PROJECT REPORT SUBMITTED FOR THE COURSE AUGMENTED REALITY AND VIRTUAL REALITY

A Project Report

submitted by

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School of Computer Science and Engineering

DECLARATION

I hereby declare that the project entitled **"Revolutionizing Interior Design With Augmented Reality In Hospitals"** submitted by me to the School of Computer Science and Engineering, Vellore Institute of Technology, Vellore-14 towards the partial fulfillment of the requirements for the course CSI4005 – Augmented Reality & Virtual Reality is a record of bonafide work carried out by me under the supervision of **Dr. Durgesh Kumar.** I further declare that the work reported in this project has not been submitted and will not be submitted, either in part or in full, for any other course or purpose of this institute or of any other institute or university.

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CERTIFICATE

The project report entitled "**Revolutionizing Interior Design With Augmented Reality In Hospitals**" is prepared and submitted by **, Mirudhulaa M (21MIC0011), Surya R (21MIC0064), Janani N (21MIC0076), Bavadharani S (21MIC0095), Monisha A (21MIC0175) and Karthik K (21MIC0179),** has been found satisfactory in terms of scope, quality and presentation as partial fulfillment of the course CSI4005 – Augmented Reality & Virtual Reality in Vellore Institute of Technology, Vellore-14, India.

Guide

Dr. Durgesh Kumar

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Finally, I would like to thank **Vellore Institute of Technology**, for providing me with a flexible choice and execution of the project and for supporting my research and execution related to the project.

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LIST OF ABBREVIATIONS

ABBREVIATION	EXPANSION
AR	Augmented Reality
VR	Virtual Reality
UI	User Interface
APK	Android Package Kit
IDE	Integrated Development Environment
SDK	Software Development Kit
SLAM	Simultaneous Localization and Mapping
3D	Three Dimensional
CPU	Central Processing Unit

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GitHub Link:

https://github.com/Surya3117/Hospital-Interior-Design-Using-AR

ABSTRACT

The suggested application truly transforms the interior design and mechanics of hospital spaces by using both Augmented Reality (AR) and simple computer graphics to enhance the furnishing and equipment selection process. Users start by using the cameras on their mobile devices to view a 3D shape of either a piece of furniture or a certain medical equipment model within the hospital. The application discovers vertical and horizontal planes in real time ensuring that a virtual piece is placed accurately. Accordingly, users can define the size, fit, and aesthetic of the items before making a purchase.

This application allows individuals to circumvent the moment or effort to physically move and test items, thus saving valuable time, effort, and money and allowing decision-makers to make a more informed decision. Users have an actual, interactive overview of how several different items will present themselves in its allocated space. This application allows a more fluid and efficient planning and design process, while regrettably allowing for fewer outright "errors" and superior use of space.

The application is couple of smart user interface methods combining AR with functional computer graphics techniques that make it easier to perform the complex task of interior design in a hospital setting. A relevant aspect of the application capabilities is to more sustainably prevent inappropriate purchases from which the entire processes falls short and creates unnecessary waste. Overall, this project encapsulates how immersive technology is capable of addressing problems experienced in real life and mitigating the problem of education and organizational transformation within healthcare settings.

Keywords: Augmented Reality (AR), 3D Visualization, Hospital Interior Design, Furniture Placement, Computer Graphics, Plane Detection, AR in Healthcare, Mobile AR Application, Virtual Furniture Preview, Real-time Environment Mapping, Hospital Equipment Simulation, Interactive Design Tool, Space Planning, AR-Based Decision Making, Digital Twin for Interior Design

CHAPTER 1

INTRODUCTION

Today's healthcare environments are evolving at a rapid rate, with more importance being placed on space planning, patient comfort, and technology incorporation. Interior design is one of the most significant components of the hospital planning process that addresses the positioning and placement of medical equipment and infrastructure, among others. This process has, up until now, relied heavily on floor plans and conventional design methods with no interactivity or visualization in the physical world.

To combat this shortcoming, the project suggests creating an Augmented Reality (AR)-enabled mobile application, which visualizes hospital interiors and medical devices in the real world through 3D modeling. The application allows healthcare experts, planners, and architects to model the interiors through their Android smartphones. It is developed using Unity and AR Foundation-optimized for portrait mode rendering for an enjoyable AR experience. The finished output is then exported as an APK file that can be run on Android devices that support ARCore.

Users have the option to select from different hospital equipment (e.g., hospital bed, IV stand, monitor) and use AR to place them on familiar surfaces in their real world. The app attempts to bridge the gap between non-interactive design ideas and dynamic planning such that the design outcome is improved in a healthcare-oriented vision.

1.1 THEORETICAL BACKGROUND

AR is a technology that projects digital content over the real world to augment how a user views the environment. In contrast to Virtual Reality (VR) which creates an entirely different world, AR overlays a digital world - such as pictures, animations, and 3D models - onto the current view of the real world by using the data retrieved from a device's camera and sensors. This implies that with AR, the users can interact with virtual objects as their actual environment envelops them.

In the recent years, AR has become prominence in several areas such as education, gaming, architecture, and healthcare. By interior design utilizing AR, its greatest advantage a user gets is seeing how a thing will look and how it will fit within an actual place prior to initiating any physical changes, thereby enhancing decision-making, minimizing planning faults, and permitting a more liberal and imaginative style of design.

In constructing the AR app, this project employs Unity, a popular real-time development platform of AR. It facilitates sophisticated 3D rendering, and an integrated development environment (IDE) is provided to build interactive experiences. The complete AR experience is driven by AR Foundation, the Unity framework for developing once and deploying to many AR platforms. Specifically, the app targets Google ARCore, the SDK for enabling AR functionality on Android devices. With major features such as motion tracking, plane detection, and environmental understanding, ARCore places the virtual hospital equipment safely within the user's space.

Realistic 3D models of the hospital equipment like beds, stretchers, and monitors are sourced from online stores like Sketchfab and TurboSquid. These models were further optimized and compiled into a single Unity project. The whole app is only used in portrait mode, ensuring stability and ease of use with AR rendering held at a constant rate. The moment users install the APK on a supported compatible Android device, users will be in a position to see and engage with hospital equipment in their real environment; hence it will be an almost accessible resource for hospital planning and design.

1.2 MOTIVATION

The development of this Augmented Reality (AR) hospital interior design application is driven by the limitations of the traditional methods of planning and visualizing hospital spaces. Generally, hospital interior designs are 2D blueprints, static 3D renderings, and manual prototypes, which lack interactivity and real-time decision-making; the requirements for effective space planning methods are not met here. These methods can be very time consuming and expensive and may not accurately replicate how the space will function in the real world.
Installation, operational cost, and placing the medical apparatus, as defined above, are very vital to patient care and safety, as well as operational efficiency within any healthcare system. Equipment such as hospital beds, injection stands, and monitors must be arranged according to the floor without having a facility directly to engage the actions of the layout. This limitation of traditional planning tools provides a chance for the incorporation of Augmented Reality to close the gap between design and physical implementation.

The application will offer an interactive AR tool through which users can experience real-world contexts for hospital equipment. Through this AR approach, healthcare professionals, architects, and hospital administrators will be able to make better-informed decisions regarding interior arrangements while optimizing space and workflow and avoiding costly errors in the design process.

