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BIM-BASED ARCHITECTURAL PLANNING AND WALKTHROUGH RENDERING OF A MULTIPURPOSE CONVENTION HALL USING REVIT

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Abstract

The project "BIM-Based Architectural Planning and Walkthrough Rendering of a Multipurpose Convention Hall Using Revit" focuses on the planning, modeling, visualization, and presentation of a multipurpose convention hall using Building Information Modeling (BIM) technology. A convention hall requires careful planning to accommodate different activities such as conferences, seminars, exhibitions, cultural programs, meetings, and social events. The project aims to develop a functional architectural layout while considering space utilization, circulation, accessibility, natural lighting, ventilation, and user comfort.

The architectural design is developed using Autodesk Revit, where the building components are created as an integrated BIM model. The model includes spaces such as the main auditorium, stage, entrance lobby, reception area, meeting rooms, exhibition spaces, service areas, restrooms, circulation spaces, and other supporting facilities. Walls, floors, roofs, doors, windows, stairs, furniture, and other architectural elements are incorporated into the model to represent the proposed convention hall accurately.

The project also focuses on three-dimensional visualization and walkthrough rendering to provide a realistic representation of the proposed building. Revit views, materials, lighting, camera perspectives, and walkthrough features are used to examine the interior and exterior spaces. The walkthrough helps evaluate spatial relationships, circulation paths, room arrangements, and the overall appearance of the convention hall before actual construction.

I. Introduction

A multipurpose convention hall is a large public building designed to accommodate different types of events such as conferences, seminars, exhibitions, cultural programs, meetings, workshops, and social gatherings. The planning of such a building requires careful consideration of functional spaces, user movement, accessibility, safety, comfort, and efficient utilization of available space. Proper arrangement of the auditorium, stage, entrance lobby, reception, meeting rooms, exhibition areas, service spaces, restrooms, and circulation areas is essential for creating an effective and comfortable environment for different types of users.

Traditional architectural planning generally depends on two-dimensional drawings, which can make it difficult to understand the complete spatial arrangement and

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relationship between different building components. Building Information Modeling (BIM) provides an integrated approach in which architectural elements can be developed as a coordinated three-dimensional building model. BIM allows designers to visualize the building, modify components, generate drawings, and coordinate different design elements within a single digital environment.

Autodesk Revit is a BIM-based software widely used for architectural modeling and building design. In Revit, walls, floors, roofs, doors, windows, stairs, furniture, ceilings, and other building components can be created as intelligent model elements. The software also supports the generation of plans, elevations, sections, schedules, 3D views, materials, and presentation drawings directly from the building model. This helps improve design coordination and makes it easier to identify potential planning issues during the design stage.

II. Literature Survey

Building Information Modeling (BIM) has become an important approach in the architecture, engineering, and construction industry for developing coordinated digital representations of buildings. Previous research has shown that BIM can improve the integration of building information throughout the design and construction process. Unlike conventional two-dimensional drafting, BIM allows architectural elements to be represented as interconnected three-dimensional components containing geometric and non-geometric information. This approach can improve design coordination, reduce inconsistencies between drawings, and support better communication among project participants.

Several studies have investigated the application of BIM in architectural planning and building design. Research has demonstrated that BIM-based workflows can support the development of floor plans, elevations, sections, schedules, quantities, and three-dimensional views from a common building model. BIM also allows design changes to be reflected across related views, reducing repetitive drafting work. Researchers have highlighted the usefulness of BIM for improving visualization and identifying spatial or coordination problems during the early stages of building design.

Studies involving Autodesk Revit have examined its application in architectural modeling, documentation, and design visualization. Revit provides parametric modeling capabilities in which walls, floors, roofs, doors, windows, stairs, furniture, and other components can be created as building elements. Research has indicated that this type of modeling helps designers understand the relationship between different building components and efficiently generate coordinated architectural documentation. Revit-based models can also support the preparation of realistic three-dimensional views for design review and presentation.

Research on 3D visualization and walkthrough rendering has shown that immersive visual representations can improve the understanding of architectural spaces compared with conventional drawings alone. Walkthroughs allow designers, clients, and users to examine circulation paths, room relationships, interior arrangements, materials, and visual appearance before construction. For large public buildings such

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as convention halls, visualization can be particularly useful for evaluating entrances, auditoriums, stages, exhibition spaces, corridors, and other functional areas.

Overall, the literature indicates that integrating BIM-based planning, Revit modeling, and walkthrough visualization can improve architectural design communication and coordination. Previous studies have mainly focused on BIM adoption, parametric modeling, design documentation, visualization, and project coordination. Building on these concepts, the present project develops a BIM-based architectural model of a multipurpose convention hall using Revit and produces three-dimensional views and walkthrough renderings. The study aims to demonstrate how an integrated digital model can support functional space planning, design visualization, and effective presentation of a convention hall before construction.

