



International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.699

Volume 14, Issue 6, June 2025

Modelling and Layout of G+1 Villa using Autocad and 3ds Max

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ABSTRACT: This project involves the design and visualization of a G+1 villa using AutoCAD for precise 2D drafting and 3ds Max for realistic 3D modeling and rendering. It aims to create a visually accurate and functionally planned residential villa, starting from architectural plans to detailed 3D models with realistic textures, lighting, and landscaping. The project highlights the integration of technical accuracy, design concepts, and presentation skills, demonstrating proficiency in CAD tools and contributing to professional standards in architectural visualization.

KEYWORDS: G+1 villa, AutoCAD ,3DS Max ,3D modelling Architectural Layout, Residential Design, CAD drafting Visualisation, Rendering Interior Design, Exterior design.

I. INTRODUCTION

A G+1 villa refers to a residential building structure that comprises a ground floor (G) and one additional upper floor (1). This architectural style is commonly chosen for single-family homes due to its efficient use of vertical space while maintaining an independent and private living environment. G+1 villas strike a balance between spaciousness and cost-efficiency, offering more room than a single-story house yet remaining more manageable than multi-story apartments. One of the primary advantages of this type of home is the independent living it provides, free from shared walls or communal areas typical of apartment buildings. The vertical layout allows for effective space utilization, often with common living areas such as the living room, kitchen, and dining space on the ground floor, while private areas like bedrooms and bathrooms are situated upstairs. Modern G+1 villas typically feature amenities such as balconies, designated parking areas, small gardens, and sometimes a rooftop terrace. They also offer a high degree of customization, allowing homeowners to tailor both the interior and exterior to their preferences. Additionally, owning both the land and the building structure ensures long-term investment value and offers the potential for future expansion. These villas are especially popular in suburban and semi-urban locations where land is more accessible, and there is a growing demand for independent, spacious, and personalized homes.

II. LITERATURE SURVEY

J. Pavan et.al 2024: Designing a farmhouse in 3ds Max involves key steps such as modeling the structure (walls, doors, windows, roof), applying realistic textures, setting up lighting to simulate real-world conditions, and rendering final visuals. The software's advanced tools support detailed architectural elements and lifelike visualizations, making it ideal for creating realistic farmhouse designs.

Antonella Bevilacqua et.al 2024: The design of an acoustic shell at Rufolo's villa involves collaboration between architectural and acoustic experts to enhance the garden's suitability for musical performances at the Ravello Festival. The study compares acoustic simulations across three scenarios: the current setup, added floor and suspended panels, and a proposed new acoustic shell. The results support naturalization, inform future shell designs tailored to performance types, and guide the development of a well-balanced amplified audio system for the venue.

Kayan Kalpan et. al 2022: This research focuses on digitally reconstructing ancient cities like Antioch to preserve and visualize lost cultural heritage. Using 3D modeling, animation, and game engines, like Unity 3D, the project recreates urban spaces, building, and social life, aiding in historical analysis and education. Despite challenges like limited excavation data and technical issues with earlier software (OGRE 3D), The study is valuable for archaeology, urban planning, and cultural preservation, with applications in museums such as the Hatay Archaeology Museum.

L.Muller et.al 2024: This research addresses the global housing shortage by exploring how automation, specifically deep learning and generative adversarial networks (GANs), can aid architectural design. Traditional methods can't meet the growing demand for housing, but automation can help create well-designed buildings efficiently. The study develops and tests an improved 3D Wasserstein GAN to generate realistic building geometry. Using specific techniques like gradient penalty, Leaky ReLU, and RMS Prop optimizer, the model achieved stable and accurate results. The dataset and model architecture are shared for future research, highlighting GANs' potential in automating and advancing generative design in architecture.

III. METHODOLOGY

The methodology adopted for this project involved a structured and systematic approach to the modeling and layout of a G+1 villa using AutoCAD and 3Ds Max software. Initially, the scope and objectives of the project were clearly defined, focusing on creating a functional and aesthetically pleasing design for a standalone residential villa. A thorough requirement analysis was carried out to determine the essential spatial components, including living areas, bedrooms, kitchen, staircases, parking space, and other amenities based on standard residential design norms and user expectations.

The design process began with the creation of 2D architectural drawings using AutoCAD. These included detailed ground and first-floor plans, along with elevation and sectional views. All drawings were prepared while adhering to relevant building codes, ergonomic standards, and site constraints. Once the 2D plans were finalized, they were exported in DWG format to be used in the 3Ds Max environment for 3D modeling.

In 3Ds Max, the imported CAD drawings were used as references to construct the 3D geometry of the villa. The modeling process included the creation of walls, doors, windows, floors, and staircases using standard primitives and AEC extended tools. Boolean operations were employed to create accurate openings in walls for the placement of doors and windows. Detailed modeling was also carried out for interior elements such as stairs, railings, and fixtures, as well as exterior features including facades and landscaping.

Materials and textures were assigned to each element using the Material Editor in 3Ds Max, incorporating the use of Multi/Sub-Object materials for enhanced realism. Realistic textures were applied to walls, floors, doors, and other components to reflect the actual visual appearance of building materials. Lighting was then introduced using standard light types such as Target Spot, Omni, and Skylight, simulating both natural and artificial lighting scenarios. Cameras were strategically positioned to capture key perspectives of both the interior and exterior spaces.

The scene was then rendered to produce high-resolution images and walkthrough animations. Global illumination and ambient occlusion settings were applied to enhance visual quality and realism. The entire model was reviewed for geometric accuracy, proper alignment, and texture consistency. Corrections and refinements were made iteratively based on visual feedback and quality checks.

