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INNOVATIONS

WHERE DIGITAL MEETS PHYSICAL

DIGITAL TWINS ARE THE NEW START FOR TODAY'S SMART CITY CONSTRUCTION.

In this paper we will explain the concepts of digital twins and digital twin cities, show the relationship between digital twins and smart cities, and analyse the characteristics of smart cities based on digital twins. Finally, we will look at the future development of smart cities based on digital twins and how Di-Phy Innovations helps cities accelerate the transition and accomplish a successful transformation.

ACCURATE MAPPING
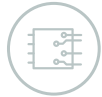
VIRTUAL-REAL INTERACTION

SOFTWARE DEFINITION

INTELLIGENT FEEDBACK

DIGITAL TWINS AND SMART CITY

A DIGITAL TWIN IS A SIMULATION PROCESS THAT MAKES FULL USE OF PHYSICAL MODELS, SENSORS, HISTORICAL DATA, ETC. TO INTEGRATE INFORMATION OF MULTI-DISCIPLINE, MULTI-PHYSICAL QUANTITIES, MULTI-SCALE, AND MULTI-PROBABILITY.

A digital twin serves as a simulation process for physical entities in virtual space. The mirror body reflects the whole life cycle process of the corresponding physical entity product.

The essence of digital twins is a bi-directional mapping relationship that exists between physical space and virtual space. Digital twins enable virtual objects to control physical entities without human intervention. The digital twin can map the physical entities and attributes, structure, state, performance, function and behaviour of systems to the virtual world, forming a high-fidelity dynamic multidimensional, multi-scale, multi-physical quantity model, which will provide an effective way for observing, recognising, understanding, controlling and transforming the physical world.

With the rapid development of technologies and industries such as the Internet of Things(IoT), big data, cloud computing and artificial intelligence(AI), the construction basis of smart city has gradually evolved from the original static 3D models towards the digital twin level that combines dynamic digital technology and static 3D model, which forms the concept that digital twin city assists smart city construction.

CHARACTERISTICS OF SMART CITY BASED ON DIGITAL TWIN

DIGITAL TWIN CITIES HAVE FOUR MAJOR CHARACTERISTICS:

ACCURATE MAPPING

Accurate mapping means that the digital twin city realises comprehensive digital modelling of buildings, roads, bridges, and other infrastructures by arranging sensors on the air, ground, underground, and river levels in the physical city, so as to fully perceive and dynamically monitor the city's operating status, and finally form the accurate information expression and mapping of the virtual city to the physical city in the information dimension.
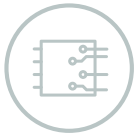
VIRTUAL-REAL INTERACTION

Virtual-real interaction means that all kinds of "traces", such as traces of people, logistics and vehicles that can be observed in the physical city, can be searched in the virtual city once they are generated.

SOFTWARE DEFINITION

Software definition means that the twin cities, physical and virtual, establish a corresponding virtual model based on the physical city, and simulate the behaviour of people, events and objects in the virtual space by means of software platforms.

INTELLIGENT FEEDBACK

Intelligent feedback refers to the intelligent early warning of possible adverse effects, conflicts and potential dangers of the city through planning and design, simulation, etc. on the digital twin city, and the function of providing reasonable and feasible countermeasures.

ON THE BASIS OF THE DIGITAL TWIN CITY, THE INTEGRATION OF THE IOT, CLOUD COMPUTING, BIG DATA, AI AND OTHER NEW-GENERATION TECHNOLOGIES CAN GUIDE AND OPTIMISE THE PLANNING AND MANAGEMENT OF PHYSICAL CITIES, WHICH WILL IMPROVE THE SUPPLY OF CITIZENS' SERVICES AND ASSIST MORE IN THE CONSTRUCTION OF SMART CITIES.