Additionally, the application will allow real-time generating virtual objects for placement changes. A flexible and dynamic solution to happen in several planning scenarios. The bottom line is to make the most affordable case, simple design enhancement, better space use, and contribution towards the safe, efficient environment in health care.

1.3 OBJECTIVES(S) OF THE PROPOSED WORK

This project seeks the foremost aim of instituting an Augmented Reality (AR) application which will assist an individual in visualizing the interiors of a hospital given an interaction with 3D models of hospital equipment. Additionally, this application allows users to position hospital equipment-simulated, such as a bed, monitor, IV stand, or other hospital equipment-in real-world environments using a smartphone, giving an experience which is dynamic and quite immersive during designing.

The specific objectives of this work are:

Create a mobile application that will use Augmented Reality for placing artificial hospital equipment in the real environments. This app was developed particularly for mobile devices that run Android with support for ARCore.

Integrate the 3D models of hospital equipment using Unity and then render them in real-time to provide a very realistic representation of the hospital interiors.

Design a friendly user interface that allows the users to select and position the hospital any equipment to be incorporated in the design of their environments, effectively facilitating interior planning.

Set it to run in portrait mode for a steady and consistent AR experience while doing the work.

Optimize the 3D models gotten from online sites like Sketchfab and Turbo Squid to be fully compatible with the Unity environment for seamless rendering.

To increase design flexibility allowing users to interact virtually with equipment, alter layouts, and visualize various possible hospital arrangements before any physical changes are made.

Consequently, the project aims to be cost-effective by providing a practical solution to healthcare professionals, designers, and architects that reinvents hospital space planning to ensure efficiency, interactivity, and accuracy.

CHAPTER 2
LITERATURE SURVEY

1. The Therapeutic Impacts of Environmental Design Interventions on Wellness in Clinical Settings

[1] This paper investigates how hospital design influences patient and staff wellness, focusing on physical and mental healthcare environments. A literature review across multiple databases identifies key environmental factors that contribute to stress reduction and improved patient outcomes. Findings suggest that natural light, soothing music, artistic elements, and nature views create a healing environment, reducing pain, anxiety, and stress. The study emphasizes the importance of Evidence-Based Design (EBD) in integrating psychological, cultural, and spatial considerations into hospital architecture. It concludes that hospital environments must be carefully designed to enhance patient recovery, staff efficiency, and overall healthcare quality.

2. The Impact of Design Factors on User Behavior in a Virtual Hospital Room to Explore Fall Prevention Strategies

[2] This paper examines how hospital room layout affects fall prevention by using Augmented Reality (AR) to simulate different designs. Ten participants explored virtual hospital rooms with varying door types, bathroom placements, and IV poles while AR trackers recorded their movement patterns. Results show that door type and medical equipment placement significantly influence patient movement, increasing the likelihood of sideways and backward motion, which can lead to falls. The study concludes that AR offers a cost-effective method for testing and optimizing hospital room designs to improve patient safety and reduce fall risks before physical implementation.

3. Interior Design in Behavioral Healthcare Facilities: Impact on Patient Well-being

[3] This paper explores how interior design elements influence the well-being of patients in behavioral healthcare facilities. Through interviews with caregivers, healthcare designers, and a literature review, the study finds that patients' sense of control over their environment plays a crucial role in their mental health. Design features such as natural elements, flexible room configurations, and access to outdoor spaces improve mood and reduce stress. However, many state-funded behavioral healthcare facilities lack the resources to implement these design changes. The study concludes that enhancing hospital interiors with thoughtful, patient-centered design strategies can significantly improve recovery rates and overall treatment outcomes.

4. Optimizing Hospital Room Layout to Reduce the Risk of Patient Falls

[4]This paper uses computational optimization techniques to develop safer hospital room layouts. The study introduces a gradient-free constrained optimization problem to generate room configurations that minimize patient fall risks. By applying a simulated annealing algorithm, the researchers optimized the placement of furniture, lighting, medical equipment, and doors. Results indicate that optimized layouts reduced fall risks by 18% compared to traditional designs and 41% compared to randomly 8 generated layouts. The study highlights the importance of strategically arranging hospital interiors to create clear pathways, reduce hazards, and enhance accessibility, concluding that computational design tools can significantly improve patient safety in hospital settings.

5. Comparative Analysis of Restorative Interior Design Elements: Screen-Based vs. Virtual Reality Evaluations

[5] This paper compares how screen-based and Augment Reality (AR) evaluations assess restorative hospital environments. Thirty-five participants evaluated 16 virtual hospital rooms featuring different window sizes, view types, material choices, and ceiling designs. Findings reveal that VR-based assessments resulted in higher restorativeness scores than traditional screen-based evaluations, indicating that immersive environments provide more accurate insights into patient preferences. Large windows, natural materials, and views of water or wooded areas were rated as most restorative, while vaulted ceilings were perceived as more calming than flat ceilings. The study concludes that AR is a valuable tool for designing and assessing hospital interiors to enhance patient well-being.

6. Interactive Interior Design using Augmented Reality and 3D Modeling

[6] This paper explores the integration of Augmented Reality (AR) in interior design, enhancing visualization and user experience. AR enables designers to project furniture, finishes, and spatial arrangements directly into a client's real-world environment, providing an immersive preview of design concepts. This fosters improved collaboration, allowing clients to actively engage in the design process, visualize changes, and make informed decisions. Designers can efficiently explore multiple configurations, optimizing resources and aligning designs with client preferences. The study highlights AR's transformative role in interior design, particularly through Vuforia Engine's Visual-Inertial Simultaneous Localization and Mapping (VISLAM) system, which enhances spatial awareness by estimating distances in real time. The findings emphasize AR's potential to reshape the design industry by streamlining workflows and enhancing personalization.

7. Enhancing the System Model for Home Interior Design using Augmented Reality

[7] This paper proposes an advanced AR-based system model that allows users to virtually place and assess interior items within their homes, mitigating mismatches between showroom selections and real-world spaces. The system employs marker-less AR combined with Simultaneous Localization and Mapping (SLAM), dynamically updating 3D feature points to minimize occlusion when multiple objects are placed. Dimension scanning ensures accurate

scaling, while touch gesture recognition facilitates transformations. Performance evaluations indicate a 43% improvement in response time due to SLAM integration. The study concludes that the proposed mobile application meets ITU-T Study Group 16's standards for virtual and augmented reality services, making home interior design more interactive, efficient, and user-friendly.

8. AR Interior Designer: Automatic Furniture Arrangement using Spatial and Functional Relationships

[8] This paper addresses challenges in furniture selection and arrangement, especially in compact urban spaces. The study introduces an AR-based tool that allows furniture resellers to provide virtual 3D models of their products, enabling users to visualize furniture in their home environment. A depth camera measures available space, detecting obstacles to determine suitable placements. The system also recommends optimal furniture arrangements by analyzing spatial and functional relationships. By eliminating manual measurements and providing real-time visualization, the tool significantly enhances the efficiency and accuracy of interior design, making it easier for users to furnish their homes with appropriately sized and well-arranged furniture.

9. Economical VR/AR Method for Interior Design Programme

[9] This paper investigates the integration of Virtual Reality (VR) and AR into interior design education at Sharjah University's College of Fine Arts and Design (CFAD). While traditional visualization techniques such as sketches, CAD, and 3D renderings are widely used, the study suggests that VR/AR can offer enhanced interactive experiences. Research findings indicate high student enthusiasm for VR/AR in interior design education, with many expressing interest in incorporating these technologies into the curriculum. The study outlines a cost-effective approach to integrating interior design scenes into VR/AR applications using smartphones and headsets, ultimately improving learning experiences and professional skills for design students.

