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## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

## PROJECT PHASE II – VIVA VOCE

# 3D Scene Virtualization for Floor Planning

**PROJECT STUDENTS**

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**GUIDE**

Ms. B Bala Sai Gayathri, M.E.

# FLOW OF PRESENTATION

- Abstract
- Objective
- Literature Survey
- Inferences from Literature Survey
- Problem Description
- Proposed System
  - Overall Architecture
  - Workflow
  - Methodology / Algorithm used
- Conclusion
- References

# ABSTRACT

Using 3D virtual environments in floor planning offers major improvements over traditional 2D blueprints. By transitioning from traditional 2D blueprints to detailed 3D models, designers and architects can gain a more comprehensive and interactive understanding of spatial arrangements. The process involves turning 2D plans into 3D models through data collection, modelling, and rendering. Challenges related to software integration, data management, and user interface design are discussed, with strategies for overcoming these issues. VR then allows users to explore and modify these models in a realistic, interactive way before any physical construction begins. This makes it easier to collaborate and make decisions based on a clear view of how the design will work in real life. This approach helps people see and adjust designs before they are physically built, making the planning process more accurate and collaborative.

# OBJECTIVE

**The objective of the proposed work is to:**

- **Improved Spatial Understanding:** 3D virtual environments provide a more immersive way to visualize floor plans, allowing designers to better understand spatial relationships. This interaction helps identify design flaws early and fosters more informed decision-making.

- **Enhanced Collaboration:** VR allows multiple stakeholders to explore and modify models in real-time, promoting clearer communication and collaboration. This leads to more efficient feedback loops and faster consensus on design changes.

- **Overcoming Technical Challenges:** While integrating 3D modeling and VR can involve complex software and data management issues, solutions like cloud platforms and advanced rendering tools can streamline the process. These technologies enhance the overall workflow and improve the user experience.

# LITERATURE SURVEY

| Author & Journal name | Title | Existing techniques | Inference |
|---|---|---|---|
| Clara Garcia, Pau Mora, Mario Ortega, Eugenio Ivorra & Gaetano Valenza | Virtual Experience Toolkit: Enhancing 3D Scene Virtualization From Real Environments Through Computer Vision and Deep Learning Techniques | A novel framework called Virtual Experience Toolkit (VET) has been proposed. It employs CV and Deep Learning (DL) techniques to swiftly and seamlessly virtualize any 3D scenario from real indoor environments. | The Virtual Experience Toolkit (VET) may face drawbacks like high computational demands, potential data privacy issues, and accuracy limitations. |

# LITERATURE SURVEY

| Author & Journal name | Title | Existing techniques | Inference |
|---|---|---|---|
| Lei Li | Application of Computer 3D Technology in Graphic Design of Animation Scene | virtual reality technology, the grid node representing the depth information of the animation field is first established in space, and the animation scene is obtained according to the relationship between the feature points of the animation scene image and the 3D point cloud. | High computational and rendering costs, a steep learning curve for complex software, and potential over-reliance on technology that might stifle creativity. Additionally, achieving realistic results often requires extensive fine-tuning and skilled personnel. |

# LITERATURE SURVEY

| Author & Journal name | Title | Existing techniques | Inference |
|---|---|---|---|
| Guangwei Li | Abnormal Recognition Technology of 3D Virtual Scene Image Based on Wireless Network Sensor | Deep learning techniques were used, combined with image processing and pattern recognition methods, to achieve accurate identification of anomalies in wireless network sensor images. | Abnormal recognition technology for 3D virtual scene images using wireless sensors can suffer from inaccuracies due to sensor limitations and network interference. It also faces high data transmission demands and security challenges. |

# LITERATURE SURVEY

| Author & Journal name | Title | Existing techniques | Inference |
|---|---|---|---|
| Shanshan Zhang | Application of 3D Digital Technology in Virtual Laboratory Training | This paper uses three-dimensional visual virtual reality to realize this training environment. Based on the application of three-dimensional visual virtual reality technology. The static modeling of virtual components is carried out through 3ds Max. | It can have limitations in replicating the tactile and nuanced aspects of physical experiments. |

