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MapNest: An AI-Driven Platform for Automated House Mapping and Utility Design

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Abstract: MapNest is a web-based platform developed to automate the design of residential floor plans and optimize utility layouts, including electricity and water systems. The system leverages HTML, CSS, JavaScript, Python, and artificial intelligence to collect user requirements and generate customized house maps. The platform simplifies the architectural design process for users without technical knowledge, offering a low-cost and accessible alternative to traditional CAD software. This paper outlines the methodology, system architecture, and implementation strategy of MapNest, and discusses its effectiveness, scalability, and potential for future enhancement.

Keywords: House Mapping, Utility Design, AI, Web Application, Automation, Floor Plan Generator.

I. INTRODUCTION

The design of house floor plans and utility networks often requires professional knowledge and expensive software tools like AutoCAD. This creates a barrier for many individuals and small developers. MapNest addresses this gap by providing an online platform that automates the process of house mapping based on user inputs. In addition to generating room layouts, MapNest also proposes efficient routes for electricity and water supply systems.

II. PROBLEM STATEMENT

Most existing home design software is complex, costly, and demands technical skills. There is a lack of easy-to-use, intelligent systems that allow users to quickly generate personalized home layouts and utility plans. Users, especially in developing regions, need a simple yet effective solution for planning small- to medium-sized residential buildings.

III. OBJECTIVES

-To develop a user-friendly web application for automated house map generation.
-To integrate AI techniques for dynamic floor plan creation.
-To provide suggestions for electricity and water line routing.
-To reduce the time and cost involved in manual map designing.

IV. LITERATURE REVIEW

Previous efforts in digital architecture include platforms like Planner 5D and SketchUp, which offer manual drag-and-drop tools for design. While these tools are powerful, they often lack automation and are not intuitive for users without prior training. Recent studies in AI-driven architecture propose machine learning models to generate layouts based on constraints, but such solutions are not widely implemented in web applications. MapNest brings these concepts together in a lightweight, accessible tool.

V. SYSTEM ARCHITECTURE & METHODOLOGY

MapNest is built using HTML, CSS, and JavaScript for frontend interactions. Python is used in the backend for processing user inputs and generating layouts. The system uses predefined design rules and decision-making logic to suggest room arrangements and utility connections.

User Input Collection:
Users enter parameters such as plot size, number of rooms, floor count, and functional preferences.

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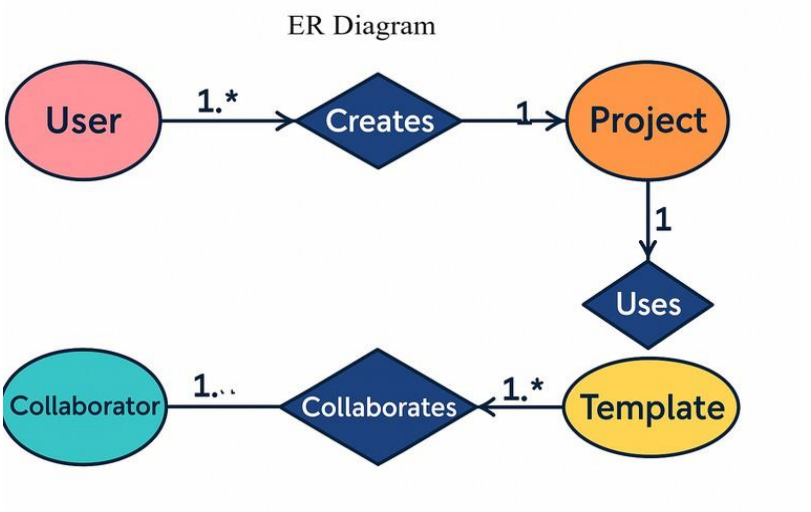
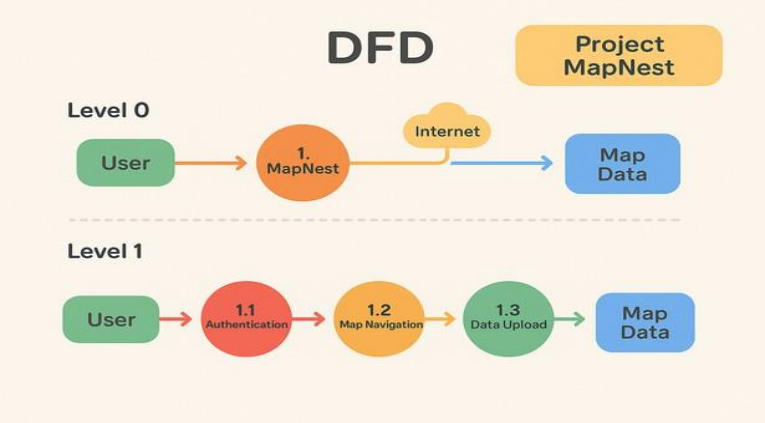
AI-Based Layout Generation:
While no complex algorithm is used, the logic simulates common architectural patterns and space optimization rules.
Utility Design Module:
Basic routing suggestions for electrical lines (main circuit and switches) and water pipelines (main line and outflows) are calculated based on room types and proximity.

