis and health maintenance technology
On line or remote state monitoring and fault diagnosis, self-healing control and damage intelligent identification and health maintenance technology, life testing and residual life prediction technology of major equipment, reliability and life evaluation technology.

4.6. High reliability real-time communication network technologies
Embedded Internet technology, high reliability wireless communication network construction technology, industrial communication network information security technology and heterogeneous communication network seamless exchange technology.
4.7. Functional safety technologies
The functional safety analysis, design, verification technology and method of intelligent equipment hardware and software, the test platform of functional safety verification is established, and the overall functional safety assessment technology of automatic control system is studied [9].

4.8. Special process and precision manufacturing technology
It is a multi-dimensional precision processing technology, precision forming process, special connection technology such as welding, bonding, sintering, MEMS technology, precise controllable heat treatment technology, precision forging technology, etc.

4.9. Identification technology
The technology of low cost and low power RFID chip design and manufacture, UHF and microwave antenna design technology, low temperature hot pressing packaging technology, UHF RFID core module design and manufacturing technology, based on depth three-bit image recognition technology, object defect identification technology.

5. Example of intelligent manufacturing: Intelligent machine
The so-called intelligent machine is also called intelligent robot. Its most impressive impression is a unique "living thing" which carries on self-control. In fact, the main organ of the self-control "living thing" is not as delicate and complex as the real person. As shown in Figure 1, intelligent robot has various internal information sensors and external information sensors, such as vision, hearing, touch and smell.

![In-line Manufacturing Process](image1)

**In-line Manufacturing Process**

![Off-line Diagnostic Model](image2)

**Off-line Diagnostic Model**

*Engineering Knowledge (CAD and CAPP)*  
*State Space System Model*  
*Model of potential Variation Patterns*

**Figure 1.** Application of virtual technology in intelligent manufacturing

Besides having a receptor, it also has an effector as a means of acting on the surrounding environment. This is muscle and muscle, or self-propelled motor, which makes hands, feet, nose, antennae, and etc. move. It can be seen that intelligent robot must have at least three elements: sense factor, motion factor and thinking element. Intelligent robot is an integrated body of many new technologies. It integrates the knowledge of many disciplines such as machinery, electronics, sensors, computer hardware, and software, customized intelligent manufacturing, and involves many advanced technologies. Robot has entered the intelligent era; many developed countries take intelligent robot as the commanding point of future technology development. The United States, Japan and Germany have obvious advantages in the field of intelligent robot research. In recent years, China has made great efforts to develop intelligent robots and has made gratifying achievements [10].
Virtual reality technology can apply ergonomics to virtual driving of cars (see Figure 2), and ergonomics can also be applied to factories. It is possible to use ergonomics to evaluate the design of a factory before it is built. The design drawings of the factory site are converted into three-dimensional virtual factory, and virtual workers are created to work in the factory.

![Figure 2. Application of virtual reality technology in ergonomics](image)

The defects of the factory design are found, and the design scheme is adjusted in the early stage of the design, which greatly saves the cost and can obtain the design scheme with better practicability. One of the earliest researchers in this field is Siemens, a German company that has developed a workplace simulation analysis software, which combines virtual reality technology with ergonomics and is applied in the workshop.

6. Conclusion
With the development of AI technology, industrial robots have become more intelligent, and can perceive, learn and make decisions themselves. In combination with the current development status and development trend of global intelligent manufacturing, the forward-looking Industrial Research Institute conservatively estimates that the global intelligent manufacturing industry will maintain a compound annual growth rate of about 15% in the next few years.

The future intelligent laboratory is a customized intelligent manufacturing, Internet and Brain Science Research Institute jointly established by customized intelligent manufacturing experts and relevant institutions of the Academy of Sciences.

References
[1] Fu Q, Lb J. Optimal Design of Information Elements in Virtual Reality System Based on TOPSIS [J]. Journal of Physics: Conference Series, 2020, 1654 (1): 012073 (7pp).
[2] Kong L, Ma B. Intelligent manufacturing model of construction industry based on Internet of Things technology [J]. The International Journal of Advanced Manufacturing Technology, 2020, 107 (1).
[3] Hynek, Kim, Joying, et al. Design of Customized Local Information System Based on Big Data Analysis [J]. International Journal of Applied Engineering Research, 2016.
[4] Yan B, Ren F J, Jiang Y C. Research on Integrated System of Information and Function Based on Virtual Prototyping Technology [J]. Key Engineering Materials, 2009, 392-394: 884-890.
[5] Cui X. Design of Food Management Information System Based on Human-computer Interaction [J]. Advance journal of food science and technology, 2015.
[6] Cui X K. Design of Food Management Information System Based on Human-computer Interaction [J]. Advance Journal of Food Science & Technology, 2015, 8(9): 650-653.
[7] Ma Y H, Xin Y, Liu L G. Intelligent and Real-Time Information System of Production Manufacturing Based on Internet of Things Technology [J]. Applied Mechanics & Materials, 2014, 651-653: 1594-1598.
[8] HG Lemur. Study of the Role of Virtual Engineering Technologies in Design [J]. International Workshop of Advanced Manufacturing & Automation, 2013, 2013.
[9] DT Pham, Y Wang, S Demo. Intelligent manufacturing strategy selection [J]. International
Journal of Innovative Computing Information & Control IIIc, 2005, 8(4): 2599-2612.

[10] Siraj A, Vaughn R B, Bridges S M. Decision Making for Network Health Assessment in An Intelligent Intrusion Detection System Architecture [J]. International Journal of Information Technology and Decision Making, 2004, 3(2): 281-306.