III. System Analysis

System analysis is an important stage in planning and developing a multipurpose convention hall using BIM technology. The project focuses on creating a functional architectural design that can accommodate conferences, seminars, exhibitions, cultural programs, and other events. The building requirements, site conditions, space requirements, circulation, accessibility, and user movement are considered during the planning stage. Functional spaces such as the auditorium, stage, lobby, reception, meeting rooms, exhibition areas, restrooms, and service areas are arranged appropriately. A three-dimensional BIM model is developed using Autodesk Revit to represent the proposed building accurately. Walls, floors, roofs, doors, windows, stairs, furniture, and other architectural components are incorporated into the model. Different views such as floor plans, elevations, sections, and 3D views are generated from the BIM model. Materials, lighting, and camera settings are applied to improve the visual representation of the building. A walkthrough is created to examine the interior and exterior spaces from different viewpoints. The model helps evaluate spatial relationships, circulation paths, and overall architectural appearance. Design modifications can be made easily within the integrated BIM environment. Overall, the system analysis provides a systematic approach for planning, modeling, visualizing, and presenting the multipurpose convention hall.

Existing System

The conventional architectural planning system mainly depends on two-dimensional drawings, manual drafting, and separate visualization methods. Architects prepare floor plans, elevations, sections, and other drawings individually during the design process. Understanding the complete three-dimensional relationship between different spaces can be difficult from two-dimensional drawings alone. Design changes may require modifications to several related drawings, increasing the possibility of inconsistencies. Manual drafting can also consume considerable time, particularly for large and complex buildings such as convention halls. Visualization is often performed separately using additional software or basic three-dimensional models. This can make coordination between architectural drawings and visual presentations more difficult. Traditional methods may provide limited information about building components and their relationships. Detecting spatial conflicts or planning issues at an early stage can also be challenging. Generating updated drawings after design

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modifications requires additional effort. Clients and users may find it difficult to understand the final building appearance from technical drawings alone. Conventional workflows also provide limited integration between modeling, documentation, and visualization. Therefore, an integrated BIM-based approach is useful for improving the efficiency and accuracy of architectural planning. Revit provides a suitable environment for combining architectural modeling, documentation, and visualization.

Disadvantages of Existing System

- Mainly depends on two-dimensional drawings.
- Difficult to visualize the complete building in three dimensions.
- Design modifications require repeated drawing updates.
- Higher possibility of inconsistencies between drawings.
- Manual drafting can be time-consuming.
- Limited integration between design and visualization.
- Difficult to identify spatial problems at an early stage.
- Separate preparation of drawings and 3D models may be required.
- Limited information about building components.
- Difficult for clients to understand complex architectural drawings.
- Walkthrough preparation may require additional software or effort.
- Less efficient for coordinating large and complex building designs.

Proposed System

The proposed system focuses on BIM-based architectural planning, modeling, and walkthrough rendering of a multipurpose convention hall using Autodesk Revit. The project begins with identifying the functional requirements and space requirements of the proposed convention hall. Important areas such as the auditorium, stage, entrance lobby, reception, meeting rooms, exhibition spaces, restrooms, and service areas are planned according to their intended functions. The building is developed as an integrated three-dimensional BIM model in Revit. Architectural components such as walls, floors, roofs, doors, windows, stairs, ceilings, furniture, and other elements are added to the model. Suitable dimensions and relationships between different spaces are maintained during the modeling process. Floor plans, elevations, sections, and 3D views are generated directly from the BIM model. Materials and finishes are applied to provide a realistic representation of the proposed building. Lighting and camera settings are adjusted for architectural visualization and presentation. A walkthrough is created to examine the movement through major interior and exterior spaces. Design changes can be implemented within the BIM model and reflected in the associated drawings and views. The proposed system improves design coordination and makes the architectural concept easier to understand. Overall, it provides an integrated workflow for planning, modeling, documenting, visualizing, and presenting the multipurpose convention hall.

Advantages of Proposed System

- Provides integrated BIM-based architectural planning.
- Creates a detailed three-dimensional building model.
- Improves visualization of interior and exterior spaces.

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- Generates plans, elevations, and sections from the same model.
- Makes design modifications easier to manage.
- Reduces inconsistencies between architectural drawings.
- Supports realistic material and lighting visualization.
- Provides walkthrough rendering for design presentation.
- Helps evaluate circulation and spatial relationships.
- Improves communication of the architectural design.
- Supports better coordination of building components.
- Reduces repetitive drafting and documentation work.

