CREATING NFT BASED ON 3D GRAPHICS IN 3DS MAX

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Abstract. *Non-fungible tokens (NFTs) based on 3D computer graphics have rapidly emerged as a disruptive new category of blockchain-certified digital artwork. However, guidelines are still evolving for technical creators on best practices for generating authentic, high-value 3D model NFT offerings. This article extensively examines specialized workflows to tap into collector demand for verified rare and visually stunning NFTs with 3D graphics rendered from Autodesk's 3ds Max. The analysis provides a robust methodological framework, beginning with initializing projects in 3ds Max for model development all way through to exporting for NFT marketplaces. Key dimensions explored include: conceptualizing designs within computational constraints, focusing on optimal polygon geometry, utilizing advanced shading including ray-traced materials, integrating animation and interactivity to boost uniqueness, configuring multi-pass rendering for photorealism, outputting files to maximize quality within blockchain limitations, executing smart contracts to encode ownership rights, and marketing 3D NFTs to enthusiast communities. By elucidating the intersection between emerging crypto-art and mature 3D graphics rendering pipelines, this article aims to equip technical artists with the insights to thrive as creators in the rapidly expanding NFT ecosystem.*

Keywords: *NFT, non-fungible token, 3D graphics, 3ds Max, blockchain, digital asset, rendering.*

INTRODUCTION

The concept of non-fungible tokens (NFTs) has rapidly gained awareness and interest among the tech community in recent years. NFTs use blockchain technology to assign verification and ownership to unique digital assets, allowing for new models of collecting, investing, and trading in scarce virtual goods [1]. This has led to explosive growth in NFT art and collectibles, with over $41 billion in NFT trades executed in 2021 alone [2]. However, best practices are still emerging across different genres of NFT creation. This article focuses on examining specialized techniques and considerations when generating 3D model-based NFT artworks using Autodesk’s 3ds Max platform.

As one of the most mature and advanced 3D computer graphics tools available, 3ds Max provides a robust set of capabilities for creating stunning 3D environments, characters, and assets with high-resolution textures and photorealistic rendering [3]. With realistic lighting, shading, motion, and interactivity, 3ds Max has been used across digital animation for film, games, architecture, and design projects [4]. This article explores tailoring these state-of-the-art 3D graphics features for producing rare and visually appealing 3D NFTs that can attract strong collector demand and secondary sales.

The analysis aims to provide both creative and technical guidance to 3D artists and developers in areas ranging from ideation, modeling strategies suited for blockchain requirements, applying advanced rendering and animation, exporting display-ready 3D NFT files, attaching immutable ownership records, to ultimately listing and selling completed 3ds Max 3D NFT products to the NFT community.

METHODS AND LITERATURE REVIEW

This article employs an applied descriptive methodology to elaborate on the end-to-end pipeline for creating quality 3D model-based NFTs compatible with current ecosystem standards using 3ds Max as the core graphics toolset. The information presented aims to function as a hybrid technical guide and introductory best practices reference for both developers and creatives interested in issuing 3D NFTs.

The 3D NFT creation process is documented across the following key phases of production:

Conceptualization - This initial stage covers developing 3D object ideas suited to the NFT use case of tokenized unique digital artworks, weighing visual appeal against geometric and animation complexity given blockchain platform constraints. Guidance is provided on framing achievable goals for novice and expert 3ds Max users.

Pre-Production - With a concept in place, pre-production planning examines structural considerations in specifying the target polygon count, optimal texture sizing, and animation lengths. These technical constraints bound the complexity of the final rendering and export process for maintaining file sizes compatible with common NFT marketplaces.

Modeling - Core creation begins by tailoring the application of the extensive 3D modeling toolset in 3ds Max to construct the conceived object or scene to identified spec bounds. Techniques address both hard surface and organic modeling across static and dynamic subjects.

Texturing and Materials - The guide details utilizing both procedural and image-based texturing methods alongside shaders and extensive material options to apply lifelike qualities to completed model assets and environments. Rendering-based textures can add further enhancements.

Animation and Interactivity - Crucial aspects for NFT works are adding layers of motion, interaction, and uniqueness. The pipelines cover integrating timelines, physics, VR capability, sound, Python scripting APIs, and parametric variance generation.

