

A
PROJECT PHASE -II
REPORT ON
AR BOOK WITH 3D ANIMATION

SUBMITTED IN THE PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE AWARD OF THE DEGREE

OF

BACHELOR OF TECHNOLOGY (COMPUTER ENGINEERING)

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ABSTRACT

In this era people have more access than ever to 3D views and pictures of virtual objects due to emerging trends and technologies. Both students and instructors find it simple to learn new things and impart them to their pupils through the use of virtual learning methods. The traditional way of teaching with books is draining, not very stimulating, and doesn't give pupils any opportunities for visualization. As a result, the majority of pupils won't be able to understand that specific theme or subject. Students rush to learn a lot of material in a short amount of time during semester examinations, competitive exams, assignments, and other periods, but because there is a limited amount of learning time, it is difficult for students to study all the books. The book is targeted towards students, educators, and professionals in various fields, including science, technology, engineering, and mathematics. A digital visual aspect is used to create augmented reality (AR), which is a rendition of the actual world that is enhanced. The core of augmented reality (AR) is 3D modeling, model rendering, etc., which broadens the user's view on learning. Nowadays, businesses use augmented reality extensively to market their goods and services. Because users can see models and products in three dimensions, this makes for an interesting user experience and increases sales. A live animated image of models and items is added by augmented reality to improve your environment. The student's perspective of studying any specific topic or concept is enhanced by 3D models. Students can see the object's visualised model by using 3D models made with the aid of augmented reality. By offering simulated information in a distorted perspective of the real world, augmented reality (AR) simplifies the lives of users. AR makes the book diagrams appear in three dimensions, which is a pleasant and interesting experience.

Keyword: 3D modeling, Image recognition, Augmented reality.

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LIST OF ABBREVIATIONS

ABBREVIATION	ILLUSTRATION
AR	Augmented Reality
API	Application Programming Interface
3D	3 Dimension
GUI	Graphical User Interface
ML	Machine Learning

1. INTRODUCTION

An ARbook is a software or application. With the aid of augmented reality, the student can examine the Image and view a 3D animated model that corresponds to it. Even if you only know the topic's name or subject, learners can use the search feature to quickly find the information they need to grasp the idea even in the absence of a picture.

You will find two perspectives on every topic you learn about in the text.

1) 3D View, With this, you won't have to survey the surface or look through space.

2)AR View, With the aid of a virtual button, you can engage with the 3D moving model while viewing it in the real world with AR View. The Description View under those topics allows students to study knowledge about that topic at the same moment. The students will see more practise tests, numerous MCQs, and other items in the text.

In order to improve and enrich a user's experience, augmented reality (AR) concentrates on rendering, modelling into 3D models, or superimposing additional information over the real world. Augmented reality is used by users and other businesses to promote goods and services, start marketing campaigns, and gather specific user data for future development. Your circumstances are improved by augmented reality (AR), which incorporates a real-time picture of products and models. Virtual reality gave rise to augmented reality, a major area of research. It becomes incredibly challenging to efficiently and effectively create a large number of 3D models. The use of information in the form of writing, pictures, audio, and other synthetic additions, in conjunction with the real world and objects is known as augmented reality, or AR. Through its powers, AR primarily combines and enhances the user's interaction with the real-world surroundings. It only requires a few minutes of free time to comprehend complex or narrow subjects. ARBook enables students to quickly visualize some important concepts or numbers that they find difficult to comprehend. Because ARBook eliminates the need for additional learning materials, ARBook now saves the room you previously used for all of your educational resources. ARBook has scanning capabilities that make it simple to learn about any subject. Below the subject you are learning in ARBook, you will find free practise exams, MCQs, and much more. ARBook is a learner's best companion because it provides solutions to all of the issues that students encounter.

Issues with Learning:-

Learning a challenging course or specific topic costs a lot of time and money. We are unable to completely comprehend some crucial concepts or diagrams because we are unable to visualise or envision them. To better grasp some concepts, students maintain a lot of physical learning materials close at hand, but carrying them around takes up a lot of room.

When a learner is interested in learning about a diagram or subject in a different field but is unfamiliar with that field and is unable to comprehend the topic. They pay for practise exams or multiple-choice questions, among other issues, to see if students have learned the material correctly and thoroughly.

Utilizing our ARBook to resolve that issue:-

It only requires a few minutes of free time to comprehend complex or narrow subjects. ARBook enables students to quickly visualise some important concepts or numbers that they find difficult to comprehend. Because ARBook eliminates the need for additional learning materials, ARBook now saves the room you previously used for all of your educational resources. ARBook has scanning capabilities that make it simple to learn about any subject. Below the subject you are learning in ARBook, you will find free practise exams, MCQs, and much more. ARBook is a learner's best companion because it provides solutions to all of the issues that students encounter.

The user-friendly human-computer interface of augmented reality technology significantly expands its application potential and benefits customers. Convolutional neural networks with deep learning have been extensively used in the area of computer vision and have grown to be an effective instrument for dynamic image recognition tasks that are also advantageous in many companies. Combining deep learning and traditional machine learning techniques, this paper uses convolutional neural networks to derive features from image data. As the most common 3D registration method in AR technology, the artificial marker-based approach is extremely competitive in terms of processing efficiency, dependability, and usefulness. Image recognition refers to a comprehensive analysis of the spectral and spatial characteristics of various features in the image, based on some means to select the features that can express the features, and finally divides the features into different feature categories through a certain recognition algorithm.

1.1 MOTIVATION

ARBook helps students, instructors, institutions, and material publishers, and thus it may be the future of education. The main motive of this project is to provide visual advance concept of any subject in easy way. This application helps teacher and student to explore every detail in virtual 3d. The AR book helps user to make an active interaction with books or diagrams. It can improve learning and make it more engaging, enjoyable, and effective. Including virtual reality can have a lot of advantages, particularly for pupils who are motivated to learn. With more interactivity, it can also bring new teaching techniques and change educational environments.

