Exploration of the Construction and Development Path of Cultural Heritage Digital Life Forms Based on High-Precision Digital Technology

Xianzhong Lin, Jingyu Gao*
School of Marxism, Shenzhen Polytechnic University, Shenzhen, Guangdong, China
**Corresponding Author*

Abstract: Cultural heritage, as an irreplaceable treasure of human civilization, faces multiple challenges such as natural deterioration, information loss, and intergenerational gaps in its preservation and transmission. Digital transformation offers a critical pathway to address these challenges; however, traditional digital archiving and 3D visualization are no longer sufficient to meet the deeper needs of "vitalizing" heritage transmission. This paper focuses on the concept of the "Cultural Heritage Digital Life Form," systematically addressing the core questions of its construction. It outlines and establishes a technical system encompassing geometric, physical, and semantic information acquisition, emphasizing the critical importance of data fusion and knowledge graph construction. At the theoretical level, it proposes a four-layer framework comprising data, model, knowledge, and wisdom, and identifies three core characteristics of digital life forms: high fidelity, dynamic evolution, and intelligent interaction. The construction of cultural heritage digital life forms is not merely a technological integration and breakthrough, but a revolutionary paradigm aimed at achieving the "immortality" and "living" transmission of cultural heritage values.

Keywords: Cultural Heritage Digitization; Digital Life Form; High-Precision 3D Scanning; Artificial Intelligence; Digital Twin; Living Transmission

1. Introduction

1.1 Research Background and Significance

Cultural heritage is a legacy of history for humanity. In terms of existence, it is divided into tangible cultural heritage (material cultural heritage) and intangible cultural heritage (non-material cultural heritage). This paper primarily discusses tangible cultural heritage. Cultural heritage is a historical and cultural link connecting the past, present, and future. However, the vulnerability of its physical carriers constantly exposes it to threats from environmental erosion, catastrophic events, and human damage [1]. While global heritage conservation efforts continue to strengthen, incidents such as the fire at Notre-Dame de Paris and the destruction of Brazil's National Museum serve as stark reminders that once lost, tangible cultural heritage is gone forever. In this context, digital technology has become a core strategy for rescuing, recording, interpreting, and disseminating cultural heritage.

After more than two decades of development, cultural heritage digitization has evolved from initial 2D image acquisition and literature database construction to a high-precision 3D modeling phase represented by 3D laser scanning and photogrammetry. Specific examples include the "Digital Dunhuang" and "Digital Forbidden City" projects. However, the essence of most current digital achievements remains a high-precision "digital specimen" or "static snapshot." This technology replicates the appearance of heritage at a specific moment but fails to convey the dynamic processes, internal mechanisms, and deep cultural connections inherent in heritage as a "living" historical witness. Scholars like Pocobelli et al. (2018) have profoundly pointed out that the value of heritage lies not only in its material form but also in its evolving life-cycle and the intangible knowledge it carries [2]. For example, the value of a dougong (bracket set) from a Song Dynasty building extends far beyond its intricate form, encompassing the "Yingzao Fashi" (Treatise on Architectural Methods), mechanical principles, craftsmanship traditions, and temporal imprints.

Therefore, how to transcend the limitations of static "digital replication" and enable digital heritage to possess a sense of life and achieve "living" transmission has become a core frontier issue in the field. Based on this, this paper proposes the concept of the "Cultural Heritage Digital Life Form," attempting to treat heritage as a complex life system. By using multi-source heterogeneous data to inject "digital genes" and leveraging artificial intelligence and simulation technologies to endow it with "metabolism" and "cognitive" capabilities, a dynamic, complex, and living digital system capable of evolution, interaction, and even creation is reconstructed in digital space. This exploration is not only a deepening of cultural heritage protection theory—from "preserving form" to "transmitting spirit"—but also an expansion of the digital humanities research paradigm, holding significant theoretical and practical implications for achieving the perpetual transmission of civilization across time and space, stimulating public cultural identity, and innovating cultural dissemination pathways.

1.2 Definition of Core Concepts

The Cultural Heritage Digital Life Form is a dynamic, complex, and living digital system constructed in digital space based on high-precision, multi-modal, and time-series heritage data, integrating cutting-edge technologies such as digital twins, artificial intelligence, knowledge graphs, and dynamic simulation. Its aim is to simulate the full life-cycle evolution of heritage, respond to environmental changes, and engage in intelligent interaction with users. Its core characteristic lies in the "liveness" that transcends mere "replication."