CHARACTERISTICS OF SMART CITIES

DRONES
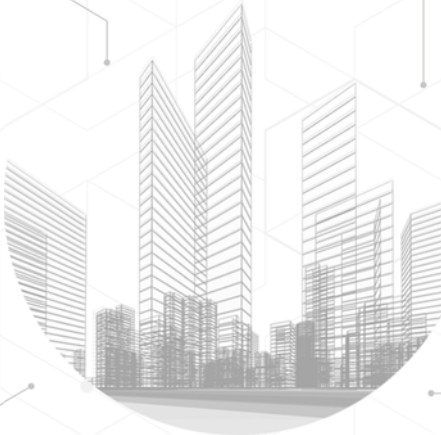Delivery and drone movement

SERVICES
Easy access to city services

AIR & WATER QUALITY
Pollution detection

SMART BENCHES
Intelligent lighting, Wi-fi, charging
devices, bikes, scooters. interactive
information board

WASTE MANAGEMENT
Bins with weight sensors

DIGITAL TWIN

ACOUSTIC & NOISE LEVELS
Risk evaluation, exposure limits, healthcare,
crime prevention

MOVEMENT
Pedestrians, speed bumps, traffic jams,
bus & heavy truck easy movement, movable lanes

SMART MOTION SENSOR FOR
PUBLIC LIGHTING
Intelligent street lighting, solar LED lighting

THE CONSTRUCTION

THE CONSTRUCTION OF A DIGITAL TWIN CITY REQUIRES A DATA FOUNDATION AND A TECHNICAL FOUNDATION.

THE DATA

The data foundation refers to the massive urban big data that is continuously generated every day from various sensors and cameras everywhere in the city, as well as the digital subsystems successively built by the municipal management departments.

TECHNICAL FOUNDATION

Technical foundation refers to relevant technologies such as the IoT, cloud computing, big data, and AI, including 5G. In a digital twin city, the data of operating status of infrastructure, the deployment of municipal resources, and the flow of people, logistics and vehicles will be collected through sensors, cameras, and various digital subsystems. With technologies including 5G delivering them to the cloud and the city government, the city will be more efficient.

THE CONSTRUCTION OF DIGITAL TWIN CITIES WILL TRIGGER GREAT INNOVATIONS IN URBAN INTELLIGENT PLANNING, MANAGEMENT AND SERVICES, AND IS THÉ STARTING POINT FOR THE CONSTRUCTION OF SMART CITIES. THIS WILL HELP ACHIEVE THE GOAL OF VISUALISATION OF ALL-ELEMENT INFORMATION OF THE CITY AND THE INTELLIGENTISATION OF CITY PLANNING, MANAGEMENT AND SERVICES.

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The digital twin city is not only the goal of a digital city, but also a key element of a smart city. It is an important facility and basic capability that enable the city to realise smartness. It is also a milestone in the transformation of urban information from qualitative change to quantitative change driven by technology, which provides the construction of smart cities more room for innovation.

BRING INNOVATION TO CITIES AND HELP ACCELERATE THE TRANSITION TO SUSTAINABILITY. EFFICIENCY, AND ECONOMIC GROWTH TO ACHIEVE THE OPTIMAL OUTCOMES.

As your trusted digital partner Di-Phy Innovations will help with the identification of the winning use cases, tangible value and return on investment through digital twin implementation.

DI-PHY INNOVATIONS' APPROACH

As your outcomes and objectives is at the core of your city, we engage with your citizens and stakeholders to understand the city's environment, the markets, the digital landscape to identify the ideal digital twin for your city.

We conduct interviews and workshops to assess the current state, understand where the potential opportunities lie, and where a digital twin can deliver the most value to your city and improve the ability to achieve the city's growth.

Following our current state assessment, we review existing strategies and wider goals. We build a roadmap to achieve the ideal digital twin city. We will collaborate with you on implementing the changes identified in the roadmap, develop the digital twin, and train people to successfully implement and adopt your digital twin city.

Our team will ensure you have the digital tools, knowledge, and processes to accelerate economic growth and be more resilient to the fast-paced and changing digital world. We will help you drive and visualise state-of-the-art digitalisation, growth, and productivity.

INTERESTED IN LEARNING MORE?
CONTACT US TODAY.

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