1.2 PROBLEM DEFINITION

The AR Book is the printed version book of the real photo of the object in this case, balinese artistic and cultural objects), that also contains short description (meaning, history, function) about each object. Each real photo of the object on the AR Book will serve as a marker, and will be detected to visualize the respective 3D object or 3D animation of an augmented reality technology application, with a narrative and backsound audio related to the object.

2. LITERATURE SURVEY

2.1 Augmented Reality Dynamic Image Recognition Technology Based on Deep Learning

Algorithm.

Author: QIUYUN CHENG, SEN ZHANG , SHUKUI BO , DENGXI CHEN , AND HAIJUN ZHANG

Abstract: Augmented reality is a research hotspot developed on the basis of virtual reality. Friendly human-computer interaction interface makes the application prospect of augmented reality technology very broad. Convolutional neural networks in deep learning have been widely used in the field of computer vision and become an important weapon in dynamic image recognition tasks. Combining deep learning and traditional machine learning techniques, this article uses convolutional neural networks to extract features from image data. The convolutional neural network uses the last layer of features and uses the softmax recognizer for recognition. This article combines a convolutional neural network that can learn good feature information with integrated learning that has good recognition effects. In the recognition tasks of the MNIST database and the CIFAR-10 database, comparison experiments were performed by adjusting the hierarchical structure, activation function, descent algorithm, data enhancement, pooling selection, and number of feature maps of the improved convolutional neural network. The convolutional neural network uses a pooling size of 3*3, and uses more cores (above 64), small receptive fields (2*2), and more hierarchical structures. In addition, the Relu activation function, gradient descent algorithm with momentum, and enhanced data set are also used. The research results show that under certain experimental conditions, the dynamic image recognition results have dropped to a very low error rate in the MNIST database, and the error rate in the CIFAR-10 database is also ideal.

2.2 High-Resolution Remote Sensing Image Information Extraction and Target Recognition Based on Multiple Information Fusion.

Author: YI LIU, MIN CHANG, JIE XU

Abstract: The current research on multiple information fusion of remote sensing images is mainly aimed at remote sensing images of specific satellite sensors, and cannot be extended to other types of data source images. For high-resolution remote sensing images, when its surface coverage changes significantly, most of the mainstream algorithms are difficult to restore satisfactorily. The algorithm proposed in this paper combines the sparse representation and the spectral, spatial, and temporal features of remote sensing images for the first time to solve the above problems. The

algorithm proposed in this paper first simulates the human visual mechanism, and obtains the spatial, spectral, and temporal features of the remote sensing image through the spatial spectral dictionary learning and the time-varying weight learning model. Secondly, local constraints are added to the extraction of temporal features to obtain temporal and geographical change information of heterogeneous remote sensing images. Then, a sparse representation model combining spacespectrum-time features is proposed to extract features of high-resolution remote sensing images. Finally, based on the VGG-16 network, this paper proposes a target recognition network with deep fully convolutional network, and uses the extracted feature map as the input of the target recognition network to realize the target recognition of the remote sensing image. Experimental results show that the method proposed in this paper can improve the accuracy of target recognition and improve the accuracy of recognition.

2.3 Simultaneous 3D Object Recognition and Pose Estimation Based on RGB-D Images.

Author: CHI-YI TSAI , SHU-HSIANG TSAI

Abstract: Object recognition and pose estimation are essential functions in applications of computer vision, and they also are fundamental modules in robotic vision systems. In recent years, RGB-D cameras become more and more popular, and the 3D object recognition technology has got more and more attention. In this paper, a novel design of simultaneous 3D object recognition and pose estimation algorithm is proposed based on RGB-D images. The proposed system converts the input RGB-D image to colored point cloud data and extracts features of the scene from the colored point cloud. Then, the existing color signature of histograms of orientations (CSHOT) description algorithm is employed to build descriptors of the detected features based on local texture and shape information. Given the extracted feature descriptors, a two-stage matching process is performed to find correspondences between the scene and a colored point cloud model of an object. Next, a Hough voting algorithm is used to filter out matching errors in the correspondence set and estimate the initial 3D pose of the object. Finally, the pose estimation stage employs RANdom SAMple Consensus (RANSAC) and hypothesis verification algorithms to refine the initial pose and filter out poor estimation results with error hypotheses. Experimental results show that the proposed system not only successfully recognizes the object in a complex scene but also accurately estimates the 3D pose information of the object with respect to the camera.

2.4 Exploring Simple and Transferable Recognition-Aware Image Processing.

Author: Zhuang Liu , Hungju Wang , Tinghui Zhou, Zhiqiang Shen , Bingyi Kang, Evan Shelhamer , and Trevor Darrell

Abstract: Recent progress in image recognition has stimulated the deployment of vision systems at an unprecedented scale. As a result, visual data are now often consumed not only by humans but also by machines. Existing image processing methods only optimize for better human perception, yet the resulting images may not be accurately recognized by machines. This can be undesirable, e.g., the images can be improperly handled by search engines or recommendation systems. In this work, we examine simple approaches to improve machine recognition of processed images: optimizing the recognition loss directly on the image processing network or through an intermediate input transformation model. Interestingly, the processing model's ability to enhance recognition quality can transfer when evaluated on models of different architectures, recognized categories, tasks, and training datasets. This makes the methods applicable even when we do not have the knowledge of future recognition models, e.g., when uploading processed images to the Internet. We conduct experiments on multiple image processing tasks paired with ImageNet classification and PASCAL VOC detection as recognition tasks. With these simple yet effective methods, substantial accuracy gain can be achieved with strong transferability and minimal image quality loss. Through a user study we further show that the accuracy gain can transfer to a black-box cloud model. Finally, we try to explain this transferability phenomenon by demonstrating the similarities of different models' decision boundaries.

2.5 Enhanced System Robustness of Asynchronous BCI in Augmented Reality Using Steady-State Motion Visual Evoked Potential.

