



The Economics of the Digital Twin Factory

Xiaosheng Wei

Nanchang University, Nanchang 330036, Jiangxi, China

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Abstract: The digital twin factory will help people to explore the industrialization technology and realization process path of the digital twin of the future factory, find out the common key and technical difficulties and make efficient breakthroughs. It can further precipitate on this theoretical basis, form various complex industrial mechanism models, and analyze the future industrial application of more complex and larger-scale intelligent systems. At present, there are still some deficiencies in China's factory digital twin, but many leading technology enterprise groups and famous scientific research and teaching institutions in the world have invested heavily in the application, research, development and application of factory digital twin intelligent technology theory.

Keywords: digital twin, factory, economy, technology

1. Introduction

At present, digital twin technology has been successfully applied in the automotive industry. In the virtual space, we build a 3D digital twin factory model of the product life cycle, complete product optimization design and process parameter optimization, realize efficient resource allocation and intelligent organization of production, and significantly improve the efficiency of industrial production and operation. The development of digital twin technology not only shows good development prospects and advantages in industry, but also provides more convenient services for people's production and life.

2. Understanding of digital twins

2.1 The basic concept of digital twins

The digital twin relationship is a digital analog expression of the physical world relationship, which can directly help us to simulate the real physical world in a digital world environment, and can predict the future world situation that may change suddenly. Therefore, it directly makes judgments based on the results of its simulation, selects the optimal solution, and feeds it back to the physical world. Its running process is to make full use of all kinds of virtual physical data such as physical physical model, sensor loading, running time and running historical data for a system. At the same time, it integrates the model process that reflects the system's multi-disciplinary, less physical quantity, less geometric scale, frequent distribution and probability characteristic information. And in the process of a specific virtual entity physical space environment, it can make its features complete the mapping of another system life cycle process.

2.2 The meaning of digital twins

2.2.1 More convenient and more suitable for innovation

The digital twin technology virtualizes the real equipment through digital design, virtual imitation design and Internet of Things technology, and directly maps all the virtual attributes in the real physical equipment to the real virtual physical space model. Thus, a virtual digital mirror system that can be disassembled, copied, converted, changed, deleted automatically, and used repeatedly is formed. This undoubtedly greatly and effectively accelerates and enhances the deeper understanding of the real virtual physical world by the mind of the virtual user. It can simultaneously solve the complex operation problems that many people's original thinking is constrained by various physical conditions in reality, or need to be completely dependent on the real physical world and cannot be realized artificially, such as modeling and simulation, batch and copy, virtual assembly system, etc., As a tool at one's fingertips, it can be used to stimulate people's interest to try to optimize the design, manufacture new environments and businesses by finding various new ways.

2.2.2 More comprehensive analytical and predictive capabilities

Existing product life cycle tracking and management seldom truly achieves accurate prediction in advance. Therefore, users cannot make accurate predictions in advance about the hidden problems of the product and what problems will occur under the apparent conditions. The digital twin algorithm can be further closely combined with the current extensive and

large-scale data and information collection, big data visualization analysis technology, and processing data mining technology in the field of artificial intelligence and Internet of Things applications. The visual model detection and analysis of the characteristics of various artificial intelligence problems by the model can realize the objective and scientific quantitative evaluation of the state characteristics of the current stage of artificial intelligence, and the analysis and diagnosis of the future development trend of the potential problems in the past or occurring. Based on the real data analysis results of prediction and quantitative analysis of such problems, simulation of real problems and the possibility of solving potential problems, we provide a more comprehensive, more objective and credible scientific analysis of decision-making information.