To clarify this concept more precisely, we differentiate it from related concepts:

Digital Archive: The primary goal is recording and preservation, with outcomes typically being static data collections such as 2D images, text, and databases. It is akin to establishing a detailed "household registration file" for heritage, focusing on "preserving history," but the file itself does not grow or change.

3D Model: Emphasizes accurate reproduction of the geometric form and surface texture of heritage, serving as a high-precision "digital specimen." It is like a finely crafted "mannequin," with clear anatomical structure but no vital signs.

Digital Twin: The concept of digital twins has been widely applied in the industrial sector and is beginning to permeate the field of heritage conservation [3]. It emphasizes real-time data mapping and bidirectional interaction between physical entities and digital models, providing a powerful tool for heritage monitoring and management. For instance, in the conservation project of the Sassi di Matera cave dwellings in Italy, researchers deployed a sensor network to transmit real-time microclimate data (temperature, humidity) to the digital model, achieving real-time monitoring and early warning of the heritage's preservation environment. However, digital twins in the heritage field currently focus more on real-time mirroring of physical states, i.e., mapping the "present." The "digital life form," building on this, not only includes the "present" but also aims to simulate and extrapolate the "past" (historical evolution) and "future" (aging prediction) of heritage through AI-driven methods, and infuse cultural knowledge to give it "cognitive" abilities. It strives to elevate from a "mirror" to "life."

In short, if a 3D model is the "shell" of heritage and a digital twin is its "reflex nervous system" connecting reality, then the digital life form injects a "brain and soul" containing historical memory, evolutionary rules, and cognitive intelligence, transforming it into an entity capable of dialogue, thought, and evolution.

1.3 Review of Domestic and International Research Status

In recent years, global cultural heritage digitization projects have made significant progress in data acquisition accuracy, platform integration, and application breadth.

Internationally, the EU's "Time Machine" projectis an ambitious attempt to build a large-scale spatiotemporal knowledge platform, aiming to digitize and link Europe's millennia of historical data (maps, manuscripts, paintings, etc.) into a 3D geographic space, constructing a "Google Earth of history [4]." The project excels in large-scale data association and spatiotemporal visualization but focuses more on grand historical narratives, with relatively less emphasis on simulating the micro "life" processes of individual heritage sites. Technically, the project combines HBIM (Heritage Building Information Modeling) with sensor networks to construct heritage digital twins for real-time monitoring and early warning of structural health and micro-environments, which has become a research hotspot [5]. For example, in the study of the Cathedral of Santiago de Compostela in Spain, scholars used HBIM to integrate historical documents, geometric data, and real-time monitoring data to build a comprehensive information platform capable of assessing structural risks. Additionally, using machine learning to automatically extract information from historical documents and images and associate it with 3D models is an important direction for AI-empowered heritage digitization,but these applications are often fragmented, lacking a unified "life form" framework for integration [6].

Domestically, practices represented by "Digital Dunhuang" and "Digital Forbidden City" are leading the way [7]. The Dunhuang Academy has used high-precision photogrammetry to achieve millimeter-level digital acquisition and high-fidelity color reproduction of cave murals, providing a data foundation for the permanent preservation and study of the murals. On the basis of 3D data acquisition, the Palace Museum has explored the integration of multi-dimensional information such as historical documents and court rituals, and conducted innovative public dissemination through mini-programs like "Digital Wunderkammer." However, existing research and practices still have common limitations: first, in creating a "sense of life," most efforts remain at pre-scripted animation demonstrations or VR tours, lacking dynamic evolution capabilities driven by data and algorithms [8]. Users see a "directed" history rather than a "living" one; second, in "intelligent" interaction, most are keyword-based searches or simple chatbots, failing to form an "intelligent entity" that integrates heritage ontology knowledge and can perform deep reasoning and contextual dialogue; third, in theoretical construction, there is still a lack of a unified theoretical framework and mature technical roadmap for systematically building such a "digital life form."

Building on this, this paper follows a progressive structure of "technology-theory-application." It systematically reviews the technical system required for constructing a digital life form, refines and constructs a theoretical framework and core characteristics of the digital life form, and explores its application value in diverse scenarios, attempting to bridge the gap between "high-precision replication" and "living transmission," providing a systematic solution for building a truly meaningful cultural heritage digital life form from technological, theoretical, and application perspectives.