# LITERATURE SURVEY

| Author & Journal name | Title | Existing techniques | Inference |
|---|---|---|---|
| Yanfei Liu, Kanglin Ning | Surface Transformer for 3D Object Detection | A novel framework called Virtual Experience Toolkit (VET) has been proposed. It employs CV and Deep Learning (DL) techniques to swiftly and seamlessly virtualize any 3D scenario from real indoor environments. | Surface Transformers may struggle with handling occlusions and complex object shapes, and their performance can be sensitive to the quality of input data. |

# LITERATURE SURVEY

| Author & Journal name | Title | Existing techniques | Inference |
|---|---|---|---|
| Pau Mora, Clara Garcia, Eugenio Ivorra ,Mario Ortega & Mariano L. Alcañiz | An End-to-End Automated 3D Scene Virtualization Framework Implementing Computer Vision Techniques | virtual reality technology, the grid node representing the depth information of the animation field is first established in space, and the animation scene is obtained according to the relationship between the feature points of the animation scene image and the 3D point cloud. | An end-to-end automated 3D scene virtualization framework using computer vision techniques can have drawbacks such as high computational and memory requirements, potential inaccuracies due to data quality and algorithm limitations, and challenges with handling complex or occluded scenes. |

# LITERATURE SURVEY

| Author & Journal name | Title | Existing techniques | Inference |
|---|---|---|---|
| J. El-Chaar, C. R. Boer, P. Pedrazzol, S. Mazzola, G. Dal Maso | Interactive 3D virtual environments for industrial operation training and maintenance | This work introduces the main characteristics of the Virtual Environments in contexts of education-centred and training-centred. | Interactive 3D virtual environments can be costly and resource-intensive, and may struggle with realistic scenario replication and user proficiency. |

# LITERATURE SURVEY

| Author & Journal name | Title | Existing techniques | Inference |
|---|---|---|---|
| Herbert D. G. Maschner, Corey D. Schou, Jonnathan Holmes | Virtualization and the democratization of science: 3D technologies revolutionize museum research and access | Using 3D technologies, emerging image-based database architectures, online measurement and analysis tools, and related methods of virtualization enhance science by bringing collections to any scientist, student, educator, or layperson, anywhere in the world | Virtualization and 3D technologies in museums can face drawbacks like high implementation costs, potential loss of tactile experiences, and technical challenges in creating accurate representations. |

# LITERATURE SURVEY

| Author & Journal name | Title | Existing techniques | Inference |
|---|---|---|---|
| Yang Lei, Yan Zhang | An improved 2D-3D medical image registration algorithm based on modified mutual information and expanded Powell method | Using approximate geometric relationship and the results in the two projections are then combined and converted to a 3D rigid transformation by 2D-3D geometric transformation. | An improved 2D-3D medical image registration algorithm using modified mutual information and the expanded Powell method can face drawbacks such as high computational complexity, sensitivity to initial conditions, and potential inaccuracies in complex or noisy images. |

# LITERATURE SURVEY

| Author & Journal name | Title | Existing techniques | Inference |
|---|---|---|---|
| Tzuan-Ren Jeng, Der-Ray Huang, Kai-Che Liu, Fu-Jen Hsiao | New 3D Image Technologies Developed in Taiwan | The obtained multiview images can be transmitted through popular streaming channel to the cloud computing center that handles huge tasks of 2D/3D image processing. | New 3D image technologies developed in Taiwan may encounter drawbacks such as high development and implementation costs, limited integration with existing systems, and potential challenges in achieving global compatibility and standardization. |

# PROBLEM DESCRIPTION

3D scene virtualization for floor planning involves creating detailed, interactive 3D models of physical spaces to aid in designing and visualizing layouts. The primary challenges include:

1. **Data Accuracy**: Ensuring that the 3D models accurately reflect the dimensions and features of the physical space, which can be difficult due to measurement errors or incomplete data.
2. **Complexity of Integration**: Integrating 3D models with existing floor planning tools and software can be complex, requiring compatibility and synchronization between different systems.
3. **Rendering Performance**: High-quality, detailed 3D visualization requires significant computational resources, which can lead to slow rendering times and performance issues, especially with large or complex spaces.
4. **User Interface**: Creating an intuitive and user-friendly interface for interacting with and modifying 3D models can be challenging, especially for users with limited technical expertise.
5. **Cost and Resource Requirements**: Developing and maintaining advanced 3D virtualization tools can be expensive and resource-intensive, limiting accessibility for smaller projects or organizations.