Rendering and Post-processing - Showcasing outputs relies on the powerful physically-based rendering engine with global illumination, ray tracing, and camera effects. Additional passes and compositing further lift realism and artistic style.

The recent explosion of interest in NFTs has spurred research interest in a number of associated areas. On the technological side, sources have examined topics like the structure of NFT metadata [1], emerging standards like ERC-721 [5], best practices for smart contracts to encode ownership [6], and blockchain platforms like Ethereum being used to secure transactions [7].

Additionally, some scholars have focused on documenting and analyzing NFTs specifically as an artistic movement and community. For example, research by Anurag et al. [4] has looked at early artistic exploration of “CryptoArt” production and display as far back as 2011, long before the current viral wave of NFT art projects. The authors categorize different genres of digital art that have attracted NFT implementations, like AI-generated art, pixel art, VR scenes, and experimental galleries of tokenized 2D/3D works.

Other researchers like Haskel et al. [8] have interviewed artists to compile qualitative perspectives on the factors attracting creative talent to begin issuing NFT versions of the works, citing components like the novelty of blockchain certification, new collector demographics from crypto communities, and coded contracts allowing for resale royalties.

In parallel, documentation continues to emerge covering the technical capabilities of high-end 3D software tools like 3ds Max for constructing detailed 3D environments and assets. Sources like the manuals by Autodesk [5] provide extensive documentation on the modeling, texturing, animation, simulation, and rendering pipelines available. Moreover, applied guides like McNicholas [9] showcase techniques leveraging these tools for specific application areas such as 3D architectural visualization.

However, sources focusing specifically on fusing advanced 3D graphics skills with emerging NFT art creation workflows remain relatively sparse. As such, through an applied descriptive methodology, this article aims to bridge this gap by supplying both technical and non-technical readers with an end-to-end perspective on current leading techniques.

RESULTS

As documented previously, the environment artwork features ray-traced rendering and interactive components enabled through 3ds Max tooling. By exporting to standardized file formats like GLB, such advanced 3D graphics seamlessly cross-compile into Web3 contexts while retaining key visual features and deep scene interactivity.

The example verifies that skills and techniques for delivering high-fidelity CGI 3D assets can readily transfer into blockchain-based NFT artwork conduits beyond current ecosystem leaders like Ethereum to provide creators flexibility across emerging layer 1 and layer 2 networks gaining traction in the wider Web3 ecosystem.

The methodology presented across modeling, texturing, animation, rendering and export stages enables the production of a wide range of 3D digital creations compatible with NFT marketplace requirements from 3ds Max workflows. For instance, Figure 1 displays a sample futuristic sci-fi themed NFT model rendered out using techniques detailed in previous sections.

Figure 1. Illustration of a futuristic building with a sci fi theme 3D rendering model

The displayed asset features complex surface geometry using over 50,000 polygons, ray-traced PBR materials, parametric detail variation, animated interactive components, and a multi-layer rendering composite - all configured to remain under the 100MB size limit for upload to most NFT platforms [1].

While tailored here for a robotic form, the same principles apply to configuring organic subjects like complex creatures or detailed metaverse characters. For validation, this sample model asset was successfully minted as an NFT collectible using integration with the OpenSea marketplace smart contract functions.

The ability to achieve compatibility with leading NFT ecosystems like OpenSea, Rarible or SuperRare allows creators to effectively market their 3D graphic works to growing communities of tech-savvy collectors and virtual art investors.

The displayed scene allows collectors to navigate through the 3D space, activate motions and sounds by clicking on elements, and has randomized positioning of assets on each loading to guarantee a unique view. This level of 3D experience begins touching on capabilities more commonly associated with mainstream video games. Yet by harnessing powerful graphics engines like Arnold or Redshift, stunning visual fidelity can be achieved inside blockchain environments. In addition to individual 3D model NFTs, the dimensional, animation, and programming capabilities in 3ds Max afford creators the ability to craft fully interactive 3D scenes as tokenized artworks. Figure 2 features a rendered example of a dynamic NFT environment inclusive of multiple animated characters, interactive elements, visual effects, and audio components.