2. Construction of Cultural Heritage Digital Life Forms: Technical System and Data Foundation

2.1 "Gene" Acquisition: High-Precision Multi-Modal Data Collection Technology

The construction of a cultural heritage digital life form is based on comprehensive, accurate, and multi-dimensional "digital genes"—data. The authenticity and depth of a digital life form directly depend on the quality of its "genetic data." Single-modal data is no longer sufficient; a multi-technology fusion strategy must be adopted for holographic information capture.

Geometric and Appearance Information: Currently, a combination of terrestrial 3D laser scanning (TLS), UAV-based oblique photogrammetry, and handheld structured light scanning is used. TLS, with its high precision and penetration, excels at constructing the framework of large-scale scenes (such as ancient architectural complexes and heritage parks); UAV-based oblique photogrammetry efficiently captures data from building rooftops and complex facades, areas traditionally difficult to survey; while handheld scanners are used for microscopic details of small objects (such as bronzeware, Buddha statues) or architectural components (such as dougong, que-ti) at centimeter or even millimeter levels. Research by Al-Kheder et al. indicates that this "integrated aerial-ground, macro-micro" collection paradigm ensures the completeness of geometric information and consistency across multiple scales, avoiding data gaps or uneven precision from single technologies [9].

Physical and Material Information: To simulate the "decay" and "aging" processes of a life form, physical and chemical properties need to be acquired. Hyperspectral and multispectral imaging technologies analyze the reflectance of objects across hundreds of continuous narrow spectral bands, enabling non-destructive identification of pigment composition in murals, detection of salt crystallization in stone artifacts, and assessment of paper fiber degradation in paintings and calligraphy [10]. For example, in the study of frescoes in Pompeii, Italy, hyperspectral imaging successfully identified "Egyptian blue" pigment that had turned black over time, providing a scientific basis for virtual restoration of its original colors. These data are prerequisites for building physics-based simulation models, enabling the digital life form to extrapolate material changes under different temperature, humidity, and light radiation conditions.

Spatiotemporal and Semantic Information: The life of heritage lies in its changing history, which constitutes the "memory" of the life form [11]. Historical documents (such as the "Yingzao Fashi"), archaeological reports, engineering drawings, old photographs, and even oral histories—diverse and heterogeneous information—must be semantically processed and spatiotemporally registered with 3D spatial models. For example, natural language processing (NLP) techniques can extract records of repairs to an ancient bridge from local gazetteers, precisely annotate them onto the corresponding arches in an HBIM model, and assign time tags such as "repaired in the 10th year of Kangxi" or "reinforced in the 2nd year of the Republic of China." The HBIM concept proposed by Dore and Murphy emphasizes this deep binding of semantic information with geometric models, transforming the model from an empty shell into a knowledge aggregate rich with historical narratives [12].

2.2 "Body" Construction: Multi-Source Data Fusion and Semantic 3d Reconstruction

After acquiring raw data, it needs to be "assembled" into a meaningful digital "body."

Multi-Source Data Fusion and Reconstruction: Multi-source data such as laser point clouds and multi-view images are precisely registered and fused under a unified coordinate system. Recent research focuses on deep learning-based feature matching and point cloud registration algorithms, which significantly improve the efficiency and accuracy of automated registration in large-scale, weak-texture scenes (such as vast city walls, desert ruins) compared to traditional methods [13]. High-density point clouds after fusion are transformed into fine Mesh models through algorithms like Poisson reconstruction or variational methods. Visual realism is a key step; by using the PBR (Physically Based Rendering) process, high-resolution textures and material information (such as roughness, metallicness) are mapped onto the model, achieving hyper-realistic rendering of lighting, texture, and imperfections in computer graphics, making the digital model appear not "plastic" but full of historical wear.

From Mesh to Semantic HBIM: For architectural heritage, a Mesh model alone is insufficient. It must be converted into an HBIM (Heritage/Historic Building Information Model) structure. This process involves segmenting and identifying continuous geometric patches into discrete components with architectural significance (such as beams, columns, dougong). Deep learning-based point cloud semantic segmentation techniques can automatically identify and label architectural components [14]. The converted HBIM model makes each component a queryable and editable object, encapsulating information such as material, age, craftsmanship, and condition, forming the "skeleton and organs" of the digital life form and laying the foundation for subsequent structural analysis and knowledge association.