IV. Methodology

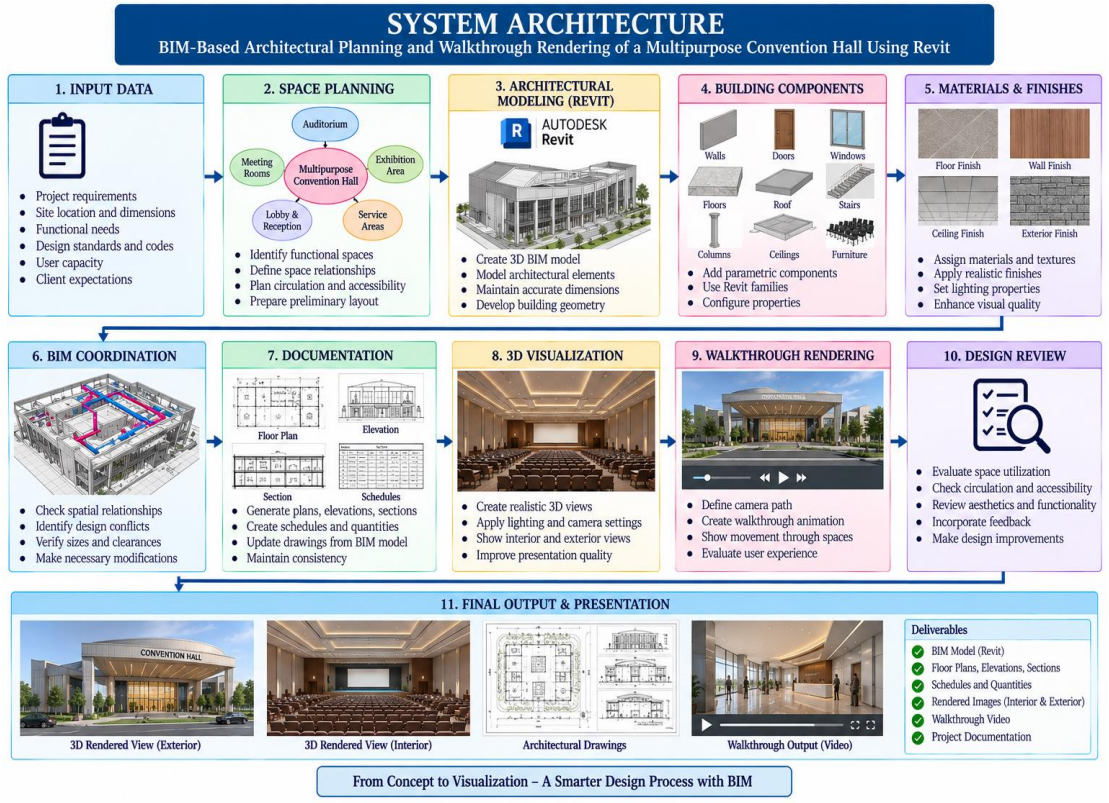
The methodology begins with collecting the requirements and functional information for the proposed multipurpose convention hall. The site dimensions, building requirements, number of spaces, circulation requirements, accessibility, and functional relationships are identified. A preliminary architectural layout is prepared by arranging major spaces such as the auditorium, stage, lobby, reception, meeting rooms, exhibition areas, and service spaces. The selected layout is then developed as a three-dimensional BIM model using Autodesk Revit. Walls, floors, roofs, doors, windows, stairs, ceilings, furniture, and other architectural components are added with suitable dimensions and properties. Materials and finishes are assigned to the building elements to improve the visual representation. Floor plans, elevations, sections, and three-dimensional views are generated from the completed model. The model is reviewed to identify spatial conflicts, circulation issues, and unsuitable space arrangements. Necessary modifications are made within the BIM environment to improve functionality and architectural appearance. Camera positions and visualization settings are established for important interior and exterior views. A walkthrough is then created to represent movement through the convention hall and demonstrate the spatial arrangement. Finally, the completed BIM model, drawings, rendered views, and walkthrough outputs are compiled for architectural presentation and evaluation.