ER Diagram & DFD -





VI. IMPLEMENTATION

A responsive UI allows users to input data and visualize generated maps. The system dynamically creates floor plans using grid layouts and visual cues. Sample images and suggested connection routes are displayed using basic drawing logic in JavaScript. Python handles processing logic on the server side.

VII. RESULTS AND DISCUSSION

MapNest was tested with multiple input configurations and successfully generated suitable maps for various house sizes. The results indicate time savings of up to 70% compared to manual planning. Users reported that the UI is intuitive and outputs were satisfactory for early-stage planning. Although limited in customization, MapNest fulfills the need for fast and basic home design solutions.

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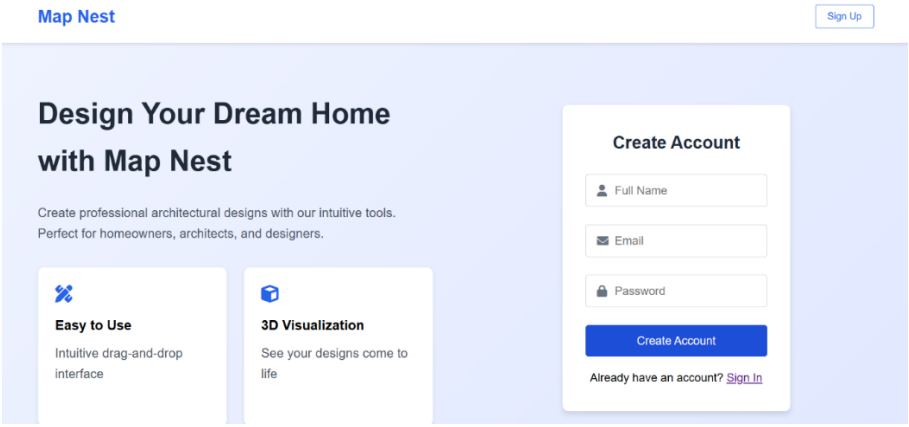

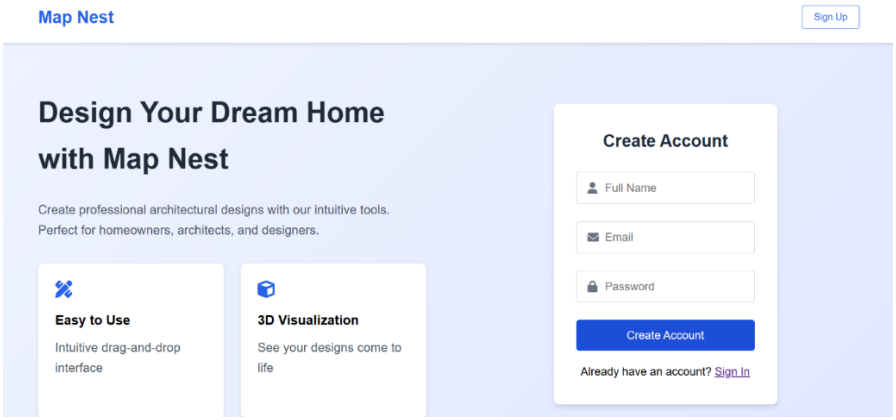

VIII. CONCLUSION

MapNest demonstrates a practical and efficient approach to automated home planning. It bridges the gap between architectural knowledge and end-user needs by offering a smart, web-based platform. It is especially useful for users in low-resource settings who require quick and easy mapping tools.

IX. FUTURE SCOPE

- Integrate advanced AI algorithms for more accurate designs.
- Add support for 3D visualization.
- Include modules for structural load calculations.
- Expand to include commercial and mixed-use building layouts.

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