Author: Aravind Ravi , Graduate Student Member, IEEE, Jing Lu , Sarah Pearce, and Ning Jiang

Abstract: This study evaluated the effect of change in background on steady state visually evoked potentials (SSVEP) and steady state motion visually evoked potentials (SSMVEP) based brain computer interfaces (BCI) in a small-profile augmented reality (AR) headset. A four target SSVEP and SSMVEP BCI was implemented using the Cognition AR headset prototype. An active (AB) and a non-active background (NB) were evaluated. The signal characteristics and classification performance of the two BCI paradigms were studied. Offline analysis was performed using canonical correlation analysis (CCA) and complex spectrum based convolutional neural network (C-CNN). Finally, the asynchronous pseudo-online performance of the SSMVEP BCI was

evaluated. Signal analysis revealed that the SSMVEP stimulus was more robust to change in background compared to SSVEP stimulus in AR. The decoding performance revealed that the C-CNN method outperformed CCA for both stimulus types and NB background, in agreement with results in the literature. The average offline accuracies for $W = 1s$ of C-CNN were (NB vs. AB): SSVEP: $82\% \pm 15\%$ vs. $60\% \pm 21\%$ and SSMVEP: $71.4\% \pm 22\%$ vs. $63.5\% \pm 18\%$. Additionally, for $W = 2s$, the AR-SSMVEP BCI with the C-CNN method was $83.3\% \pm 27\%$ (NB) and $74.1\% \pm 22\%$ (AB). The results suggest that with the C-CNN method, the AR-SSMVEP BCI is both robust to change in background conditions and provides high decoding accuracy compared to the AR-SSVEP BCI. This study presents novel results that highlight the robustness and practical application of SSMVEP BCIs developed with a low-cost AR headset.

2.6 A Hybrid 3D Registration Method of Augmented Reality for Intelligent Manufacturing.

Author: XIAN YANG , (Member, IEEE), JINGFAN YANG , HANWU HE , AND HEEN CHEN

Abstract: Presently, core 3D registration technologies for augmented reality have problems like low accuracy and poor tracking stability in natural environments pertaining to mass customization and intelligent manufacturing, resulting in error display or poor visual performance. (1) A non-linear scale space was used to alleviate the problem associated with scale invariance, the relevant calculations and construction methods were studied. The adaptive non-maximal suppression method was examined, which reduced redundancy of ORB (Oriented FAST and Rotated BRIEF) feature points. (2) The method of combining nonlinear local descriptors with LK method is studied to improve the low stability problem against Light change by LK method only, and a forward-backward error detection method was studied to evaluate feature point tracking results. (3) The improved ORB and LK methods are used to track the target and achieve data fusion. Then, the fused data is voted and clustered by means of consistent voting, only the maximum number of clusters within the threshold is left as the final tracking result to realize 3D registration. Finally, the paper validates the proposed method through the natural environment dataset of open source. The dimensions of verification include challenging scales, rotation changes, perspective changes, motion blur, occlusion, and out-of-view object.

2.7 Image Recognition and Analysis: A Complex Network-Based Approach.

Author: ZHUANG MA AND GUANGDONG HUANG

Abstract: The placement and order of image pixels play a significant role in the accuracy of image recognition in current algorithms. Complex networks will significantly reduce the impact of images on classification recognition accuracy when rotation, translation, and scaling occur. Complex networks' topological invariance has made it clear that using them to analyze image recognition will considerably increase image classification accuracy. However, most studies of complex networks for image classification have focused on individual networks, neglecting the combination of multiple networks. This paper proposes a new complex network classification method that combines complex networks and convolutional neural networks(CNN) to train classification using deep learning. We show that the method has high classification accuracy and distinct network features and compares well with a single complex network approach. In addition, to make the distribution of the degree histogram of the image more uniform and concentrated, the original formula for calculating the power value was optimized to reduce the influence of the radius parameter on the power value.

2.8 Rendering Optimization for Mobile Web 3D Based on Animation Data Separation and On-Demand Loading.

Author: LIANG LI, XIUQUAN QIAO, QIONG LU , PEI REN, AND RUIBIN LIN

Abstract: Based on advances in image processing technology and Web-enabling technologies for mobile devices, mobile Augmented Reality (AR) and Virtual Reality (VR) has developed rapidly. The rendering and interaction of 3D models is an important part of AR and VR applications and is closely related to user experience. However, since the existing WebGL 3D JavaScript libraries for Web-based mobile 3D (represented by three.js and babylon.js) load the entire model file at once, large-size 3D models with complex interactions cannot be rendered smoothly due to limited data transmission, the weak computation capabilities of mobile Web browsers, and the latency of 3D model rendering. In this paper, we first propose model-animation data separation and an on-demand loading mechanism to improve the data request and loading process of Web 3D models. The main mechanisms are the following: (1) The model data are segmented into topological data and animation data sequences, and only the necessary data of the model are loaded when the Web-based mobile 3D model is first rendered. (2) The 3D model animation data sequence is semantically decomposed, and a multigranular model animation data service is established to provide continuous

animation data support. (3) An asynchronous request-response mechanism is used to optimize the loading method of the model data. The model rendering mechanism uses an on-demand request and rendering method to transform the centralized loading process of the 3D model into a decentralized process. According to the testing and verification results, this optimization method can reduce the latency of mobile Web 3D in model data transmission and rendering by 24.72% for the experiment models. The interaction experience of Web-based mobile AR and VR is substantially improved relative to existing Web 3D rendering engines and rendering mechanisms, especially in complex interactive service scenarios.