2.2.3 Digitization of Experience

In some relatively traditional industries in my country, such as industrial design, manufacturing engineering and industrial information consulting services in the automotive industry. Empirical data information is often considered to be in a borderline, fuzzy state. It is difficult to accurately grasp the form of empirical information and truly quantify it so that the court can accurately make a case judgment conclusion or some important factual basis. Another important key scientific and theoretical progress of digital twin technology, as well as various scientific and technological means, digitize the results of expert experience that were previously thought to be incomplete. And it can provide data preservation, duplication, modification and information transfer and utilization functions. For example, in view of the characteristics of some various sensor failures in the production, operation, maintenance and management of our current large-scale handheld mobile terminal equipment. After comprehensive consideration and training through a large-scale machine learning model, a model that can target typical fault characteristics can be sorted out. By combining the analysis and processing of relevant data experts, the corresponding typical fault records are calculated and used as the basis for judging whether there is a fault in the equipment. It can update the new situation in the characteristic database of the newly formed fault pattern in a targeted manner, and finally form an automatic and intelligent diagnosis and judgment.

3. The economic boost from the digital twin factory

3.1 Improving economic efficiency

Faced with increasingly severe market competition pressure and increasing human and material cost, modern enterprises must not only provide products suitable for sales while meeting market demand, but also pursue independent product innovation as much as possible. Faced with these pressures, companies have to seek better solutions. Digital twin technology can better realize the complex technology and human and material investment in product design, research and development, and production of enterprises, and can make good use of virtual simulation space technology to achieve accurate product analysis and evaluate suitable environmental conditions for new product design. If the enterprise does not evaluate the production manufacturability of product innovation technology for new products, the result will inevitably bring some hidden dangers of great risks. And by constructing a set of virtual digital manufacturing factory model based on digital twin technology, it will be one of the best solutions and methods for enterprises to solve these complex manufacturing problems of current products in the future. By relying on the real numbers and other related virtual data generated in the entire product life cycle system, the production of the entire digital factory is digitally simulated in this virtual big data environment model. This enables enterprises to quickly configure production processes and system optimization in a very short period of time, which can maximize the work efficiency of employees, accelerate the use of resources, and make the operation of the factory highly flexible.

3.2 Promoting the development of the digital economy

With the gradual maturity of various new computing and technical tools such as cloud computing service technology and artificial intelligence cloud computing platform, IBM proposed the large-scale productization of cloud computing service technology about 10 years ago. This is already basic and it can be said that it has really entered a stage of technology that is close to maturity. Coupled with a twin technology of the digital economy, IBM can help us better realize the virtual economy based on cloud computing service technology, or the digital economy. In fact, the Industry 4.0 Research Institute has already observed and learned about the digital twin that is currently being deployed by IBM and the global market. In short, only by vigorously developing the development and construction of digital twins and allowing the digital economy to play a role in the national economy, can a country better serve the economy. Because the development of the service industry has good development prospects and considerable profit income, the digital twin can better serve the real economy and realize "manufacturing as a service" and "technology as a service". Or in long-term efforts, there is a chance to realize "everything is a service". By integrating the three core elements of entity, data and technology, the digital twin has planned a virtuous circle in which "entity + technology" creates value and data, "data + technology" guides entity value-added optimization,

and "entity + data" supports further development of technology. It provides feasible ideas for deepening the integration of the real economy and the digital economy.

3.3 Digital twins drive the development of manufacturing

The digital twin factory not only promotes the development of the digital economy, but also has obvious manifestations in other industries. In the manufacturing industry, in addition to maintaining the cost advantage in the design and production of prototype products and the existing technological leadership in the quality of design, manufacturers can also optimize the supply chain through digital twin technology. Digital twin technology will better play a greater value in the reverse logistics industry, such as the recycling of waste items, and the development and utilization of waste simulation remanufacturing technology to maintain the sustainable development of resource recycling.

4. Conclusion

The digital twin world is not only reshaping industrial society, but also subverting the traditional production methods of people developing, producing, purchasing and maintaining machinery and equipment to create a more perfect world. The digital twin car will promote the reconstruction and reconstruction of China's urban ecology, infrastructure, economic structure, business model, etc. Combined with the rapid growth of urbanization in my country, it will bring strong momentum to the development of the world economy.

References

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