10. AR Furniture: Integrating Augmented Reality Technology to Enhance Interior Design using Marker and Markerless tracking

[10] The paper "AR Furniture" explores an Android application utilizing Augmented Reality (AR) for interior design, enabling users to visualize furniture in their spaces before purchasing. It employs both marker-based tracking for displaying product details and markerless tracking for placing 3D models in real-world settings. Developed with Unity3D, Kudan AR SDK, and Autodesk 3ds Max, the app was tested for tracking efficiency, lighting conditions, and user satisfaction. Results indicate effective tracking under optimal conditions but suggest improvements in marker patterns, wall detection, and light robustness. User satisfaction averaged 3.93/5, with strengths in visualization and weaknesses in error recovery.

2.1 PROPOSED SYSTEM

The proposed system is an Augmented Reality for hospital interior planning. This application helps the user envision the placement and visualization of three-dimensional models of hospital equipment, such as beds, stretchers, and medical devices in the real world using ARCore-supported Android devices. The system's developed ability to detect physical surfaces allows the user to accurately position, scale, and rotate virtual objects for planning purposes. Users can engage interactively in the equipment arrangement process, ensuring efficient space utilization before physical setup. By reducing planning mistakes, saving time, and making the setup of room designs flexible without the need for expensive physical rearrangement, this proves advantageous. The system spans across all relevant hospital spaces and further ensures immersive-at-real time decision-making in the hospital system.

2.2 BENEFITS OF PROPOSED SYSTEM

1. Real-time Visualization - Users are able to view hospitals equipment almost as if floating in actual space, making it easy for them to understand their proper fit in the environment before placing it physically.

2. Accurate Space Planning-Guarantees the correctness of place, scale, and arrangement of hospital equipment to minimize errors in arrangement.

3. Cost and Time Efficiency-Reduces the physical test and repetition, saving setup time and costs.

4. Flexibility and Customization-Users can rearrange, swap, or add new 3D equipment models as per the new requirements of the room.

5. Improved Decision-Making-Interactive and visual correlate the healthcare staff with designers, so that they make faster and better-informed choices.

6. Enhanced User Experience-Easy-to-use AR interface offers intuitive drag, drop and rotate mechanisms for use by non-technical users.

CHAPTER 3
SYSTEM REQUIREMENTS

3.1 HARDWARE REQUIREMENTS

Smartphones with ARCore Support:

Android 7.x (Nougat) or later OS running with ARCore compatibility.

A minimum of 4 GB RAM, 64-bit CPU, octa-core CPU, and a camera that can record high-definition video.

Motion sensors include the accelerometer and the gyroscope.

3D Models:

3D models must be optimized for hospital equipment available on the sources from a marketplace, e.g., Sketchfab and TurboSquid.

Testing Environment:

Devices having enough memory space for APK installation and AR functionality testing.

3.2 SOFTWARE REQUIREMENTS

Unity: For 3D rendering, AR, and AR exploration, software versions 2020 and above.

AR Foundation: For developing AR applications on multiple platforms, incorporating ARCore and ARKit.

ARCore SDK: This SDK includes features for motion tracking, plane detection, and understanding the environment for AR enabling.

3D Modeling Software: Blender/Maya for the pre-import tweaking and optimization of the models.

C#: It is required for producing C# scripts inside Unity to enact interactions within the AR scene.

3.1.1 Functional Requirements

The system should allow users to:

Place models of the hospital equipment in real-life environment with AR.

Interact with them and change their positioning in real-time.

Real-time rendering wide measurements are highly important.

3.1.2 Non-Functional Requirements

Performance: The app should run without high-latency lags, especially during real-time AR rendering.

Compatibility: The app's compatibility must be wide with Android devices that are certified for ARCore.

User Interface: User interface should be simple, intuitive, and responsive.

Security: The app should justify that no sensitive user data is compromised. Efforts must be made to request only the requisite permissions.

CHAPTER 4

SYSTEM ARCHITECTURE

4.1 SYSTEM ARCHITECTURE

The system architecture for the hospital interior design AR application consists of several components and layers that work together to create an interactive and responsive experience for the user. The system has a mobile AR device made using an Android framework that is compatible with ARCore to access the above-mentioned basic augmented reality (AR) functions related to motion tracking, plane detection, and environmental understanding. The core of the system uses ARCore to enhance real-world augmentation so that virtual objects can be properly placed onto real-world surfaces during AR, saving real-estate and providing options to the User in the AR content that would typically be physically prototyped. The Unity plugin, AR Foundation, serves as an interface to connect Unity and ARCore and, takes care of using either ARCore or ARKit for AR functionalities; AR Foundation was adopted as it allows cross-platform, AR deployment in Unity.

Unity is the selected development environment for accessing and managing 3D models and user interaction options. The hospital equipment 3D models such as beds, IV stands and digital monitors have been imported directly to Unity and render effectively to suit use on mobile devices. Any object manipulation through Augmented Reality (AR) would be coordinated through a custom C# script that achieve features for 2D (image) object selection; 3D object placement; and 3D object transformation, which included, scaling and rotation. The interface has been designed for users to manipulate models through commonplace gestures. Ultimately, the layering of "hardware" and "software" capabilities enable Users to visualize space and interact with the room layouts in real-time, improving the overall planning effectiveness and decreasing the associated costs by eliminating unnecessary physical prototypes.

