A Dream Home – A House Design Provider

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Abstract: **The Core goal of the project is to provide the house designs using Artificial Intelligence and Machine Learning techniques, as well as to provide the required time and Budget to build the house. The Architectural Design, Urban Planning, and Construction Engineering Domains, even when treated separately, are extremely demanding targets for sophisticated software tools development. The proposed framework architecture is designed to support the cooperation/collaboration of software tools. The verification has shown that it may be effectively used for the impact analysis of arbitrary external (urban block specific) attributes on their internal state and the behaviour (specific for a single building).**

A. Objective

The Application of a Dream Home paradigm is dominantly focused on the internal facility parameters monitoring and control. For the subset of these internal parameters, like for example: daylight illumination; privacy; and natural ventilation, the facility (building) environment impacts analysis is unavoidable. we present the model of a smart house environment impact analysis framework suitable for Model Driven Simulations of Building (house) Attributes. The proposed framework architecture is designed to support the cooperation/collaboration of software tools. The verification has shown that it may be effectively used for the impact analysis of arbitrary external (urban block specific) attributes on their internal state and the behavior (specific for a single building).

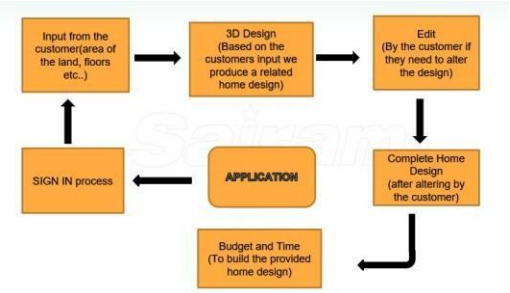
B. Motivation

Many of them are facing problems to build a perfect house with proper ventilation and with good interior and exterior designs. In order to overcome their difficulties, we use artificial intelligence techniques here. This helps them to build a Dream home with all facilities using artificial intelligence techniques. Addition to predict approximate time and budget to build their Dream home.

C. Relevance of the project

There exist many application like Sketchup, Planner 5D, Room Planner, Smart Home Designs for designing the house. But they are the platform to create a design with their own knowledge.

D. Design Methodology



E. Abridgement

Here we are going to get outline(inputs) from the user by asking some questions. Our application produce 4-5 designs based on the requirements stated by the user. If user want to do any edit in the design ,they can click the edit option can perform edit. Addition to this we provide approximate cost estimation and time period to build the provided design.

II. RELATED WORKS

[1] The use of CAD and CAM technologies enlarges the range of prospects for housing design, construction and production. It enables reduction in time, material and labour use, overall cost , construction waste and risks, and at the same time it broadens the possibility of realizing complex architectural shapes and all sorts of customization

[2] Housing price indexes system architecture is based on the Skyline platform, and utilizes the JavaScript language for secondary development. The Skyline platform provides

users with rapid access to 3D geospatial data. Skyline's open architecture and robust API offer system developers a rich set of capabilities to utilize in a wide range of applications and systems.

[3] In the modeling process, we use VRML to build the simple style, and then complex shape generated by the 3DS MAX software. After some appropriate adjustments, we can finally derive the VRML file with extension – WRL.

[4] A software tool called BH-ShaDe (Basic House Shape Design) whose main goal is to assist architecture students in the task of housing design. BHShaDe tries to go beyond traditional CAD tools in helping students design residential projects.

[5] The plan generation here produces the properties such as plane (contains both position and orientation information),dimension, and name of the rooms and regions in plan view rather than actual plan drawing. For the convenience of the user, a rectangle and the text of the name will be applied automatically to each room or region.