Finally, all outputs including the 2D plans, 3D views, rendered images, and walkthrough animations were compiled into the final project documentation. The completed report demonstrated the integration of architectural design

principles with modern software tools, showcasing both technical and creative proficiency in residential design and visualization.

IV. EXPERIMENTAL RESULTS

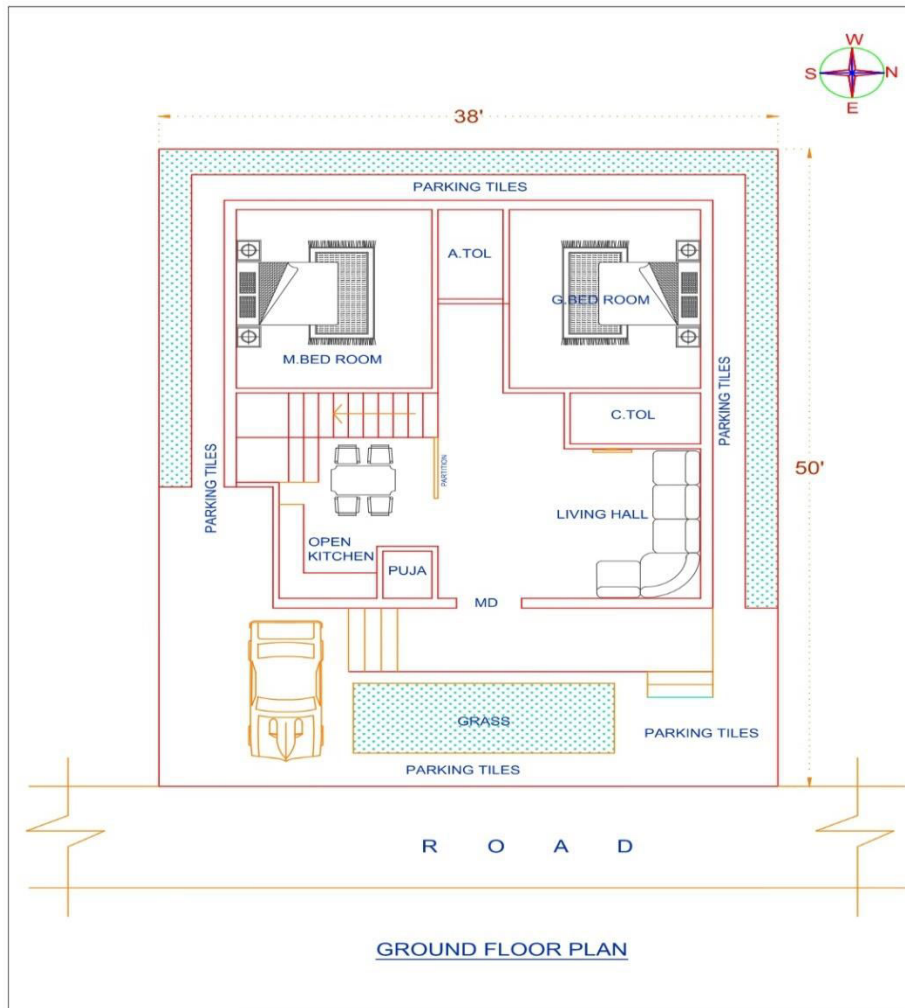


fig1:ground floor plan

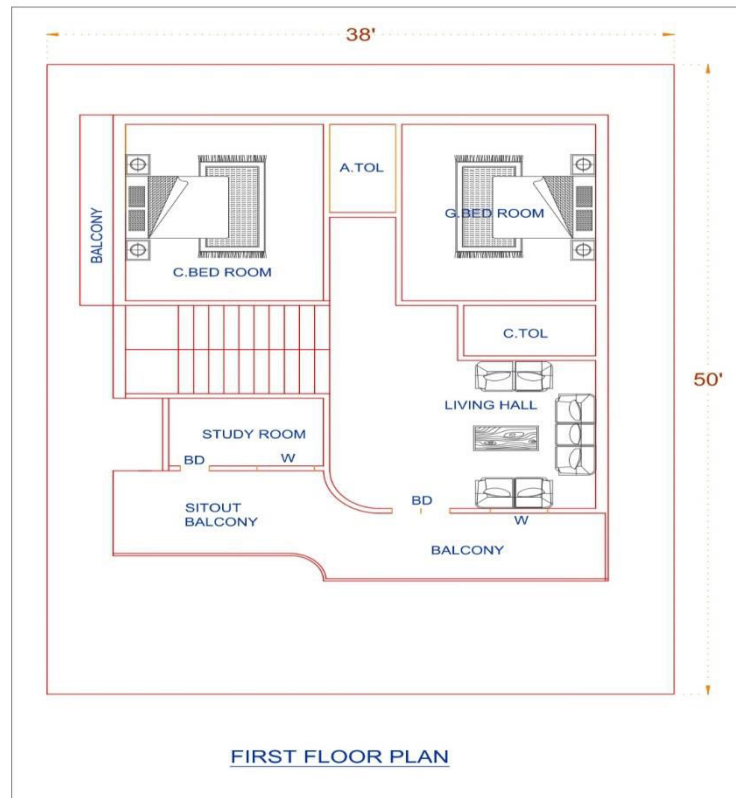


fig 2: first floor plan



fig 3: final result of g+1 villa

V. CONCLUSION

The successful modeling of a G+1 villa using AutoCAD and 3ds Max highlights the value of digital tools in modern architecture. AutoCAD ensured precise 2D planning, while 3ds Max enabled realistic 3D visualization, enhancing design accuracy, communication, and client engagement. This integration streamlined the design process, reduced manual effort, and showcased the potential for future adoption of advanced technologies like BIM, VR, and AI in residential architecture.

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