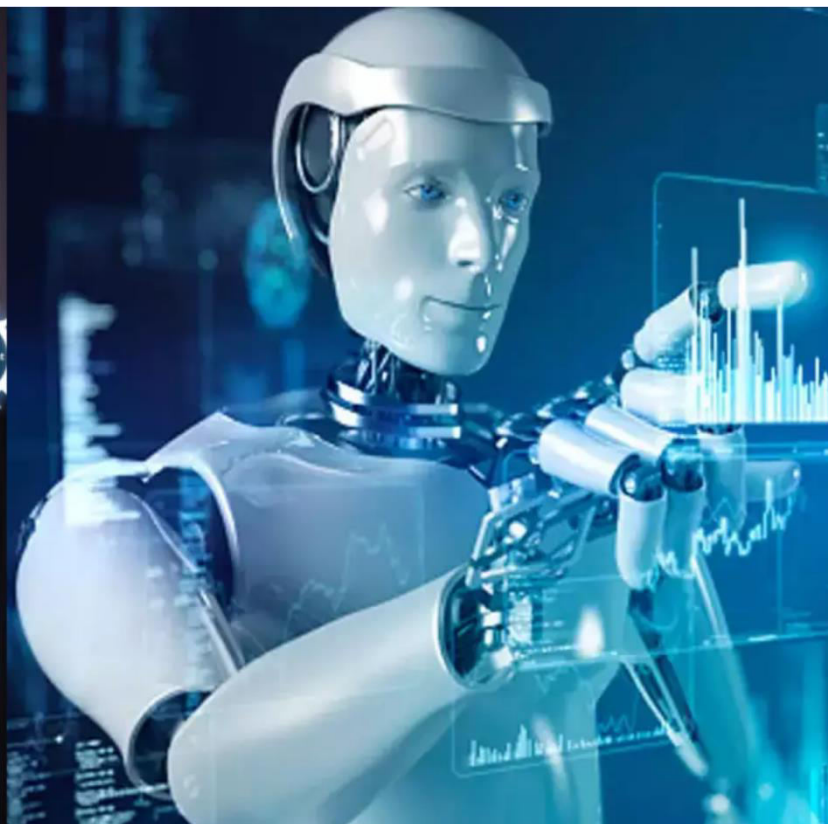




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Vision Planner

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ABSTRACT: House planning is often challenging, especially when the available plot has irregular shapes and dimensions. To simplify this process, this project proposes a 2D House Planning Software that enables customers to design their house layouts with ease. The software provides a user-friendly interface where users can create and modify rooms, walls, doors, and windows without requiring technical or architectural expertise. A key feature of the system is the ability to adapt designs of various plot shapes, ensuring that the space is used efficiently while still meeting the user's demands. By combining automated layout suggestions with manual customization, the tool empowers customers to experiment with different designs and finalize a suitable house plan. This makes it a practical, cost-effective, and accessible solution for preliminary architectural planning in real estate and construction. The software is developed using full stack technologies, with a responsive front-end interface for interactive 2D design and a robust backend for data storage, project saving, and retrieval. Graphics libraries are integrated to enable smooth drawing, scaling, and editing of floor plans, while database support ensures user projects can be securely stored and accessed at any time.

KEYWORDS: House Planning, 2D Design System, Layout Optimization, Irregular Plots, Interactive UI, Full-Stack Application, Space Planning.

I. INTRODUCTION

Vision Planner is a 2D House Planning Software designed to assist users in conceptualizing house layouts quickly and efficiently. The system provides an interface where users can build floor plans by adding and adjusting structural components such as rooms, walls, doors, and windows. The software combines automated layout suggestions with flexible manual editing, enabling users to design efficiently without requiring architectural expertise.

II. LITERATURE SURVEY

Recent studies in architectural design and space planning have focused on automating layout generation, improving usability of design tools, and handling complex spatial constraints such as irregular plot shapes.

The research work by **Thomas Merrell et al. (2011)** titled "Interactive Furniture Layout Using Interior Design Guidelines" demonstrates automated layout generation using rule-based and constraint-driven approaches. The system generates interior layouts efficiently; however, it primarily focuses on furniture placement and does not provide flexible user-driven editing for complete house planning.