System Architecture

The system architecture represents the complete workflow for BIM-based architectural planning and walkthrough rendering of the multipurpose convention hall. The process begins with Project and Site Input Data, including site dimensions, building requirements, functional spaces, and design constraints. The Space Planning Module identifies and arranges the auditorium, stage, lobby, reception, meeting rooms, exhibition spaces, restrooms, and service areas. The Architectural Modeling Module develops the three-dimensional building model using Autodesk Revit. The Building Components Module adds walls, floors, roofs, doors, windows, stairs, ceilings, furniture, and other architectural elements. The Material and Finish Module assigns suitable materials, textures, and finishes to the building components. The BIM Coordination Module checks spatial relationships and coordination between different building elements. The Documentation Module generates floor plans, elevations, sections, schedules, and other architectural drawings from the BIM model. The 3D Visualization Module creates realistic interior and exterior views of the convention hall. The Walkthrough Module defines camera paths and produces a virtual

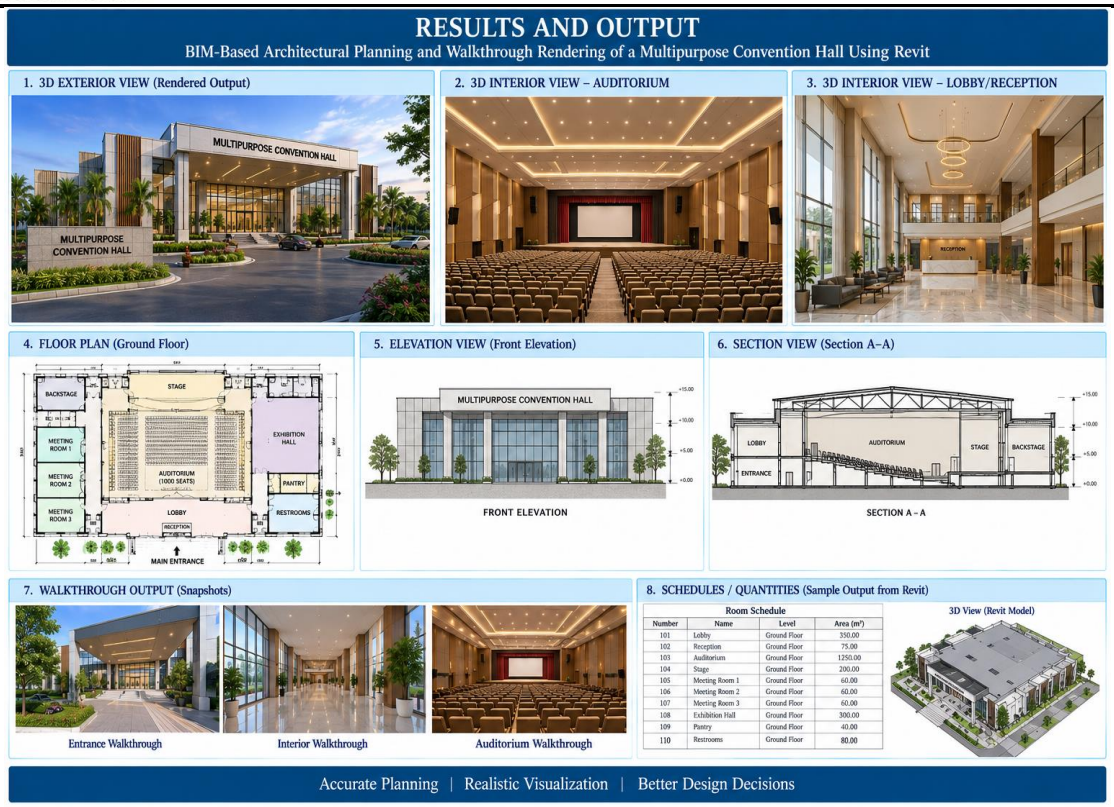
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movement through the building. The Design Review Module evaluates space utilization, circulation, appearance, and required modifications. Finally, the Output and Presentation Module provides the BIM model, drawings, rendered views, walkthrough, and project documentation. Overall, the architecture follows the workflow **Input Data → Space Planning → Revit BIM Modeling → Building Components → Materials & Finishes → BIM Coordination → Documentation → 3D Visualization → Walkthrough Rendering → Design Review → Final Outputs & Presentation**.



V. Result and Output

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VI. Conclusion

The project successfully demonstrated the BIM-based architectural planning and walkthrough rendering of a multipurpose convention hall using Revit. The convention hall was planned by considering functional requirements, space utilization, circulation, accessibility, and user comfort. A detailed three-dimensional BIM model was developed by incorporating architectural elements such as walls, floors, roofs, doors, windows, stairs, ceilings, furniture, and other components. The Revit model provided an integrated platform for developing floor plans, elevations, sections, 3D views, and architectural documentation. Materials, finishes, lighting, and camera views were applied to improve the visual representation of the proposed building. The walkthrough provided a clear understanding of the interior and exterior spaces and helped visualize movement through the convention hall. The BIM-based approach also made design modifications and coordination between different drawings more efficient. The project demonstrates that Revit can effectively support architectural planning, modeling, visualization, and presentation within a single environment. Overall, the proposed convention hall design provides a functional and visually understandable architectural solution. The developed BIM model and walkthrough can support better design communication and decision-making before the actual construction stage.

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