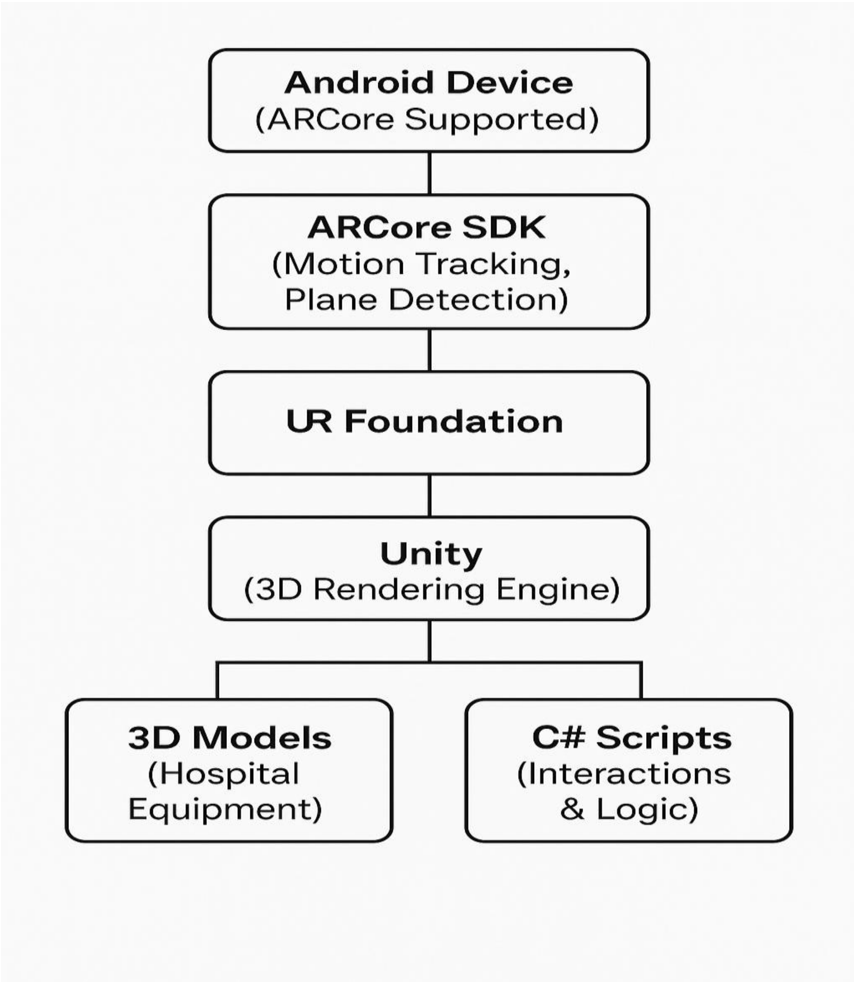


Fig. No. 01 System Architecture

4.2 DETAILED DESIGN

The concept design for the AR-based hospital equipment placement system emphasizes instinctive interaction, rendering accuracy, and real-time response time. First, when the user opens the application on an ARCore-compatible Android smartphone, the camera opens and scans the environment for horizontal planes through ARCore's motion tracking and surface detection. From the interface, the user is presented with a menu of 3D hospital equipment models (for instance: beds, monitors, stretchers). As the user selects an item, the corresponding 3D model spawns, and is anchored to a detected surface in the user's immediate environment. At this stage, the user can use touch gestures to interact with the virtual models: drag it to move, pinch to scale, or rotate it to orient it. All these was handled via C# scripts in Unity and updated on the 3D model in real-time. Unity controlled the rendering pipeline for the equipment render models in the correct shading and scale to the spatial context determined by the device. The AR Foundation managed the synchronization of ARCore to Unity, and the overall performance of the AR application. The final design supported portrait orientation, to offer the best usability while enabling user comfort during longer use within the application. This system could help users simulate and evaluate multiple layout configurations, before any physical adjustments are made, leading to informed decision-making.

CHAPTER 5

SYSTEM IMPLEMENTATION

5.1 MODULE DESCRIPTION

The suggested application consists of many modules that communicate with one another, and this allows the different modules to operate smoothly and thus provide a satisfying user experience. The four major functional modules of the application include the Augmented Reality Visualization Module, the Model Selection Module, the Environment Detection Module, and the User Interaction Module. The Augmented Reality Visualization Module allows users to see real-time placement of 3D models in the physical environment by using as camera on the device. The Model Selection Module, enables users to browse and select, and then customize a model of 3D furniture or equipment from a set library. The Environment Detection Module enables the identification of valid surfaces, such as floors and walls, using plane-detection algorithms, to accurately place elements in AR. The User Interaction Module dictates user interactions including gestures for zoom, rotation and drag, allowing users to interact with virtual objects in a natural manner. Every module has been optimized for performance and accuracy to better support decision-making processes of a hospital design and construction.

5.2 UI DESIGN AND INTERACTION COMPONENTS

The user interface (UI) is designed for simplicity and usefullness in its functioning. The home screen provides easy access to the model categories, recent and the start AR button. The AR view has an intuitive interface that allows you to place, scale and rotate the objects as you wish. The UI has clear icons and touch allows intuitive operation, feedback is instant and the interface is built for good usability. The UI allows drag-and-drop placement, swapping one model for another and a snapshot feature that saves/display your models for later review.

CHAPTER 6
CODE AND OUTPUT

6.1 CODE

Scripts for android application

DataHandler.cs

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class DataHandler : MonoBehaviour
{
    private GameObject furniture;

    [SerializeField] private ButtonManager buttonPrefab;
    [SerializeField] private GameObject buttonContainer;
    [SerializeField] private List<Item> items;
    // [SerializeField] private String label;



    private int currrent_id = 0;


    private static DataHandler instance;
    public static DataHandler Instance
    {
        get
        {
            if(instance==null)
            {
                instance = FindObjectOfType<DataHandler>();
            }
            return instance;
        }
    }

    private void Start() {
        // items = new List<Item>();
        LoadItems();
        // await Get(label);
        CreateButtons();
    }
```

```
    void LoadItems()
    {
        var item_obj = Resources.LoadAll("Items",typeof(Item));
        foreach (var item in item_obj)
        {
            items.Add(item as Item);
        }
    }

    void CreateButtons()
    {
        foreach (Item i in items)
        {
            ButtonManager b = Instantiate(buttonPrefab,buttonContainer.transform);
            b.ItemId = currrent_id;
            b.ButtonTexture = i.itemImage;
            currrent_id++;
        }
    }

    public void SetFurniture(int id)
    {
        furniture = items[id].itemPrefab;
    }

    public GameObject GetFurniture()
    {
        return furniture;
    }

    // public async Task Get(String label)
    // {
    //     var locations = await Addressables.LoadResourceLocationsAsync(label).Task;
    //     foreach (var location in locations)
    //     {
    //         var obj = await Addressables.LoadAssetAsync<Item>(location).Task;
    //         items.Add(obj);
    //     }
    // }

}
```

InputManager.cs

```
using System.Collections;
```

```
using System.Collections.Generic;
using UnityEngine;
using UnityEngine.XR.ARFoundation;
using UnityEngine.EventSystems;
using UnityEngine.SceneManagement;

public class InputManager : MonoBehaviour
{
  // [SerializeField] private GameObject arObj;

   [SerializeField] private Camera arCam;
   [SerializeField] private ARRaycastManager _raycastManager;
   [SerializeField] private GameObject crosshair;
   private List<ARRaycastHit> _hits = new List<ARRaycastHit>();

   private Touch touch;
   private Pose pose;
   // Start is called before the first frame update
   void Start()
   {

   }

   // Update is called once per frame
   void Update()
   {
      CrosshairCalculation();
      touch = Input.GetTouch(0);
      if(Input.touchCount<0 || touch.phase!=TouchPhase.Began)
      {
         return;
      }
      if(IsPointerOverUI(touch)) return;


      // Ray ray = arCam.ScreenPointToRay(touch.position);
      // if(_raycastManager.Raycast(ray,_hits))
      // {
      //     Pose pose = _hits[0].pose;
      //     Instantiate(DataHandler.Instance.furniture,pose.position, pose.rotation);
      // }
      Instantiate(DataHandler.Instance.GetFurniture(),pose.position, pose.rotation);

   }

   bool IsPointerOverUI(Touch touch)
```

```
    {
        PointerEventData eventData = new PointerEventData(EventSystem.current);
        eventData.position = new Vector2(touch.position.x, touch.position.y);
        List<RaycastResult> results = new List<RaycastResult>();
        EventSystem.current.RaycastAll(eventData,results);
        return results.Count>0;
    }

    void CrosshairCalculation()
    {
        Vector3 origin = arCam.ViewportToScreenPoint(new Vector3(0.5f,0.5f,0));
        Ray ray = arCam.ScreenPointToRay(origin);
        if(_raycastManager.Raycast(ray,_hits))
        {
            pose = _hits[0].pose;
            crosshair.transform.position = pose.position;
            crosshair.transform.eulerAngles = new Vector3(90,0,0);
        }
    }

    public void HomeSceneloader()
    {
        SceneManager.LoadScene(0);
    }

    public void Scene1loader()
    {
        SceneManager.LoadScene(1);
    }

    public void Scene2loader()
    {
        SceneManager.LoadScene(2);
    }
    public void Close_Instructions()
    {
        GameObject.Find("Instruction_Panel").SetActive(false);