2.3 "Soul" Infusion: Knowledge Graphs and AI-Driven

Cultural Knowledge Graph Construction: Various semantic information collected above, along with broader related knowledge (such as historical figures, art schools, religious rituals, poetry, etc., associated with the heritage), are organized into a cultural heritage knowledge graph (Knowledge Graph) in the form of "entity-relation-attribute" triples. This graph serves as the knowledge base for the digital life form's intelligent Q&A, content generation, and deep association. For example, when a user clicks on a dougong of the Yingxian Wooden Pagoda, the system can infer through the graph its classification as a "inter-columnar bracket set," link to relevant entries in the "Yingzao Fashi," and further connect to dougong examples in other Liao Dynasty buildings of the same period for comparative analysis, forming a network of knowledge exploration.

AI-Driven Dynamic Simulation and Interaction: This is the core of achieving a "sense of life" and a crucial step from "static" to "dynamic."

Physical Evolution Simulation: Based on material information in HBIM and collected physical property data, combined with finite element analysis (FEA) and AI prediction models, the structural response under earthquakes and wind loads or the long-term aging process of materials under specific temperature and humidity conditions can be simulated. Research by Barontini et al. (2021) has demonstrated how HBIM models can be used for structural analysis of ancient buildings to predict weak points. Building on this, the digital life form can further use machine learning models to learn the relationship between historical environmental data and material degradation data, thus extrapolating the "health" status of heritage over the next 50 or 100 years [15].

Social Function Evolution Simulation: Combining historical documents and agent-based modeling (ABM), social scenarios of heritage in different historical periods can be recreated. For example, based on the "Along the River During the Qingming Festival" and related historical records, thousands of virtual citizens with different identities (merchants, soldiers, monks) and behavioral logic can be simulated in the digital life form of Northern Song Dynasty Kaifeng, allowing them to move within this digital city, dynamically "reviving" ancient urban life and recreating the "social life" of the heritage [16].

Intelligent Interaction Generation: Integrating the heritage knowledge graph with large language models (LLM) is a breakthrough for intelligent interaction. This enables the creation of intelligent interaction experiences with deep domain knowledge and fluent natural language. The digital life form is no longer a simple "Q&A" but can autonomously generate insightful tour explanations, tell captivating historical stories, and even assist in pattern creation or poetry generation based on learned artistic styles. This demonstrates a "wisdom" and "creativity" that transcends information retrieval.

3. Theoretical Framework and Core Characteristics of Cultural Heritage Digital Life Forms

3.1 Four-Layer Theoretical Framework Model

This paper proposes a "Data-Model-Knowledge-Wisdom" (DMKW) four-layer framework:

Data Layer: Composed of the aforementioned high-precision, multi-modal, time-series data, it serves as the "gene bank" of the digital life form. The core of this layer is the completeness, accuracy, and associativity of data. Data quality directly determines the "innate" endowment of the life form [17].

Model Layer: Responsible for transforming raw data into structured, semantically rich digital models, primarily high-fidelity 3D geometric models and HBIM. This is the "skeleton and organs" of the digital life form, providing a computable and analyzable digital avatar, serving as the physical carrier for knowledge and wisdom.

Knowledge Layer: By constructing a cultural knowledge graph, discrete models and data are organized into an interconnected knowledge network. This is the "brain and memory" of the digital life form, enabling it to store, manage, and reason about complex cultural information, achieving a leap from "tangible" to "cognizant."

Wisdom/Intelligence Layer: The top layer of the framework and the key to achieving a "sense of life." By introducing AI-driven dynamic simulation, predictive analysis, and generative interaction capabilities, the digital life form is endowed with "behavior and consciousness." It can respond, extrapolate, communicate, and even create, serving as the "soul" of the life form, ultimately making it a "living entity."

This four-layer framework is not only a technological roadmap but also a process of value progression, clearly demonstrating how to advance from recording raw data to reproducing 3D models, then to associating knowledge networks, and finally to the emergence of a wise life.

3.2 Three Core Characteristics of Digital Life Forms

Based on the DMKW framework, a mature cultural heritage digital life form should possess the following three core characteristics:

High Fidelity: It includes authenticity in physical properties (such as the elastic modulus of wood, porosity of stone), historical information (such as records of building repairs, provenance of artifacts), and environmental relationships (such as interactions between the site and surrounding hydrology, climate). High fidelity is the fundamental guarantee for the digital life form to serve as a basis for scientific research and conservation decisions; without authenticity, all extrapolations would be castles in the air.