III. EXISTING AND PROPOSED

A. Existing system:

SketchUp is a program used for a wide range of 3D modelling projects like architectural, interior design, landscape architecture, and video game design, to name a few of its uses. The program includes drawing layout functionality, surface rendering, and supports third-party plugins from the Extension Warehouse. SketchUp is an easy, elegant 3D modelling program. Starting with basic shapes and forms, you can build anything from skyscrapers to 3D-printable product mockups. From a notion — a concept, an idea, whatever your little heart desires. Planner 5D is an easy-to-use home design software for model building that will help you correctly arrange all the elements you need for your home. Try different textures, furniture, and design ideas within one program, play with colors and floor plans – everything is possible with Planner 5D. The Planner 5D gives everybody a chance to create a professional-looking home, landscape, and office floorplans and designs. Create the space you've always dreamed about, whether you're a skilled designer or just a beginner.

B. Proposed system:

All house designing app are only used to design the house design of their own but it can be done only with the help of architect support or a person having better knowledge about the app. Here we use Random forest and k-NN algorithm to predict the house prices. Here we provide designs based on the users input. After getting the input from the user, we provide various 3D designs as possible for that area. Based on that design the user can choose any one from the provided design or if they want to edit in such design also we enabled the edit option in taskbar. So that they get best with all facilities. After that if they want to add furniture and other properties we provide a library in our app, so that they can visualize complete home solution. Then, Based upon your final chosen design we calculate and provide the approximate time and cost need to build your house. After that you can export the design as any format. Thus, Our App helps you to build your Dream Home with proper and well planned design.

K-nearest neighbour algorithm:

The k-nearest neighbour (k-NN) algorithm can be utilized in house design apps to provide recommendations and suggestions based on similar designs or user preferences. Here's how the k-NN algorithm can be applied in this context:

1. Data Collection: The house design app can gather a dataset of previously designed houses or architectural plans, including various features such as layout, room sizes, architectural styles, and materials used. Additionally, user preferences and design choices can also be collected.

2. Feature Representation: Each house design or user preference is represented as a feature vector, where each feature corresponds to a specific aspect of the design, such as the number of rooms, square footage, or architectural style. The app may also consider categorical variables, such as the desired number of floors or the presence of specific amenities.

3. Calculating Similarity: Given a new house design or user preference, the app applies the k-NN algorithm to calculate the similarity between the new input and the existing designs in the dataset. This is typically done using a

distance metric, such as Euclidean distance or cosine similarity, to measure the proximity between feature vectors.

4. Finding Nearest Neighbours: The k-NN algorithm identifies the k nearest neighbours to the new input based on their feature similarity. These neighbours are the designs or preferences that are most similar to the new input in terms of their features.

5. Recommendation or Design Exploration: Once the k nearest neighbours are identified, the app can provide recommendations to the user based on these similar designs. For example, it can suggest alternative layouts, room arrangements, or architectural styles based on what has been successful or preferred by other users. The app can also enable users to explore different design options by presenting variations of the nearest neighbours' features.

Random-forest algorithm:
The random forest algorithm can be employed in house design apps to assist with various aspects of the design process. Here's how the random forest algorithm can be utilized in this context:

1. Dataset Creation: The house design app can gather a dataset comprising information about different house designs, including features such as layout, architectural styles, materials used, energy efficiency, and other relevant attributes. This dataset serves as the training data for the random forest algorithm.

2. Feature Selection: The app identifies the most significant features that contribute to the design outcomes or user preferences. These features can include factors such as room sizes, number of floors, location, proximity to amenities, and architectural elements. Feature selection helps to focus the random forest algorithm on the most influential aspects of house design.

3. Training the Random Forest Model: The app utilizes the training dataset to train a random forest model. The random forest algorithm constructs an ensemble of decision trees, each trained on different subsets of the dataset. This ensemble approach enables the model to capture complex relationships and patterns between the features and the design outcomes.

4. Design Prediction and Recommendation: Once the random forest model is trained, it can be used to predict and recommend house designs. For example, given a set of user preferences and requirements, the app can utilize the random forest model to suggest suitable architectural styles, layouts, or materials based on the learned patterns from the training dataset. The model can also provide estimates for energy efficiency, construction costs, or other relevant design criteria.