    }
}
```

PlaneDetectionController.cs

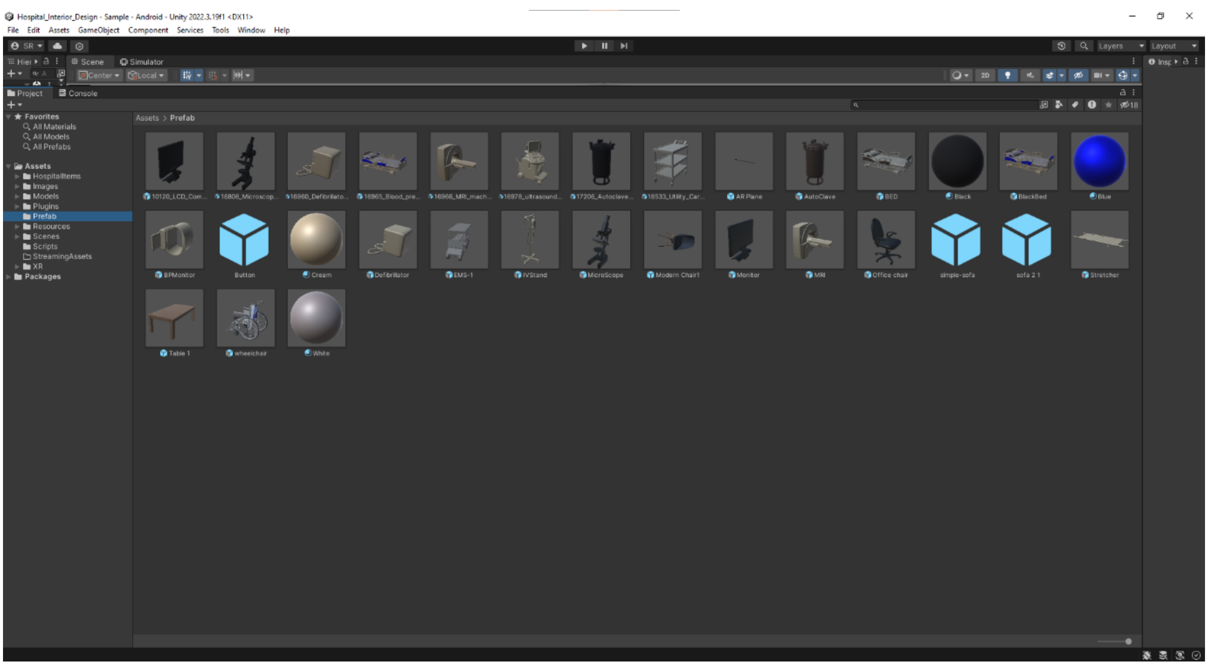
```
using System.Collections.Generic;
using UnityEngine;
using UnityEngine.UI;
using UnityEngine.XR.ARFoundation;
```

```
namespace UnityEngine.XR.ARFoundation.Samples
{
    /// <summary>
    /// This example demonstrates how to toggle plane detection,
    /// and also hide or show the existing planes.
    /// </summary>
    [RequireComponent(typeof(ARPlaneManager))]
    public class PlaneDetectionController : MonoBehaviour
    {
        [Tooltip("The UI Text element used to display plane detection messages.")]
        [SerializeField]
        Text m_TogglePlaneDetectionText;

        /// <summary>
        /// The UI Text element used to display plane detection messages.
        /// </summary>
        public Text togglePlaneDetectionText
        {
            get { return m_TogglePlaneDetectionText; }
            set { m_TogglePlaneDetectionText = value; }
        }

        /// <summary>
        /// Toggles plane detection and the visualization of the planes.
        /// </summary>
        public void TogglePlaneDetection()
        {
            m_ARPlaneManager.enabled = !m_ARPlaneManager.enabled;

            string planeDetectionMessage = "";
            if (m_ARPlaneManager.enabled)
            {
                planeDetectionMessage = "Disable Plane Detection and Hide Existing";
                SetAllPlanesActive(true);
            }
            else
            {
                planeDetectionMessage = "Enable Plane Detection and Show Existing";
                SetAllPlanesActive(false);
            }

            if (togglePlaneDetectionText != null)
                togglePlaneDetectionText.text = planeDetectionMessage;
        }
```

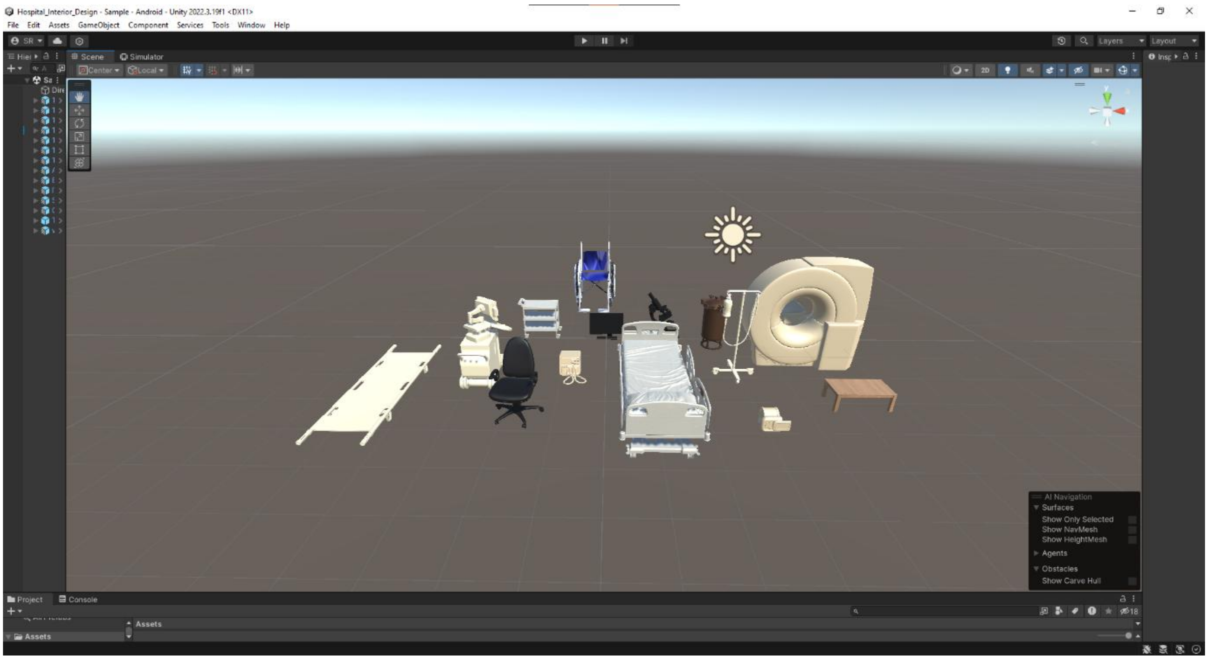
```
        /// <summary>
        /// Iterates over all the existing planes and activates
        /// or deactivates their <c>GameObject</c>s'.
        /// </summary>
        /// <param name="value">Each planes' GameObject is SetActive with this
value.</param>
        void SetAllPlanesActive(bool value)
        {
            foreach (var plane in m_ARPlaneManager.trackables)
                plane.gameObject.SetActive(value);
        }

        void Awake()
        {
            m_ARPlaneManager = GetComponent<ARPlaneManager>();
        }