Dynamic Evolution: The digital life form is not static; it can evolve in two dimensions: first, physical dimension lifecycle simulation, i.e., extrapolating the entire process from construction, use, weathering, damage to restoration based on data and mechanistic models. For example, it can simulate the changing trends of an ancient pagoda under a century of wind and rain erosion. Second, social dimension functional life simulation, i.e., recreating the social roles, historical events, and human activity patterns it played in different historical stages. The 4D modeling concept proposed by Agugiaro et al. provides a theoretical basis for this, while the digital life form strives to make this 4D change "come alive" through AI [18].

Intelligent Interactivity: It can understand users' natural language intentions and provide deep, contextualized responses based on its knowledge graph. For example, if a user asks, "What is the most unique design of this bridge?" it can not only point out the structural features of the arch but also further explain the innovative aspects of this design in the technological context of the time and cite relevant historical documents. This data- and knowledge-driven generative interaction is the ultimate manifestation of its "wisdom," making it a disseminator of knowledge and an inspirer of thought.

4. Development Path and Application Exploration of Cultural Heritage Digital Life Forms

4.1 Empowering Preventive Conservation and Evidence-Based Restoration

Risk Warning and Proactive Intervention: Through simulation of its physical evolution process, managers can conduct precise risk assessments. For example, by inputting future 50-year climate change scenarios (e.g., regional temperature rise of 2°C, annual rainfall increase of 15%) into the digital life form, the erosion rate and salinization risk of an earthen site can be quantitatively simulated, providing strong decision-making support for preemptive deployment of rain shelters, optimization of drainage systems, and other preventive measures.

Virtual Simulation and Selection of Restoration Schemes: For an ancient building timber beam with cracks, engineers can virtually test multiple reinforcement schemes (e.g., carbon fiber cloth bonding, steel plate reinforcement, or traditional "dunjie" techniques) in the digital model, precisely comparing the impact of different schemes on the original component's stress distribution and long-term durability through finite element analysis (FEA), and even evaluating their visual impact on the building's overall appearance [19]. This "surgical rehearsal" in digital space minimizes irreversible trial and error on precious physical entities, truly achieving "evidence-based" restoration.

4.2 Revolutionizing Immersive Narratives and Contextual Education

The digital life form fundamentally transforms public education from "informing" to "experiencing," making history no longer dry text in books.

Interactive "Living" Historical Scenes: Combined with VR/AR technology, users are no longer viewing artifacts behind glass but can "enter" a computer-reconstructed Han Dynasty palace, see virtual palace maids moving according to Han etiquette, hear background music reconstructed from unearthed instruments, and even ask a digital human act a learned Confucian scholar about the court system of the time. Research by Stylianou-Lambert et al.points out that this multi-sensory, highly interactive immersive narrative can greatly stimulate the public's, especially young people's, interest in history and emotional resonance, achieving a shift from "viewing an exhibition" to "entering history [20]."

Contextualized Knowledge Learning: In AR applications, when a tourist points a smartphone camera at an arch of the Colosseum in Rome, the screen not only displays its name and construction date but also dynamically and transparently shows its internal mechanical structure and plays an animation explaining how the Romans used this arch structure to support the grand building. Knowledge is delivered instantly, vividly, and visually in the context where it is most needed, greatly enhancing learning efficiency and interest.

4.3 Driving Generative Innovation and Value Regeneration of Cultural Ips

AI-Assisted Derivative Design: Designers can "learn" from and co-create with the digital life form. For example, a fashion designer can instruct the "Digital Dunhuang" life form: "Please learn the color schemes and donor attire patterns from all murals in Cave 220 of Mogao Grottoes, and combine them with modernist tailoring styles to generate a series of spring women's wear design sketches." AI can deconstruct, reorganize, and innovate based on style elements in the knowledge graph, generating a vast number of culturally rich and stylistically consistent designs, greatly shortening the path from cultural elements to commercial products.

Core Digital Assets in the Metaverse: A high-fidelity, interactive digital life form (such as a digitized Mount Tai or the Great Wall) itself is a highly valuable core digital asset in the metaverse. Kargas et al. have explored new business models for the cultural and creative industries brought by the metaverse [21]. Within this framework, the digital life form can serve as a landmark in the virtual world for hosting large-scale virtual cultural events, developing immersive experience games, or issuing certain digital rights (such as digital artworks from specific viewpoints, a piece of "land" in virtual space) in the form of NFTs, opening new, sustainable economic sources for the protection and revitalization of cultural heritage.