5. Performance Evaluation and Iteration: The random forest model's performance can be evaluated using metrics such as accuracy or mean squared error. This evaluation helps assess the model's effectiveness in predicting design outcomes. If necessary, the app can iterate by fine-tuning the model parameters, adjusting feature selection, or incorporating new data to improve its predictive capabilities.

Support Vector Machine Algorithm:

Support vector machines (SVMs) are powerful yet flexible supervised machine learning algorithms which are used both for classification and regression. But generally, they are used in classification problems. In the 1960s, SVMs were first introduced but later they got refined in 1990. SVMs have their unique way of implementation as compared to other machine learning algorithms. Lately, they are extremely popular because of their ability to handle multiple continuous and categorical variables.

IV. CONCLUSION

The Existing system is used to create the design only. But we provide designs based on the users input. The inherent complexity, embedded in real world concepts, promotes modeling and simulations as the unavoidable mechanisms for the preventive evaluation of engineering achievements. The application of a Dream Home paradigm is dominantly focused on the internal facility parameters monitoring and control. For the subset of these internal parameters, like for example: daylight illumination; privacy; and natural ventilation, the facility (building) environment impacts analysis is unavoidable. In this report based on the Systemof-Systems paradigm, we have illustrated the model of a smart house environment impact analysis

framework suitable for Model Driven Simulations of Building (house) Attributes.

V. FUTURE ENHANCEMENT

The Application can further be modified to provide design for big constructions like theme Parks, Hospitals, Company buildings and etc.We try to increase the accuracy level of predicting the house prices and time to build the design, by improving the interaction of user and the architect in a better way, by providing more best designs for one area.

REFERENCE

[1] Vesna-Mila Colic-Damjanovic, Novica Jankovic, Vladimir Lojanica, Housing of the Future: Housing Design of the Fourth Industrial Revolution, Department of Hydraulic Machinery and Energy Systems University of Belgrade, Faculty of Mechanical Engineering Belgrade, Serbia(2018).

[2] Nianlong Hanl, 2,',Wei Zhang3, Kai Liangl, The Design and Implementation of Shenzhen House Price Indexes System Based on 3D-GIS, ICenter for Assessment and Development of Real Estate, Shenzhen, China Laboratory of Real Estate Policy Simulation, Shenzhen, China Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, Shenzhen, China(2018).

[3] Jixia li, Interior Design Method Based on Virtual Reality Technology, Zhengzhou University of Science and Technology henan zhen zhou(2016).

[4] Eva Millan, Mar´ıa-Victoria Belmonte, Manuela Ruiz-Montiel, Juan Gavilanes, Jos ´ e- Luis P ´ erez-de-la-Cruz,BH-ShaDe: a software tool that assists architecture students in the illstructured task of housing design(2016).

[5] Y. Meng and S.S. Wong, Implications of virtual reality technology in nutrition intervention, Faseb Journal,2014.

[6] Asier Aztiria, Aaron Crandall and Gordon Hunter, "Introduction to the thematic issue on Challenges in Engineering Intelligent Environments", Journalof Ambient Intelligence and Smart Environments, 6 (2014).

[7] P. Hamernik, P. Tanuska, and D. Mudroncik, "Classification of Functions in Smart Home", International Journal of Information and Education Technology,Vol. 2, No. 2, April 2012.

[8] Zahra Forootan Jahromi, Amir Rajabzadeh, and Ali Reza Manashty, "AMulti-Purpose Scenario-based Simulator for Smart House Environments",(IJCSIS) International Journal of Computer Science and Information Security,Vol. 9, No. 1, January 2011.

[9] Xiong Lu, Design analysis and generation of traditional dwellings — The Chinese Bamboo House, State Key Laboratory of Subtropical Building ScienceSchool of Architecture, South China University of Technology Guangzhou,China(2009).

[10] Jeff A. Estefan, ‖Survey of Model-Based Systems Engineering (MBSE)Methodologies", INCOSE MBSE Initiative, s2008.