2.9 Developing an Image-Based 3D Model Editing Method.

Author: MIN PANG ¹ , LIGANG HE ² , (Member, IEEE), FENGGUANG XIONG ¹ ,
XIAOWEN YANG ¹ , ZHIYING HE³ , AND XIE HAN¹

Abstract: As 3D technologies advance rapidly, 3D printing, 3D animation, and 3D Movie are springing out in different areas. It becomes a remarkable challenge to generate a large number of 3D models effectively and efficiently. This paper proposes a novel editing method based on the feature lines of images (i.e., image contour and principal axis) for generating new 3D models. Our method takes as input an existing 3D model (as the original model) and an image selected by the user (or a sketch hand-drawn by the users), and performs the model editing to generate a new 3D model. In particular, our method first takes as input an original 3D model and an image selected by the user. Second, the selected image is processed to produce the feature lines, i.e., contour and principal axis of the image. Third, the silhouette of the original model from a given view is acquired, and projected on a projection plane to produce a contour and principal axis of the model, which is the feature lines of the original model. Fourth, by comparing the feature lines of the image and the original model, the constraint conditions are established to control the editing of the 3D model. Finally, 3D model editing is conducted through the as-rigid-as-possible mesh deformation to produce a new 3D model with the appearance resembling the selected image. Furthermore, this paper proposes an energy function to guide the detailed model editing, and measure the similarity between the generated 3D model and the corresponding image. We have conducted extensive experiments to evaluate the proposed method. The results show that comparing with the existing editing methods in literature, the proposed model editing method is able to construct various types of 3D models more effectively and more efficiently.

2.10 3D Model Retrieval Based on a 3D Shape Knowledge Graph.

Author: WEIZHI NIE , (Member, IEEE), YA WANG, DAN SONG , AND WENHUI LI

Abstract: A development of 3D construction technology has led to 3D models being applied in many fields, and the number of 3D models has exploded in recent years. Thus, 3D model retrieval has become a popular topic with many proposed approaches. However, all of the methods focus on the 3D model's global structural descriptor design based on various deep learning networks and ignore the local structural information of the 3D model and the correlation of the local structures. In this paper, we propose a novel 3D model retrieval method based on a 3D shape knowledge graph. We first introduce the concept of a geometric word that can be utilized to assemble other 3D model. Second, we construct a 3D shape knowledge graph based on the geometric words, models and their relations. Additionally, we propose a novel graph embedding method to generate embeddings of nodes. Finally, an effective multiple entities' retrieval method is used to handle the 3D model retrieval problem. More specifically, the 3D shape knowledge graph retains the basic structural information and saves these as a set of triples. Any 3D model can find its geometric words in a rich enough knowledge graph. It is reasonable that our approach can solve the cross-domain model retrieval problem. Our approach focuses on the structural information of 3D model and is not restricted by the database. We evaluate the proposed method on the ModelNet40 dataset for the 3D model retrieval task. Meanwhile, we also utilize the ShapeNet dataset to evaluate the performance of cross-domain retrieval task. Experimental results and comparisons with state-of-the-art methods demonstrate that our framework can achieve superior performance.

3. SOFTWARE REQUIREMENTS SPECIFICATION

Hardware Requirements		
Processor	RAM	Disk Space
Pentium III,Pentium IV or higher	64 Mb or higher	130 Mb
Software Requirements		
Operating System		
Win-7,Win-8.1 or any os		
Browser		
Google Chrome or Firefox or Microsoft Edge etc...		

3.1 INTRODUCTION

3.1.1 Project Scope

In order to improve and enrich a user's experience, augmented reality (AR) concentrates on rendering, modelling into 3D models, or superimposing additional information over the real world. Augmented reality is used by users and other businesses to promote goods and services, start marketing campaigns, and gather specific user data for future development. Your circumstances are improved by augmented reality (AR), which incorporates a real-time picture of products and models. Virtual reality gave rise to augmented reality, a major area of research. It becomes incredibly challenging to efficiently and effectively create a large number of 3D models. The use of information in the form of writing, pictures, audio, and other synthetic additions in conjunction with the real world and objects is known as augmented reality, or AR. Through its powers, AR primarily combines and enhances the user's interaction with the real-world surroundings.

Aspects of ARBook:

1. Each learning resource will now be made accessible in a language you are familiar with.
2. Easy-to-understand UI: ARBook's user interface is very straightforward and clear, making it accessible to all users.
3. Unlimited Learning: You can learn about any subject or area using ARBook in a matter of minutes.
4. Platform Independent: ARBook will be accessible on all platforms and devices.
5. Totally Free: All of ARBook's essential functions as well as a ton of educational materials are free.

ARBook helps students, instructors, institutions, and material publishers, and thus it may be the future of education. It can improve learning and make it more engaging, enjoyable, and effective. Including virtual reality can have a lot of advantages, particularly for pupils who are motivated to learn. With more interactivity, it can also bring new teaching techniques and change educational environments. However, it can also help pupils and improve their ability to retain knowledge. Traditional learning techniques can be changed and improved thanks to ARBook, particularly since it can handle the problem of people's deteriorating attention spans, which has become a problem over time. It can be used for learning in businesses, colleges and schools, the medical field, and by all different types of learners.

3.1.2 User Classes and characteristics

1. **Planned approach towards working:** The working in the organization will be well planned and organized. The data will be stored properly in the dataset , which will help in retrieval of information as well as its storage.
2. **Accuracy:** The level of accuracy in the proposed system will be higher. All operations would be done correctly and it ensures that whatever information is coming from the center is accurate.
3. **Reliability:** The reliability of the proposed system will be high due to the above stated reasons. The reason for the increased reliability of the system is that now there would be proper storage of information.
4. **No Redundancy:** In the proposed system utmost care would be that no information is repeated anywhere, in storage or otherwise. This would assure economic use of storage space and consistency in the data stored.
5. **Immediate retrieval of information:** The main objective of the proposed system is to provide for a quick and efficient retrieval of information. Any type of information would be available whenever the user requires.
6. **Storage of information:** Sufficient information to be stored in the dataset according to the website..