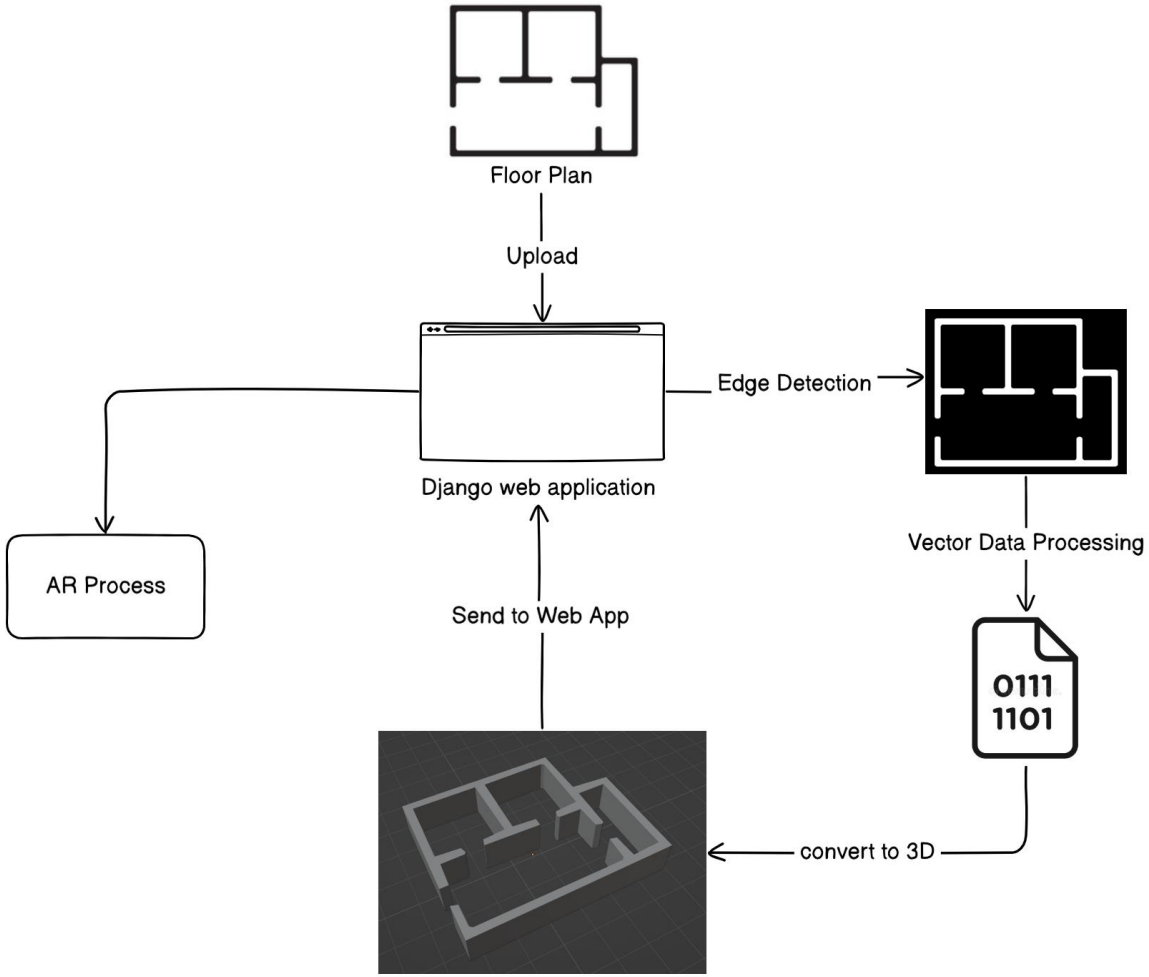
# PROPOSED SYSTEM

An augmented reality application on a smartphone to visualize a 3D house design. The floorplan image captured by the smartphone camera is designated as a marker and then sent to the server. The server-side application detects corner positions on the image using deep learning. The model is then added over the floor plan image marker.