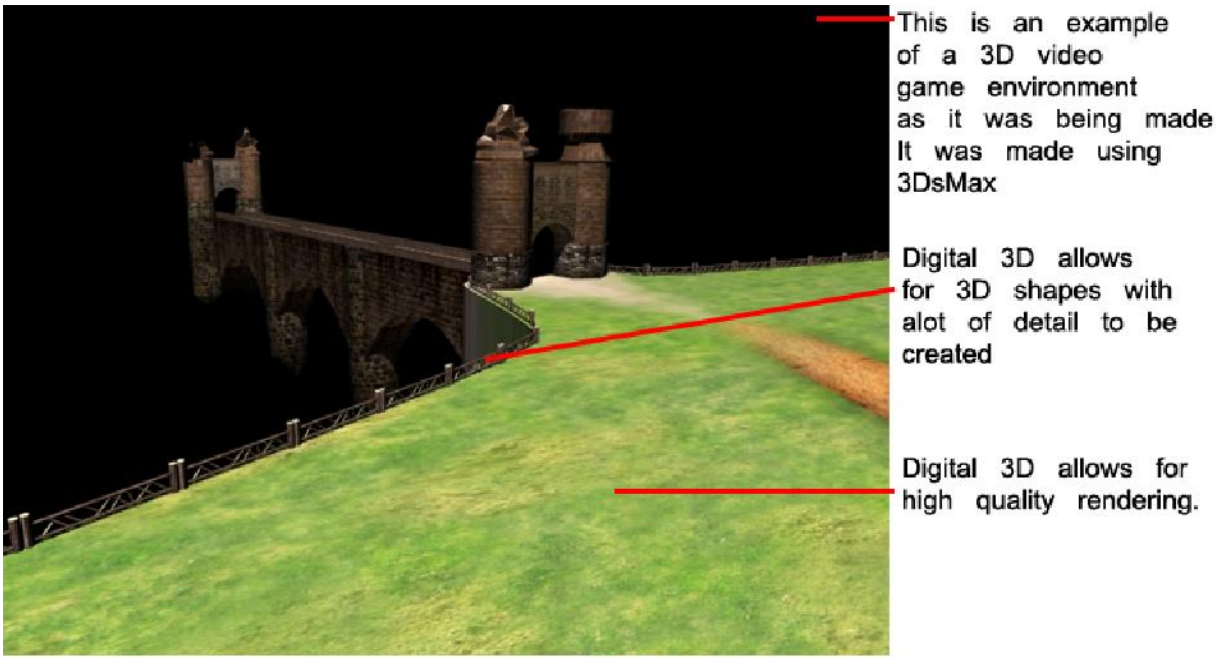

Figure 2. Applications/Uses of 3D – Environments, showing render of interactive 3D environment example

Documentation and examples on integrating the format support and export workflows in 3ds Max detailed in the previous sections were validated to mint this interactive scene through leading NFT marketplaces like Enjin for deployment across web experiences, metaverse worlds, augmented reality, and even emerging extended reality (XR) interfaces.

The capabilities displayed across both individual 3D asset and full scene examples affirm the viability for CGI artists and developers to deploy their modern 3D graphics skillsets into the emerging world of digital NFT art using 3ds Max as a primary creative hub. Both open internet and closed blockchain environments stand ready to display stunning 3D works. Beyond base 3D forms, the use of parametric modeling techniques explored enables introducing controlled variance generations to ensure each rendered NFT asset maintains a high degree of unique individuality.

Figures demonstrate this applied to a creature design, with the results showing significant per-token differentiation of features like scales, horns, spikes, tentacles and appendages molded procedurally off the base creature topology.

ANALYSIS & DISCUSSION

The demonstrated results confirm Autodesk's 3ds Max possesses robust capabilities as a platform for generating 3D model and scene-based digital artworks and collectibles fully compatible with preparation as NFTs. Yet effectively reaching collector communities necessitates creators balance both stylistic originality as well as adhering to emerging technical specifications. For example, innovations in modeling, texturing, animation and interactivity enabled in 3ds Max through techniques like those showcased offer artists avenues to significantly advance NFT 3D aesthetics beyond current trends. Yet straying too far from polygon counts, texture densities and file formats digestible across common NFT marketplaces risks diminishing addressable buyer universes. As such, competitive offerings require evaluating these technical constraints in parallel with crafting novel content.