7. **Easy to Operate:** The system should be easy to operate and should be such that it can be developed within a short period of time and fit in the limited budget of the user.
8. **User friendly:** Clear structure, navigation and page names. Responsive and compatible design.
9. **Quick registration & profile approval:** The registration process is very simple for service providers and clients which does not consume access of time. Once the form is submitted, the service provider and clients get the approval immediately.
10. **Real-time request:** If a user asks for a service, the bot should provide information to the user in real time.
11. **Request and Response feature:** The Request/Response process works in both ways. User gets response according to the request
12. **Creation of dataset:** Dataset contains data related to diseases and its prescription
13. **Manage the users:** The admin has all rights to manage the users and responses. Verification of profiles of all service providers and customers is done by admin to avoid any fraud.
14. **Manage reviews:** If the feedback/review of any user is less than 2 then the account gets directly deleted from the database.
15. **Service Assistance:** There are some instances with on-demand home service websites that the clients have to face some critical issues. FAQs tab is provided to resolve these issues

3.2 FUNTIONAL REQUIREMENTS

3.2.1 System Feature 1

- **System Services:**

Provide appropriate information related to subject provided by user.

To store user login details and history.

To maintain a dataset on a real basis.To keep the dataset updated.

To catch requests of the user and provide appropriate responses.

3.2.2 System Feature 2

- **Client Users:**

To get the proper result of the request.

To get real time response from the system.

Can access app easily.

Provide information to the user as a response.

Get information related to subject.

3.3 EXTERNAL INTERFACE REQUIREMENTS

3.3.1 User Interfaces

- User Friendly UI, can be accessed by anyone
- Easy to reach.
- No language barrier.
- Helpful for students in learning.
- Students can directly access the 3D images as well as scan from book and see the related 3D diagram.
- Easy to maintain.
- Easy to use .
- Friendly application.

3.3.2 Software Interfaces

Our ARBook Provides:

- Easy solutions to complex issues and better learning.
- Draws on students' natural interest in 3D models to help them improve their ability to concentrate, think critically, and analyse information. Improving user comfort is one of the ARBook's major goals in order to make everyday living for students and teachers easier.
- Time and money are saved because users can study online without having to purchase books.
- The ARBook enables users to engage actively with texts or illustrations. This project's primary goal is to offer a Visual Advanced Concept of Any Subject in a Simple Way. AR helps kids focus on reading texts carefully, which improves their comprehension and critical-thinking skills and promotes their natural joy of books.
- Improving user comfort is one of the AR Book's major goals in order to make everyday life for students and teachers easier. The two main forces behind the worldwide AR Book are time and money benefits. The AR Book enables users to actively engage with schematics or texts.
- ARBook will make it easier for students to gain knowledge easily by just viewing the 3D models.

3.4 NON-FUNCTIONAL REQUIREMENTS

3.4.1 Performance Requirements

- The performance of the functions and every module must be good. The overall performance of the software will enable the users to work efficiently.
- Performance of the providing virtual environment should be fast Safety Requirement.
- The application is designed in modules where errors can be detected easily. This makes it easier to install and update new functionality if required.

3.4.2 Safety Requirements

- The application is designed in modules where errors can be detected and fixed easily.
- This makes it easier to install and update new functionality if required.
- User can access the application anytime and anywhere.

3.4.3 Security Requirements

- ARBook use two main security processes – **authentication (user identity verification) and authorization.**
- Users can access information related to any subject easily.

3.4.4 Software Attributes

- **Adaptability:** This software is adaptable by all users.
- **Availability:** This software is freely available to all users. The availability of the software is easy for everyone.
- **Maintainability:** After the deployment of the project if any error occurs then it can be easily maintained by the software developer.
- **Reliability:** The performance of the software is better which will increase the reliability of the Software.

- User Friendliness: Since, the software is a GUI application the output generated is much user friendly in its behavior.
- Integrity: Integrity refers to the extent to which access to software or data by unauthorized persons can be controlled.
- Security: Users are authenticated using many security phases so reliable security is provided.
- Test ability: The software will be tested considering all the aspects.

3.5 SYSTEM REQUIREMENTS

3.5.1 Database Requirements

Firebase, Vuforia

3.5.2 Software Requirements

Operating System
Windows
Browser
Google Chrome or firefox or Microsoft Edge etc...
Front-End
Unity, Vuforia
Back-End
Firebase

3.5.3 Hardware Requirements

Processor	RAM	Disk Space
Snapdragon 786 or above	2 GB or higher	100 Mb

3.6 ANALYSIS MODEL

Analysis of the system can be divided into following phases:-

1. Content Creation:

Written Content: Develop engaging and informative written content for the book, including the storyline, descriptions, and educational material.

Visual Assets: Create high-quality illustrations, images, or graphics that align with the book's content and can serve as markers for AR activation.

3D Models and Animations: Design and develop 3D models and animations that enhance the printed content and provide interactive experiences when viewed through AR.

2. Augmented Reality Integration:

Marker Recognition: Determine the markers or triggers in the book that will activate the AR content when viewed through a compatible device or AR application.

AR Platform: Choose an AR platform or SDK (Software Development Kit) to develop the AR functionality of the book. Examples include ARKit (iOS), ARCore (Android), or third-party platforms like Vuforia or Unity.

Tracking and Rendering: Implement marker tracking and rendering techniques to ensure accurate placement and alignment of the 3D animations in the book's environment.

User Interface: Design an intuitive and user-friendly interface for interacting with the AR content, such as tapping, swiping, or pinching to activate or manipulate 3D objects.

3. Technical Considerations:

Device Compatibility: Consider the target audience and their devices to ensure compatibility across various smartphones, tablets, or dedicated AR devices.

Performance Optimization: Optimize the 3D models, animations, and AR functionality to ensure smooth and responsive performance on a range of devices.

File Size and Loading Times: Balance the quality and complexity of 3D assets with file size limitations and loading times, ensuring a seamless experience for users.

Accessibility: Ensure that the AR book is accessible to a wide range of users, considering factors such as visual impairments, device compatibility, and alternative interaction methods.