**Advantages of Proposed System**

- Understandability
- User engagement
- Visualization
- User friendly interface
- Efficient collaboration

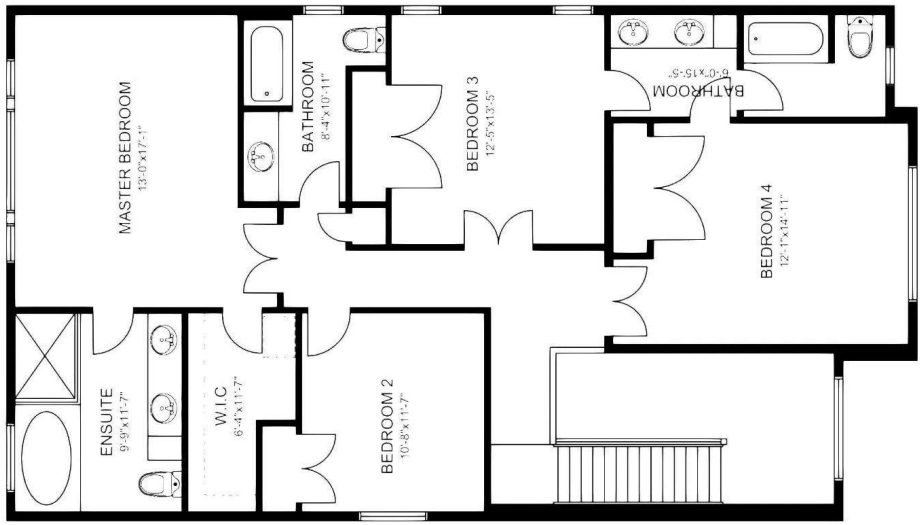
# System Architecture



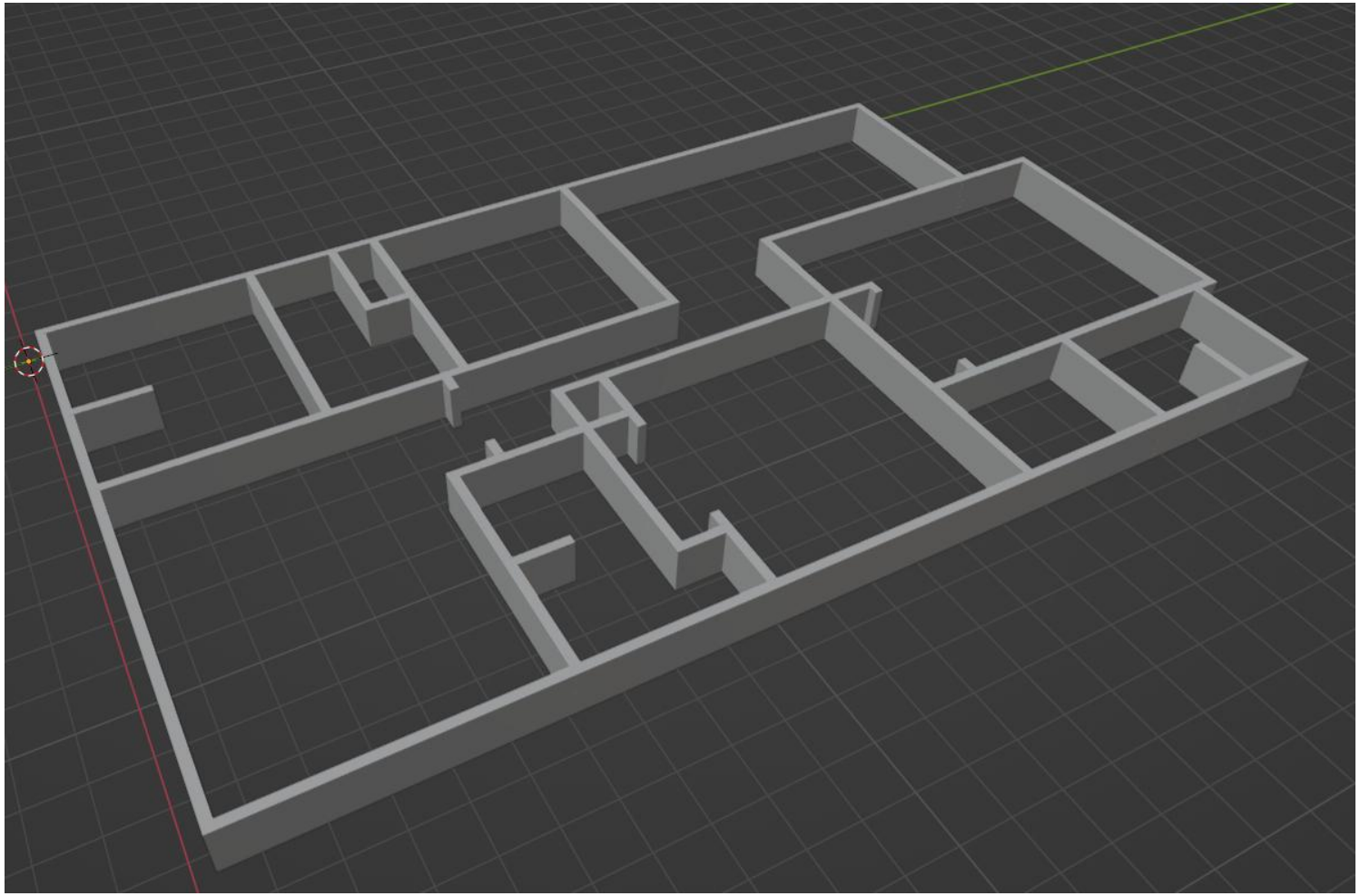
# Methodology

- **Data Collection & 3D Modeling**: Gather site data and convert 2D blueprints into detailed 3D models using CAD or BIM software.
- **Rendering & Visualization**: Enhance the 3D model with realistic textures and lighting to create an immersive visual representation of the design.
- **VR Integration & Interaction**: Export the model to a VR platform for interactive exploration, allowing real-time adjustments and collaborative feedback from stakeholders.
- **Testing & Refining**: Conduct usability tests and gather feedback to refine the model for improved user experience and design accuracy.
- **Final Review & Presentation**: Use VR for final presentations, making any last adjustments based on stakeholder input before preparing for construction.