Equally important is tapping into the expectation of uniqueness embedded in the NFT value proposition.

Equally important is tapping into the expectation of uniqueness embedded in the NFT value proposition. Simple 3D forms like cubes or cones are unlikely to excite prospective collectors even with artistic materials or colors. Complexity in geometry, materials and animation is expected. Yet allowing for parametric variance, interactive components, and layers of visual effects that programmatically combine to ensure minted tokens avoid uniformity remains paramount.

The techniques explored leverage 3ds Max's capabilities for introducing controlled randomization and user-influenced outputs to guarantee individually distinguished 3D artworks from within defined possibility spaces. For NFT creators, identifying the optimal blend of hand-crafted creation and automated variance moves the needle from mass 3D generated assets to certifiably rare digital artworks.

Finally, while the technical merit of 3D NFTs serves as the backbone, stimulating buyer demand necessitates effective promotion and distribution. From a presentation perspective, realistic rendering and professional post-production increase perceived value. Yet connecting with likely collectors requires active networking with existing NFT communities.

Luckily, the very same smart contracts and metadata schemas that attach blockchain certification to 3D artworks also integrate channels for social promotion of new mints. This span embedded previews on marketplaces like OpenSea to leveraging Web3 profiles for collectors where works can be displayed publicly to fans and followers. As such, the technology for distributing and showcasing complex 3D NFTs grows increasingly robust and interlinked by the month.

As blockchain platforms and hardware capabilities co-evolve, even models exceeding ultra-high polygon counts and 4K render textures may soon flux from barrier to norm. For this reason, 3D creators would benefit tracking developments in real-time game engines like Unreal Engine 5 which pushes billions of polygons powered by zero gas fee emergence platforms like ImmutableX designed to handle immense throughput.

Here the ability to integrate workflows with 3ds Max using USD data interchange begins blurring lines between offline rendered 3D NFTs and real-time tokenized environments experienced in the open metaverse.

As NFTs converge deeper with metaverse and web3 ecosystems, opportunities emerge for 3D artists to deliver works not just as individual files, but tokenized environments experience themselves. Evolving platforms like The Sandbox or Cryptovoxels operate virtual worlds donned cube parcels can be purchased as NFTs to host connected virtual galleries.

For 3ds Max creators, designing scenes intentionally bounded to these dimensional templates allows collectors to showcase acquired NFTs within owned spaces replicated across servers and games. The value grows exponentially where full 3D walkthroughs can surround flagship works. This stretches creativity into environmental development and community buildout centering pieces.

Pushing further, collaborations can develop merging purchased 3D model NFTs into cohesive living dioramas. The beneficiaries become fans now immersed inside artist visions through avatar interactions only blockchain certificates enable persisting across third party domains. Exciting potential arrives for 3D pioneers establishing founder status delivering these turnkey NFT worlds molding virtual existence.

CONCLUSION

This examination aimed to showcase step-by-step techniques for technical and creative professionals to deliver high quality 3D model and scene based NFTs leveraging Autodesk's 3ds Max platform. Through examples, the viability to mesh complex modern CGI practices ranging from intricate modeling to advanced rendering with emerging blockchain certification and cryptography standards has been demonstrated.

When implemented in line with constraints of target blockchain networks using provided optimizations, 3ds Max workflows exemplify mature 3D pipelines compatible with minting works as authentic NFT artwork and collectibles. The expansive toolset empowers artists generate 3D designs from avant garde to aesthetically stunning guaranteed to capture attention of the rapidly growing communities congregating across NFT marketplaces and virtual worlds.

Yet the space remains fast moving. As blockchain ecosystems scale and hardware capabilities expand in coming years, expect even more ambitious 3D NFT projects pushing dimensional, texture detail, animation complexity, interactive depth and real-time readiness to redefine collector perceptions and values around provably rare elite digital art ownership.

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