4. Testing and Feedback:

Usability Testing: Conduct thorough testing with potential users to gather feedback on the AR experience, identifying areas for improvement and addressing any technical or usability issues.

Iterative Development: Use the feedback received during testing to refine and enhance the AR

book, making adjustments to the content, user interface, or technical aspects as needed.

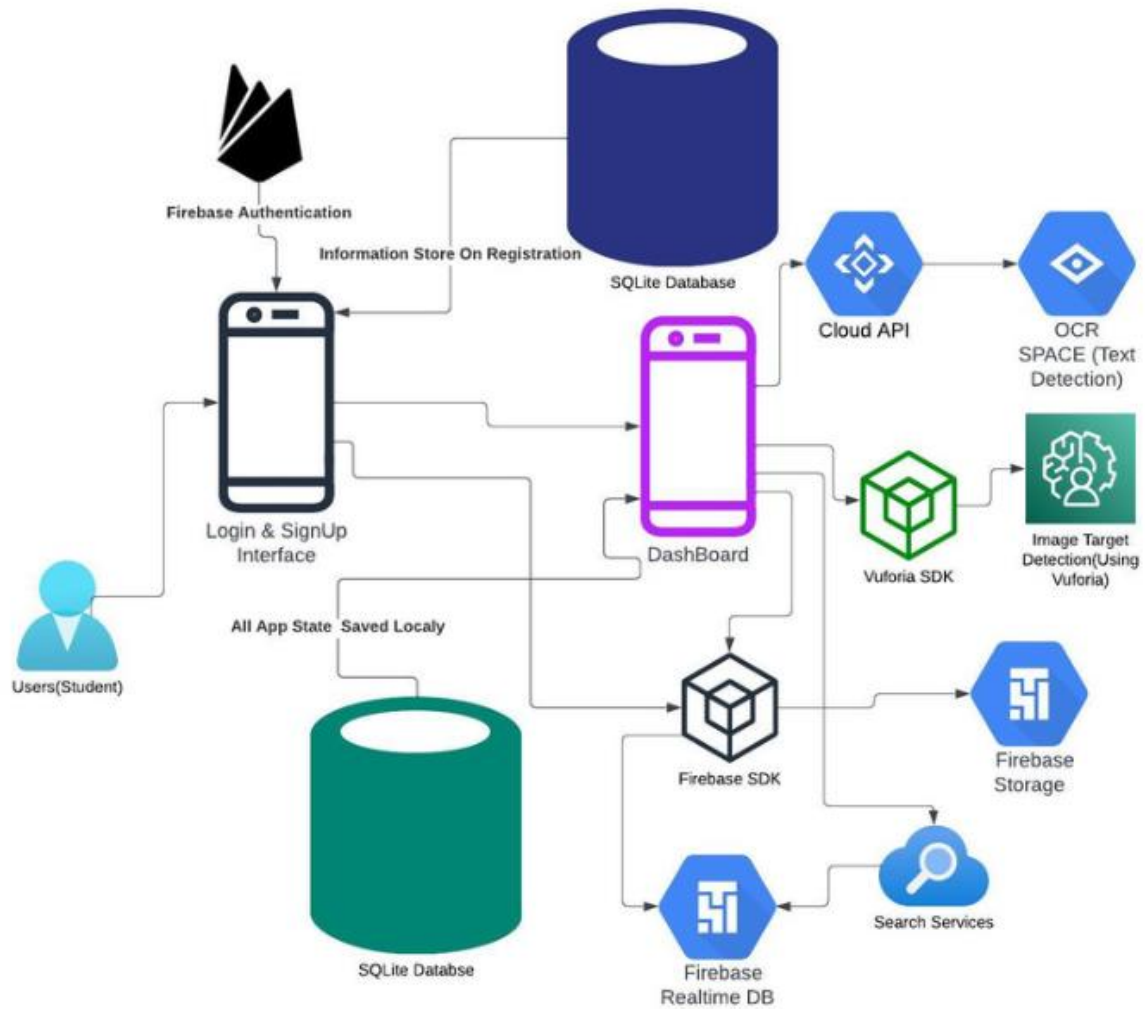
5. Distribution and Marketing:

Publishing Platforms: Determine the distribution channels for the AR book, such as mobile app stores, online marketplaces, or direct sales through a dedicated website.

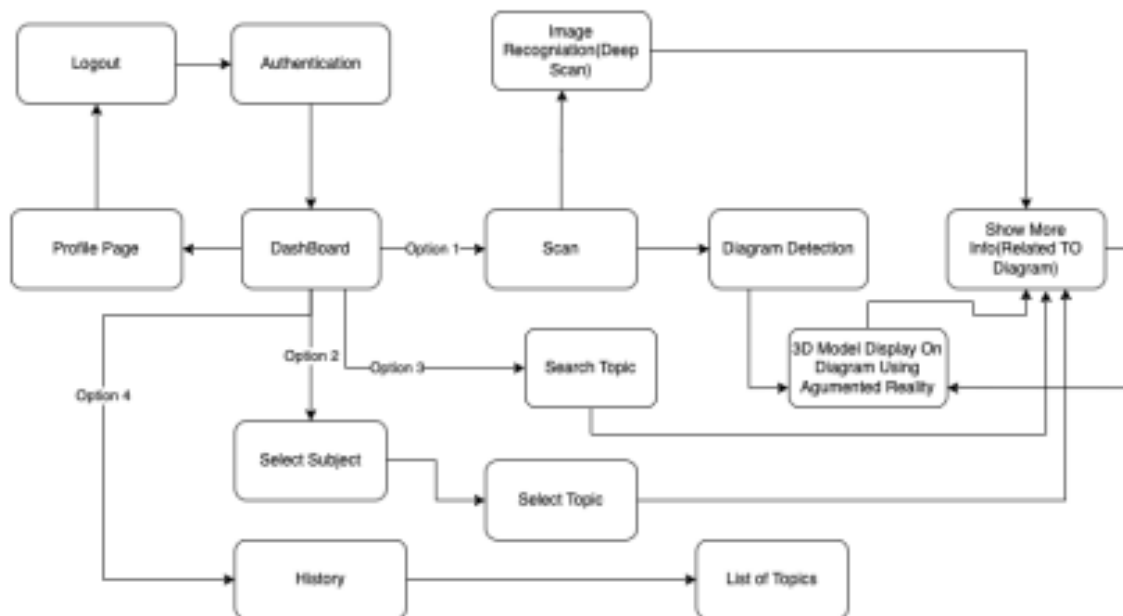
Marketing Strategy: Develop a marketing plan to promote the AR book, leveraging various channels like social media, websites, influencers, or traditional advertising to reach the target audience.