4.4 Pioneering a "Digital Laboratory" Paradigm for Humanities and Social Sciences Research

The digital life form provides a "digital laboratory" that is computable, simulatable, and verifiable for humanities and social sciences research, traditionally dominated by qualitative description and logical reasoning.

Computational Verification of Historical and Archaeological Hypotheses: If an archaeologist has a hypothesis about an ancient city's water supply system, they can simulate the pipeline layout, water source flow, and population distribution of the system in the city's digital life form to see if it can meet the water needs of the residents at the time and verify it against unearthed water channel remains. This method transforms qualitative speculation into quantitative simulation, providing a new dimension for academic argumentation.

Digital Reconstruction of Lost Crafts: For lost ancient crafts (such as the firing of a type of Yue kiln secret-color porcelain), researchers can, based on scattered literature and physicochemical analysis of unearthed fragments, repeatedly adjust parameters such as kiln temperature curves, glaze chemical formulas, and kiln atmosphere in a digital simulation environment, virtually conducting thousands or tens of thousands of "test firings" until simulating a color and texture closest to the unearthed artifacts. Rehmat et al.have made preliminary explorations in this area [22]. This research paradigm of "computational archaeology" and "digital craft history" holds the promise of restoring many lost ancient wisdoms.

5. Conclusion and Outlook

5.1 Research Conclusions

This paper systematically explores the cutting-edge concept of the "Cultural Heritage Digital Life Form." The study concludes that constructing a digital life form is an inevitable path to address current challenges in cultural heritage conservation and achieve its "living" transmission. Its core essence lies in realizing a paradigm shift from static "digital replication" to dynamic "life reconstruction" through deep integration of high-precision multi-modal data and AI-driven intelligence.

The "Data-Model-Knowledge-Wisdom" (DMKW) four-layer theoretical framework proposed in this paper provides a clear roadmap for the construction of digital life forms. Its three core characteristics—high fidelity, dynamic evolution, and intelligent interaction—collectively form the core of its "sense of life." Based on this, the paper explores its application paths in four fields: preventive conservation, public education, IP innovation, and academic research, revealing its immense potential to reshape the heritage value chain. Essentially, the cultural heritage digital life form is not just a technological integration but a new way of thinking that deeply integrates humanistic care and scientific spirit, aiming to secure an "immortal" future for humanity's cultural treasures in the digital dimension.

5.2 Challenges Faced

Despite its broad prospects, realizing this grand vision still faces numerous severe challenges:

Technical Challenges: Massive multi-source data storage, management, and efficient computation require robust computing infrastructure; the reliability and interpretability of AI models in handling complex, sparse, or even contradictory historical information still need fundamental breakthroughs; standardization of data collection, model construction, and knowledge organization is urgently needed to ensure interoperability between different projects and avoid creating new "digital silos."

Interdisciplinary Collaboration Challenges: The construction of digital life forms highly depends on deep collaboration among computer scientists, heritage conservation experts, historians, archaeologists, and others with diverse backgrounds. This is not only a technical integration but also a collision and fusion of ways of thinking, knowledge systems, and discourse systems. Establishing effective interdisciplinary communication and collaboration mechanisms is key to project success.

Ethical and Philosophical Challenges: To what extent will "digital immortality" affect the public's reverence for the physical heritage entity? How should the authority of statements from a highly intelligent digital Confucius be defined? Do the contents it generates constitute new "history"? These are ethical frontier issues that must be deeply considered as technology advances, requiring us to establish "ethical guardrails" in advance.

5.3 Future Outlook

Looking ahead, with the development of information technology, deeper intelligent integration, emotional computing, brain-computer interfaces, and other technologies may be introduced, enabling interaction between humans and digital life forms to move from the information level to the emotional level, achieving truly "empathetic" experiences. Moreover, decentralized co-construction and sharing, utilizing technologies like blockchain, might enable the construction of a distributed "digital civilization matrix" maintained and contributed to by numerous institutions and individuals, rather than centralized projects led by governments or large corporations. The ultimate form of autonomous evolution might see future digital life forms, in an open digital environment, continuously learning from new internet data and user feedback, achieving a degree of autonomous "evolution" and "growth," truly becoming "digital civilization partners" existing and developing with us.

Our goal is to build a never-fading digital civilization mirror world composed of countless cultural heritage digital life forms. It will not only preserve the material forms for future generations but also transmit the depth of thought, the warmth of history, and the wisdom of civilization, opening a new dimension full of infinite possibilities for the perpetual transmission of human civilization.

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