The study "Interactive Floor Plan Modeling Using 2D Graphics Tools" by **T. Lin and S. Peng (2020)** explores user-friendly design interfaces with drag-and-drop functionality. While the system improves usability for non-experts, it offers limited support for irregular plot shapes and lacks intelligent layout suggestion mechanisms.

Research by **Zhenhua Huang and colleagues (2022)** on automated layout algorithms for irregular spaces introduces geometry-based adaptive techniques to efficiently utilize non-standard plot areas. Although effective in handling irregular geometries, the system lacks accessibility for general users and does not integrate interactive editing features.

The work on Building Information Modeling (BIM) tools such as **Autodesk Revit** provides highly detailed and accurate architectural modeling capabilities. However, these tools are complex, require professional expertise, and are not suitable for early-stage conceptual design by non-experts.

Additionally, studies on intelligent space allocation using optimization techniques such as genetic algorithms (e.g., **R. Chauhan and A. Singh, 2016**) show improved efficiency in room placement. However, these approaches often involve high computational cost and limited real-time interactivity.

III. METHODOLOGY

The proposed Vision Planner system’s methodology is centered on the interactive creation of 2D house layouts through a combination of user-driven design and automated layout suggestion techniques based on geometric processing and rule-based algorithms.

The system begins with the acquisition of user inputs, which include plot dimensions, boundary shapes (regular or irregular), and initial design preferences. These inputs are processed to extract coordinate data and structural constraints. The raw input is then normalized using geometric preprocessing techniques to ensure consistency in scale, alignment, and coordinate representation.

After preprocessing, the system applies geometry-based algorithms and heuristic rules to analyze the plot structure and generate optimized layout suggestions. These algorithms consider factors such as space utilization, room adjacency, accessibility, and structural feasibility. The layout engine dynamically computes possible placements for rooms, walls, doors, and windows within the given plot boundaries.

Once the initial layout is generated, the system enables user interaction through an intuitive graphical interface. Users can manually modify the design by adding, resizing, or repositioning structural elements. Real-time rendering using canvas/SVG technologies ensures immediate visual feedback for every modification.

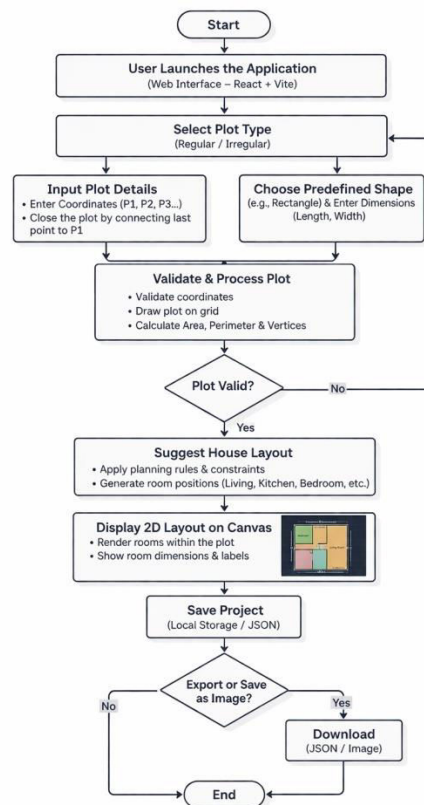


Fig 3.1 Vision Planner Generation Methodology

IV. SYSTEM ARCHITECTURE

The architecture of the Vision Planner system is designed as an interactive modular pipeline that integrates user input handling, geometric processing, layout generation, and real-time rendering functions.

The Vision Planner system architecture comprises the frontend interface, backend processing module, and layout engine. The frontend module provides users with an interactive environment to input plot dimensions, draw layouts, and visualize house plans in real time. It supports operations such as adding rooms, adjusting walls, and modifying structural elements through an intuitive graphical interface.

The backend module processes user inputs, validates plot dimensions, and manages communication between the frontend and the layout engine. It ensures that the input data is correctly formatted and applies necessary preprocessing such as coordinate normalization and constraint validation.