4. SYSTEM DESIGN

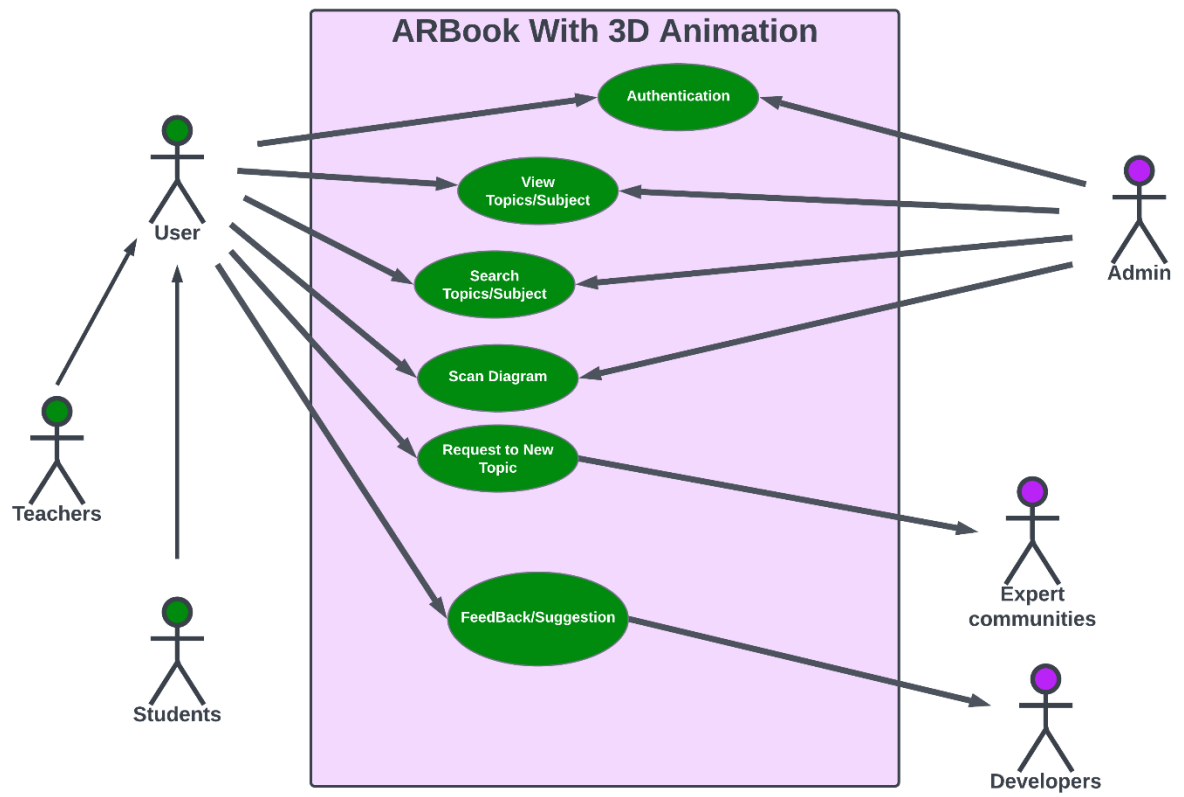
4.1 System Architecture:



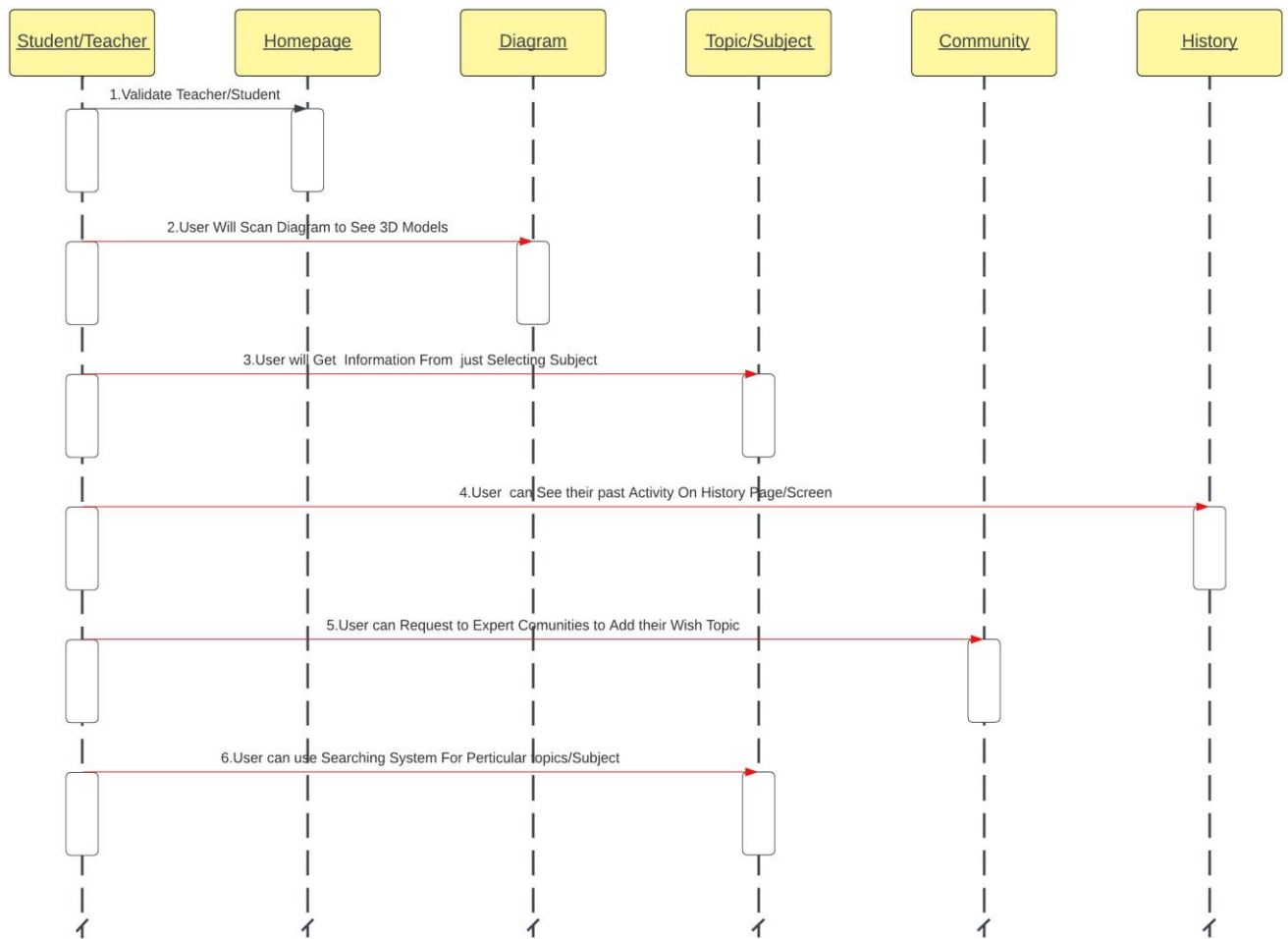
4.2 Dataflow Diagram:



