The Interactive Relationship between Digital Twin and Industrial Design Activities

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Abstract:

With the advent and development of information technology in industry and product design, product design-driven big data has evolved; Digital twin, a new emerging and fast-growing technology which connects the physical and virtual world, has attracted much attention recently, the digital twin approach has become one of the most important technological trends in recent years, The basic idea of a digital twin approach is that it is a system that includes a real environment with physical components and systems and a digital environment with digital sensors to receive data sent from the corresponding physical environment, where the digital environment reflects the real environment with relevant characteristics that depend on the stages of the entire product's life cycle Such as design, manufacture, production, quality inspection, and maintenance. Etc., where the stages are monitored and analyzed to improve quality and discover problems that require solving, which enables to reduce costs and time and provide the physical product with better work policies.

An approach is presented to apply digital twin technology during the various stages of product design through communication and co-evolution between the physical product and its digital representation during the stages of the product lifecycle, where Converting Big data into a small set of information that the designer can use directly to support effective decision-making In the design process, as well as integrating a variety of different data about the product, the user and the environment effectively to respond to the requirements of the users .

Digital twin technology increases the flexibility, adaptability and intelligence of the product since by applying digital twin technology the real product has a digital image consisting of different models, and these models have five main functions: To reproduce accurately the characteristics, behavior and rules of the physical product to create an accurate digital image; The independent operation of the models by simulating the different behaviors of the product, which can then be used to guide the operation of the physical product; Remote control of the status of components; Predictability of problems before they occur; Check performance before product design and production is finished.

Key Words:

Digital Twin, Industrial Product Design, Big Data, Virtual Models, Simulation.