The layout engine acts as the core component of the system. It uses geometry-based algorithms and heuristic rules to analyze the plot structure and generate optimized layout suggestions. The engine determines the placement of rooms, walls, doors, and windows while ensuring efficient space utilization and logical arrangement.

Unlike traditional systems, Vision Planner does not include a database module. Instead, the system focuses on real-time processing and immediate output generation. Once the layout is finalized, the generated floor plan is rendered using canvas/SVG technologies and is directly available for download as an image file.

The architecture enables efficient real-time interaction, reduces system complexity by eliminating storage dependencies, and provides a fast and user-friendly experience for house planning.

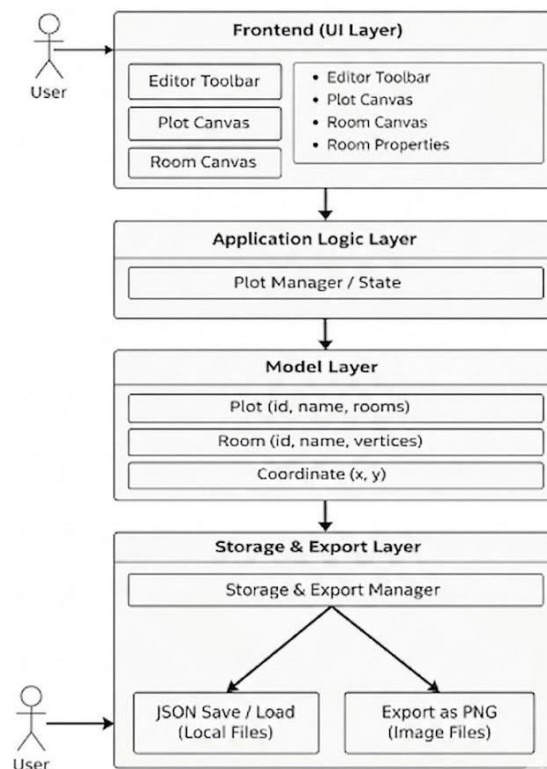


Fig 4.1 System Architecture

V. RESULTS

The Vision Planner system provides a user-friendly interface that enables users to design house layouts based on the given plot details. The main interface allows users to input plot dimensions and select the type of plot, such as regular or irregular, through simple input controls.

Once the user submits the plot information, the system processes the input using geometric algorithms to generate a suitable layout. Based on the selected plot type, the system produces two types of outputs: one for regular plots with standard layout structures, and another for irregular plots where the layout adapts to non-uniform shapes.

The generated layout is displayed to the user through an interactive 2D interface, allowing visualization of rooms, walls, doors, and other structural elements. Users can make basic adjustments if required and finalize the design.

After finalization, the system provides the output as a downloadable image of the floor plan. This simplifies the workflow by enabling users to directly save and use the generated design without additional processing.