        ARPlaneManager m_ARPlaneManager;
    }
}
```

6.2 OUTPUT SCREENSHOTS

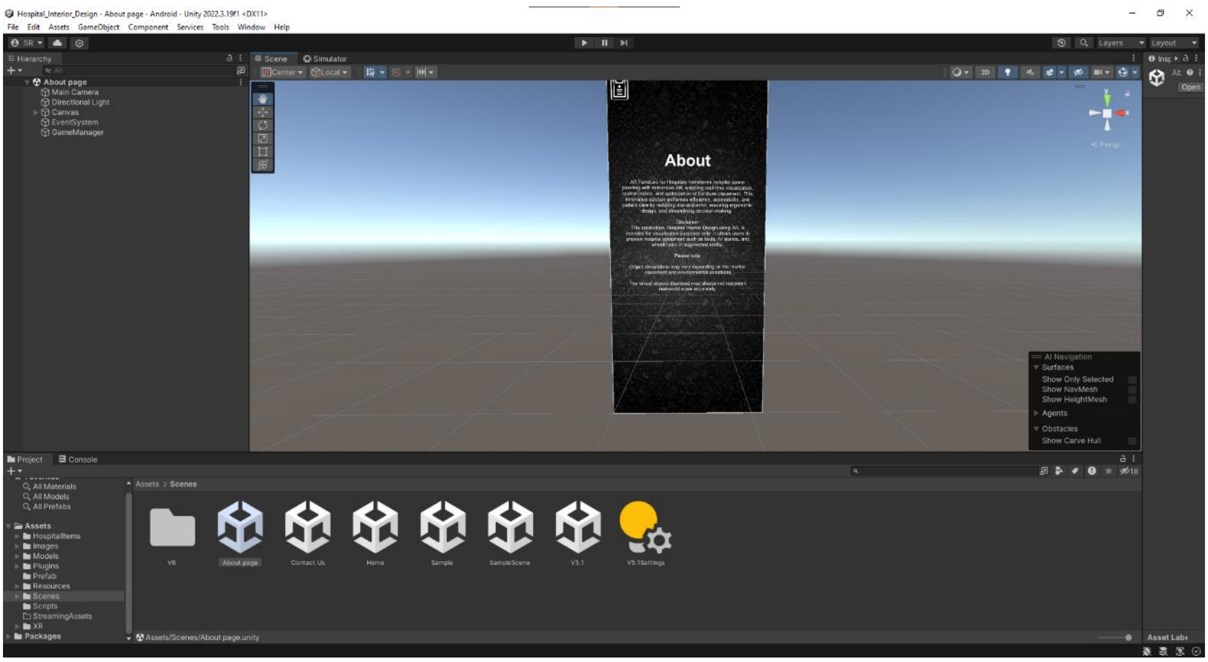
Available Items



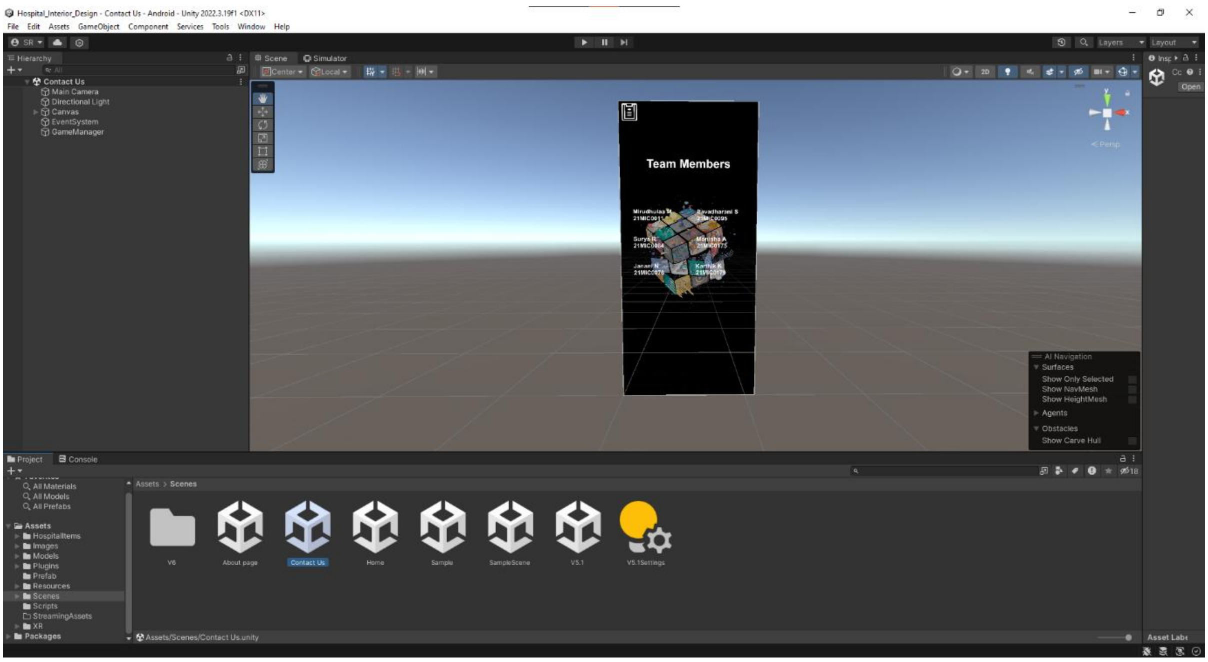
Sample of all objects

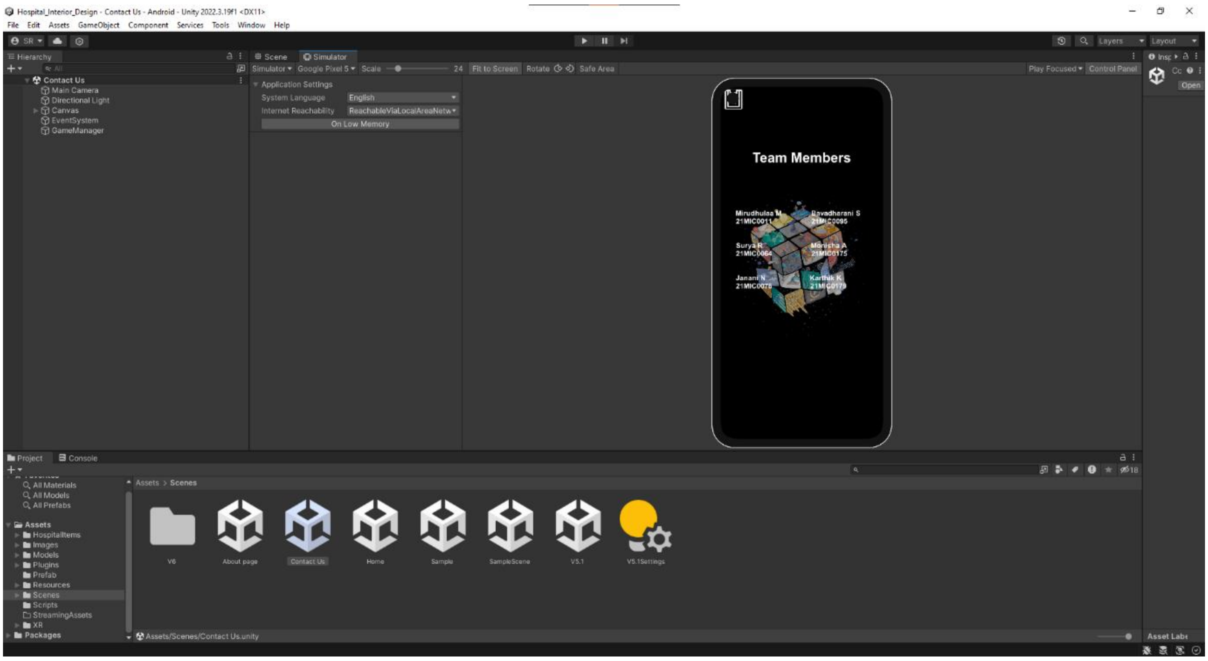


Designed About page

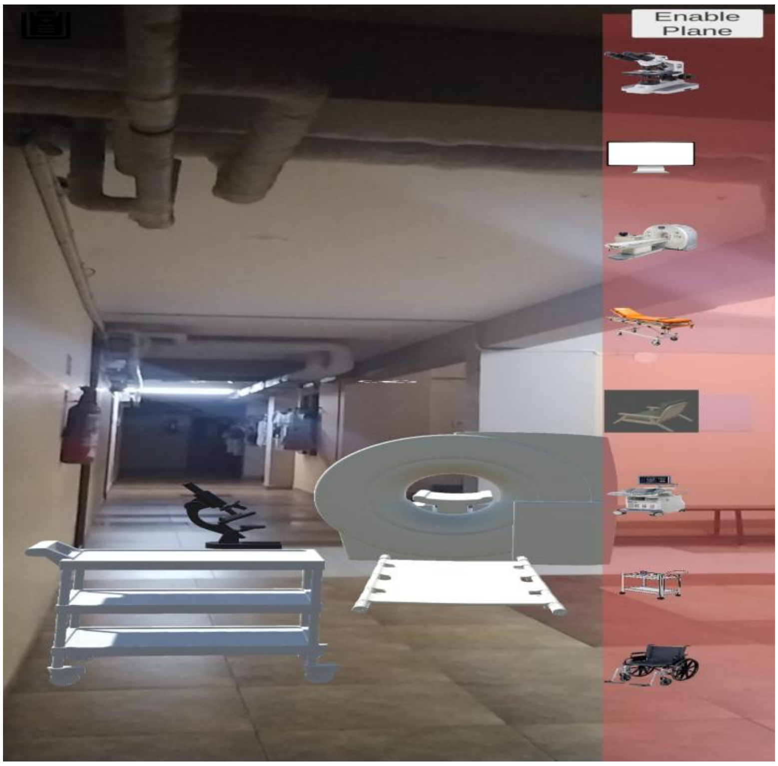


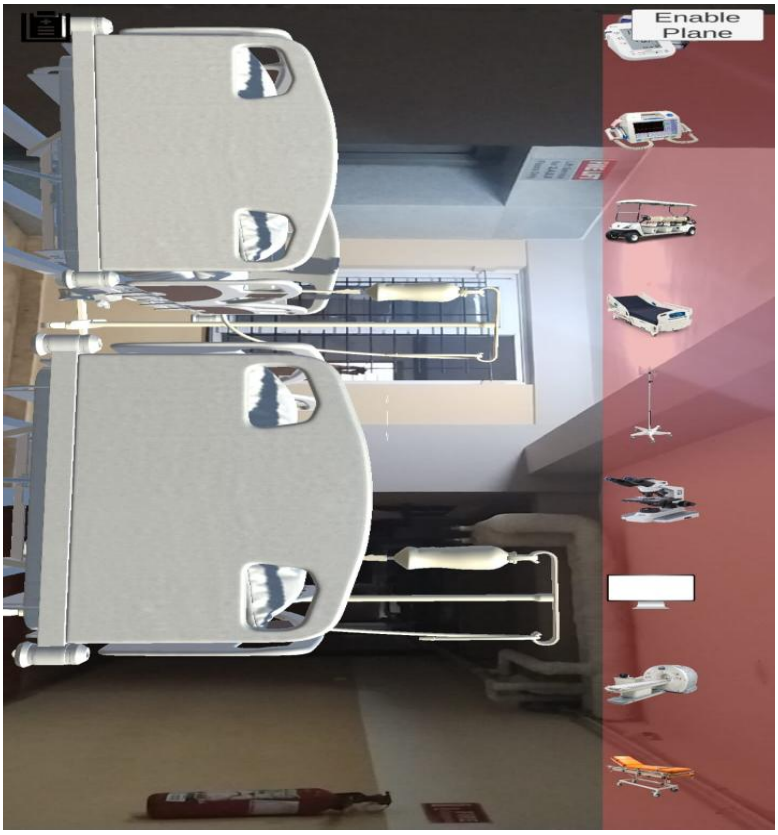
Designed TeamMembers page

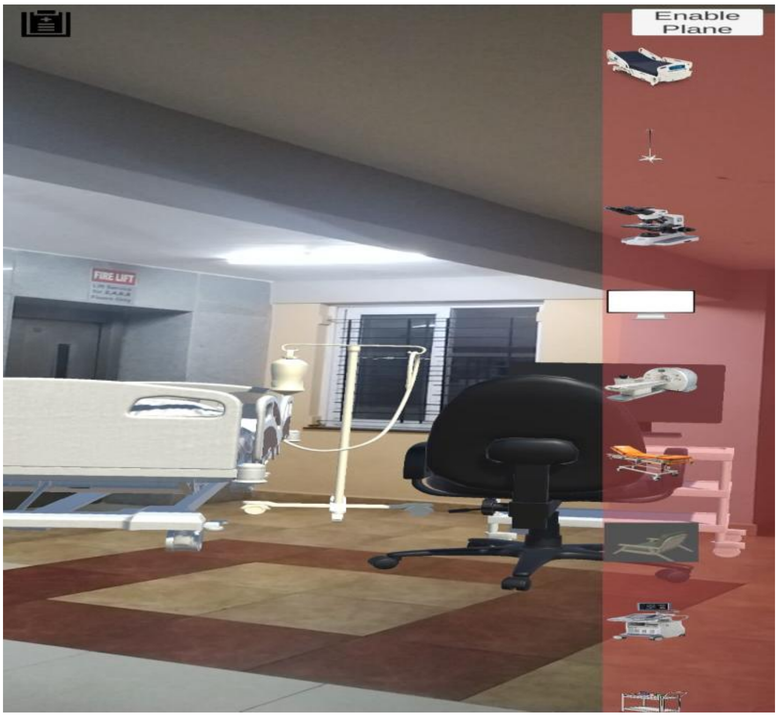


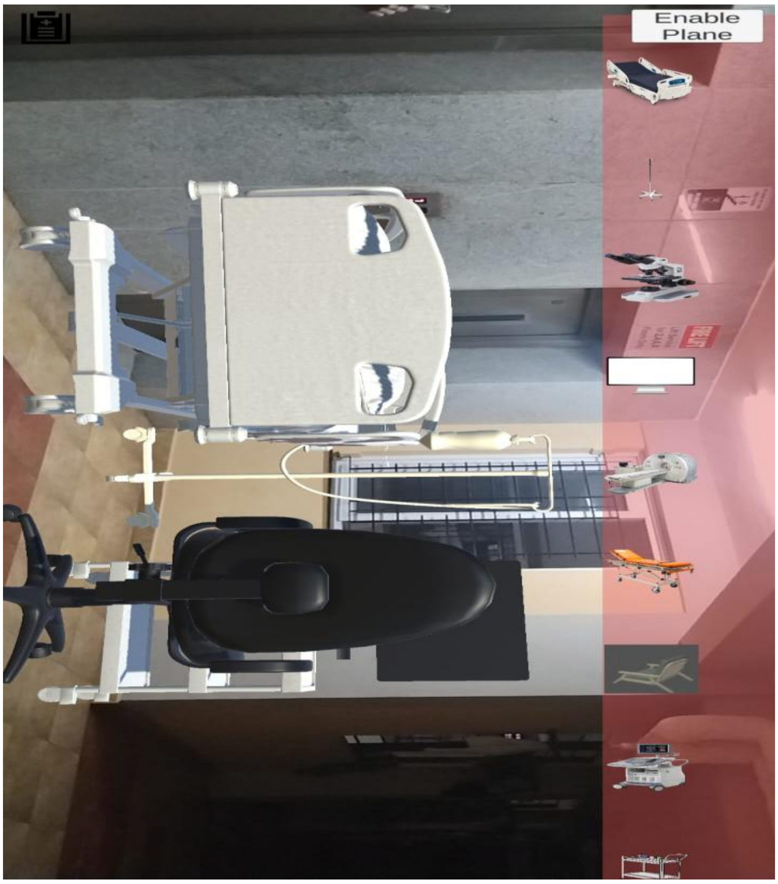


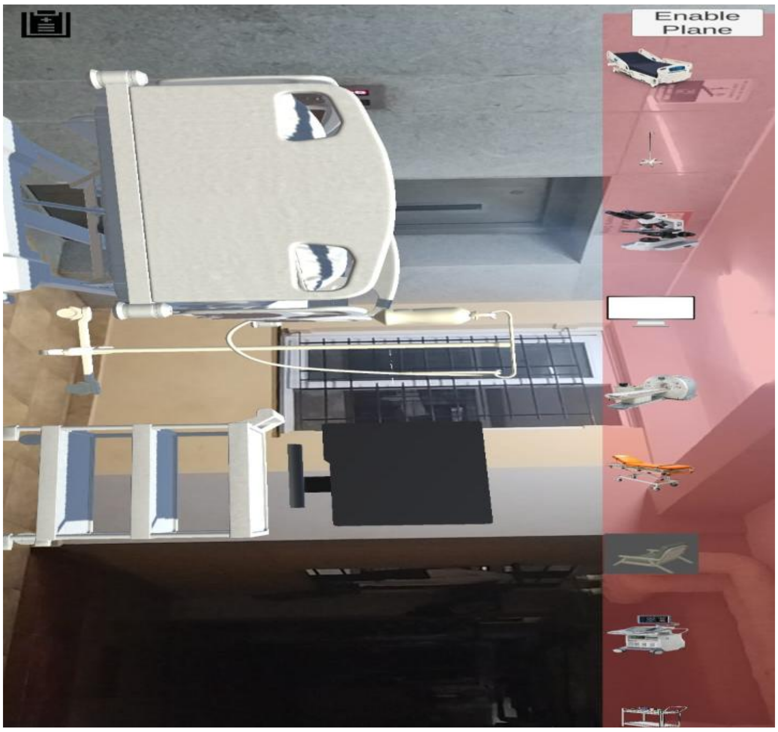
ANDROID APPLICATION SCREENSHOTS:


Enable
Plane


Enable
Plane


Enable
Plane
FIRE LIFT

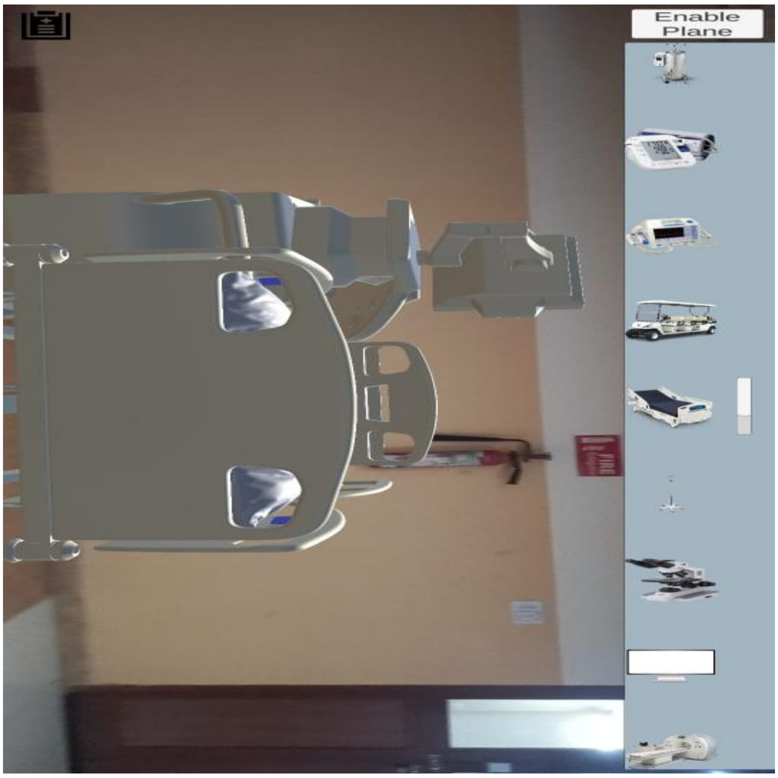

Enable
Plane


Enable Plane


Enable Plane


Enable Plane
FIRE


Enable Plane


Enable Plane

CHAPTER 7
CONCLUSION AND FUTURE ENHANCEMENT

7.1 CONCLUSION