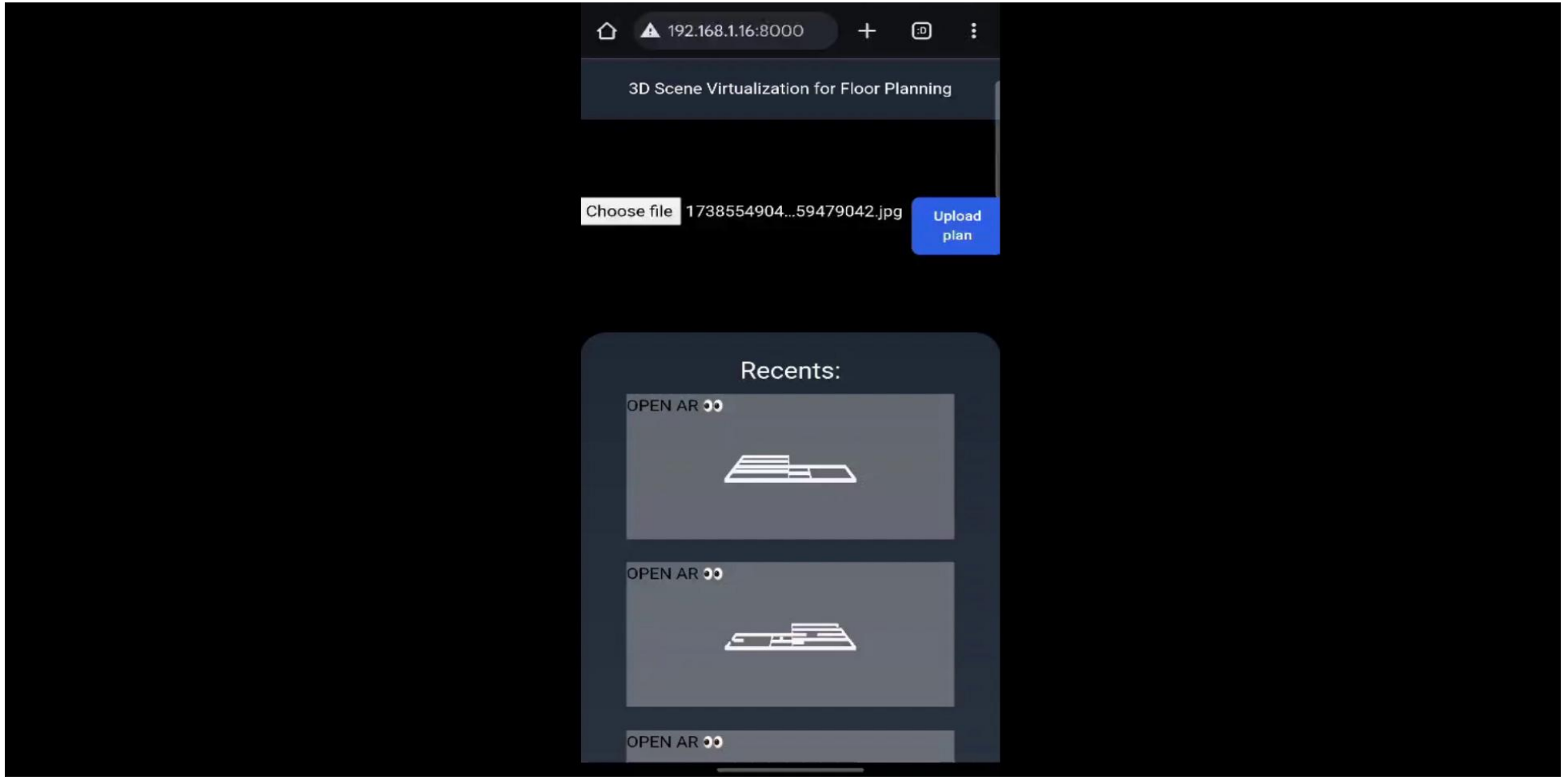
# RESULTS & DISCUSSION



# RESULTS & DISCUSSION



# Demo Video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Choose file
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Upload plan
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This is to certify that

**Gangadhara Ravi Teja**

has actively participated in the research paper presentation conducted at the 4th International Conference on Sentiment Analysis and Deep Learning (ICSADL2025), hosted by Far Western University in Bhimdatta, Nepal.

This research presentation titled

**3D Scene Augmentation for Floor Planning**

showcased commendable dedication and proficiency in the generation, analysis and presentation of the research content.

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General Chair

# Payment Proof

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| Description: | Conference Registration Fee |
| Quantity: | 1 |
| Amount in Words: | One Hundred and Sixty Dollars (US) |
| Total Amount: | 160 USD |

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# CONCLUSION

The proposed 3D scene virtualization system for floor planning offers significant advantages, including enhanced accuracy, improved performance, and seamless integration with existing tools. Its user-friendly interface and scalable, cost-effective solutions make advanced 3D modeling accessible to a broad range of users. By facilitating efficient collaboration and providing real-time visualization, the system addresses key challenges in floor planning, ultimately streamlining the design process and enhancing overall productivity.