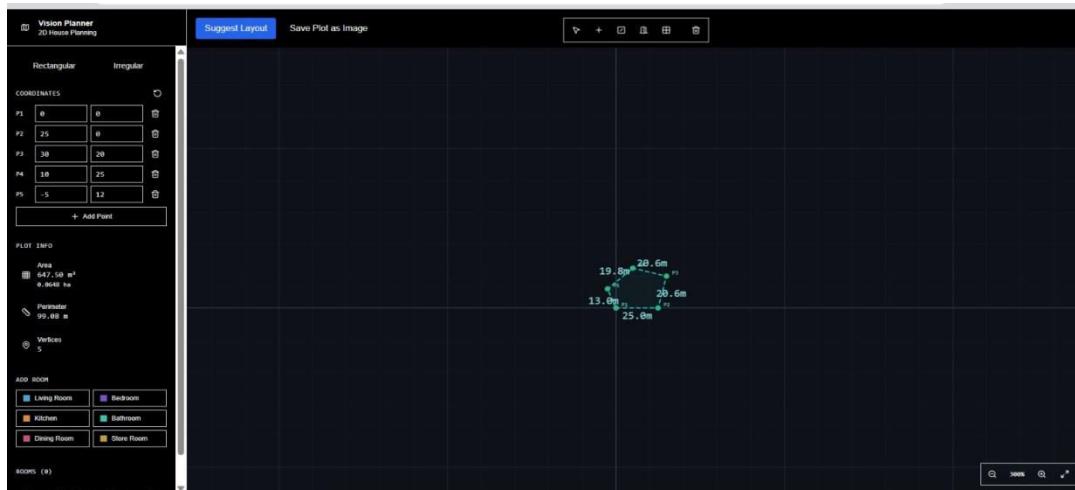


Fig 5.1 Vision Planner Irregular plot interface

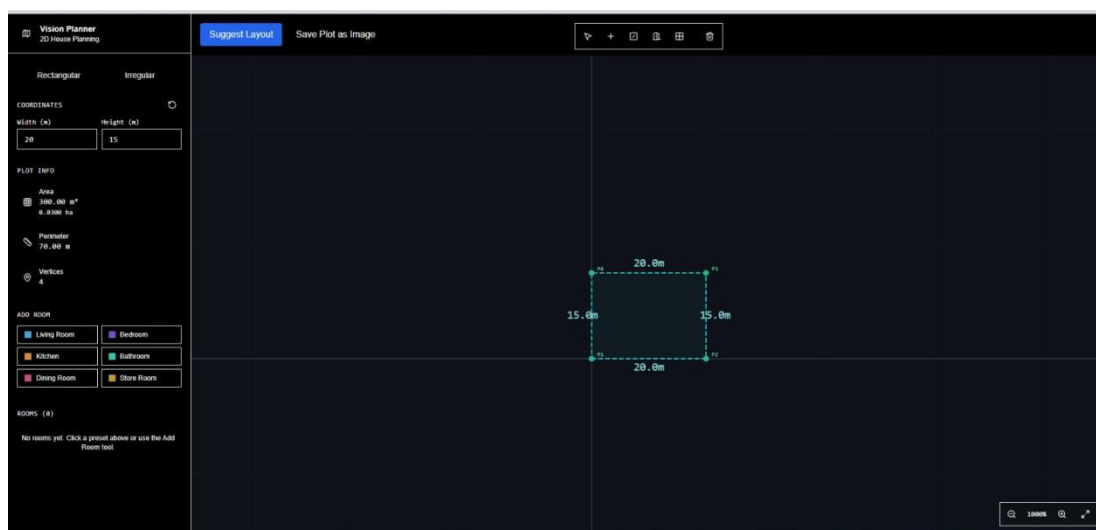


Fig 5.2 Vision Planner Regular plot interface

VI. CONCLUSION

Vision Planner is an interactive 2D house planning system developed to simplify the process of designing floor layouts for users without requiring architectural expertise. Traditional planning methods are often complex, time-consuming, and dependent on professional tools, which limits accessibility for general users. The proposed system overcomes these limitations by providing a user-friendly interface combined with intelligent layout generation techniques. The system integrates geometry-based algorithms and heuristic rules to generate efficient and practical layout suggestions while also allowing users to manually customize their designs. This balance between automation and user control ensures better space utilization and flexibility in design. The use of real-time rendering enables users to instantly visualize changes, improving the overall design experience. Unlike many existing systems, Vision Planner does not rely on database storage and instead focuses on simplicity and performance by allowing users to directly download the generated layout as an image. This reduces system complexity and makes the application faster and easier to use.

VII. FUTURE SCOPE

Although the Vision Planner system provides an effective solution for 2D house planning, several enhancements can be implemented to further improve its capabilities. One major extension of the system is the incorporation of 3D visualization, where the generated 2D layouts can be converted into detailed 3D models. This would allow users to better understand spatial arrangements and experience realistic representations of their house designs. Another possible improvement is the integration of advanced intelligent algorithms to provide smarter layout suggestions based on user preferences and design patterns. The system can also be extended to support multi-floor planning, enabling users to design complete buildings rather than single-floor layouts. Additionally, features such as real-time collaboration can be introduced, allowing multiple users (such as architects and clients) to work on the same design simultaneously. The system can also be enhanced with cloud integration for saving and accessing designs across devices. Furthermore, support for exporting layouts in multiple formats and integration with construction or real estate platforms can make the system more practical for real-world applications. Overall, these improvements would make Vision Planner more powerful, scalable, and suitable for advanced architectural planning.

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