An AR-based design for the interiors of hospitals is a creative and practical solution to the shortcomings of traditional 2D layout planning. The system promotes way-finding processes by enabling users to place and visualize the 3D models of hospital equipment in real-life spaces, which increases the spatial understanding, minimizes costly mistakes, and eliminates the long decision-making process. Met with flexibility, real-time feedback, and interactivity, the designers and physicians are thereby empowered to visualize and realize efficient, safe, and well-optimized hospital environments without basic physical trial-and-error. This not only works in saving time and resources but also makes sure that the care spaces are well-precisely designed and adaptable to future changes, thus paving the way for smarter healthcare infrastructure planning.

7.2 FUTURE SCOPE

The AR-based interior design platform for hospital premises can be enhanced with many future improvements to promote its usability and efficiency. The inclusion of real-time collaborative functions will allow the architects, hospital administrators, and staff to work together remotely on one design at the same time. More sophisticated object snapping and collision detection would be beneficial in avoiding errors in placement and rendering the layouts safer and more ergonomic. AI-driven suggestions would potentially be eligible for applying automatically to embellishing optimal equipment placement based on room dimensions and healthcare regulations. Cloud storage for storing and sharing room designs effortlessly across user devices would be another enhancement. A greater planning experience for a large healthcare infrastructure may also include multi-storey hospital planning and virtual walk-throughs in VR headsets.

CHAPTER 8
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