# REFERENCES

**[1]** Clara Garcia, Pau Mora, Mario Ortega, Eugenio Ivorra & Gaetano Valenza. Virtual Experience Toolkit: Enhancing 3D Scene Virtualization From Real Environments Through Computer Vision and Deep Learning Techniques.

**[2]** Lei Li. Application of Computer 3D Technology in Graphic Design of Animation Scene.

**[3]** Guangwei Li. International Conference on Ambient Intelligence, Knowledge Informatics and Industrial Electronics.

**[4]** Shanshan Zhang. Application of 3D Digital Technology in Virtual Laboratory Training.

**[5]** Yanfei Liu, Kanglin Ning. Surface Transformer for 3D Object Detection.

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**[6]** Pau Mora, Clara Garcia, Eugenio Ivorra ,Mario Ortega & Mariano L. Alcañiz. An End-to-End Automated 3D Scene Virtualization Framework Implementing Computer Vision Techniques.

**[7]** J. El-Chaar, C. R. Boer, P. Pedrazzol, S. Mazzola, G. Dal Maso. Interactive 3D virtual environments for industrial operation training and maintenance.

**[8]** Herbert D. G. Maschner, Corey D. Schou, Jonnathan Holmes. Virtualization and the democratization of science: 3D technologies revolutionize museum research and access.

**[9]** Yang Lei, Yan Zhang. An improved 2D-3D medical image registration algorithm based on modified mutual information and expanded Powell method.

**[10]** Tzuan-Ren Jeng, Der-Ray Huang, Kai-Che Liu, Fu-Jen Hsiao. New 3D Image Technologies Developed in Taiwan.

***THANK YOU***