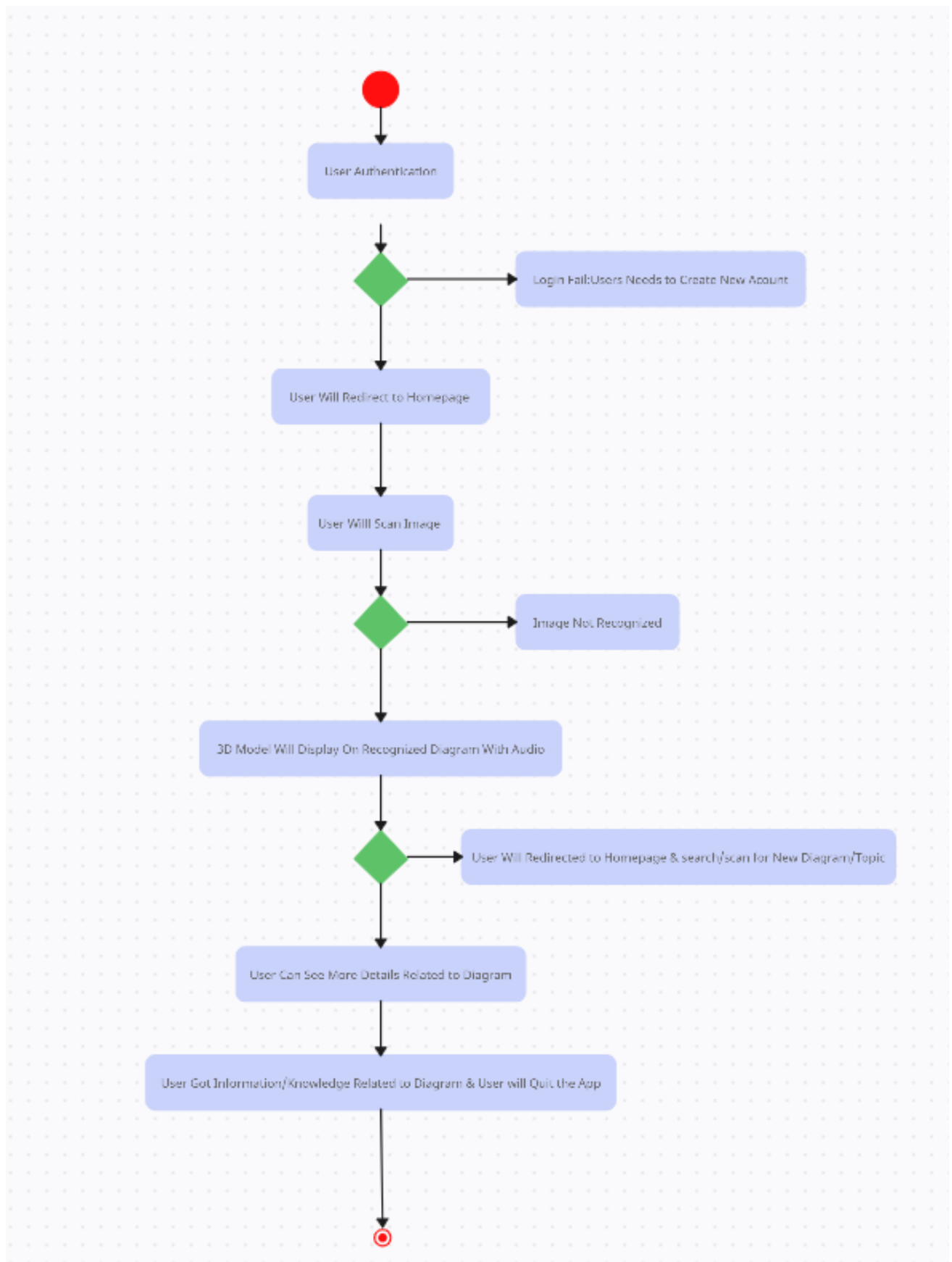
4.3 UML Diagram:



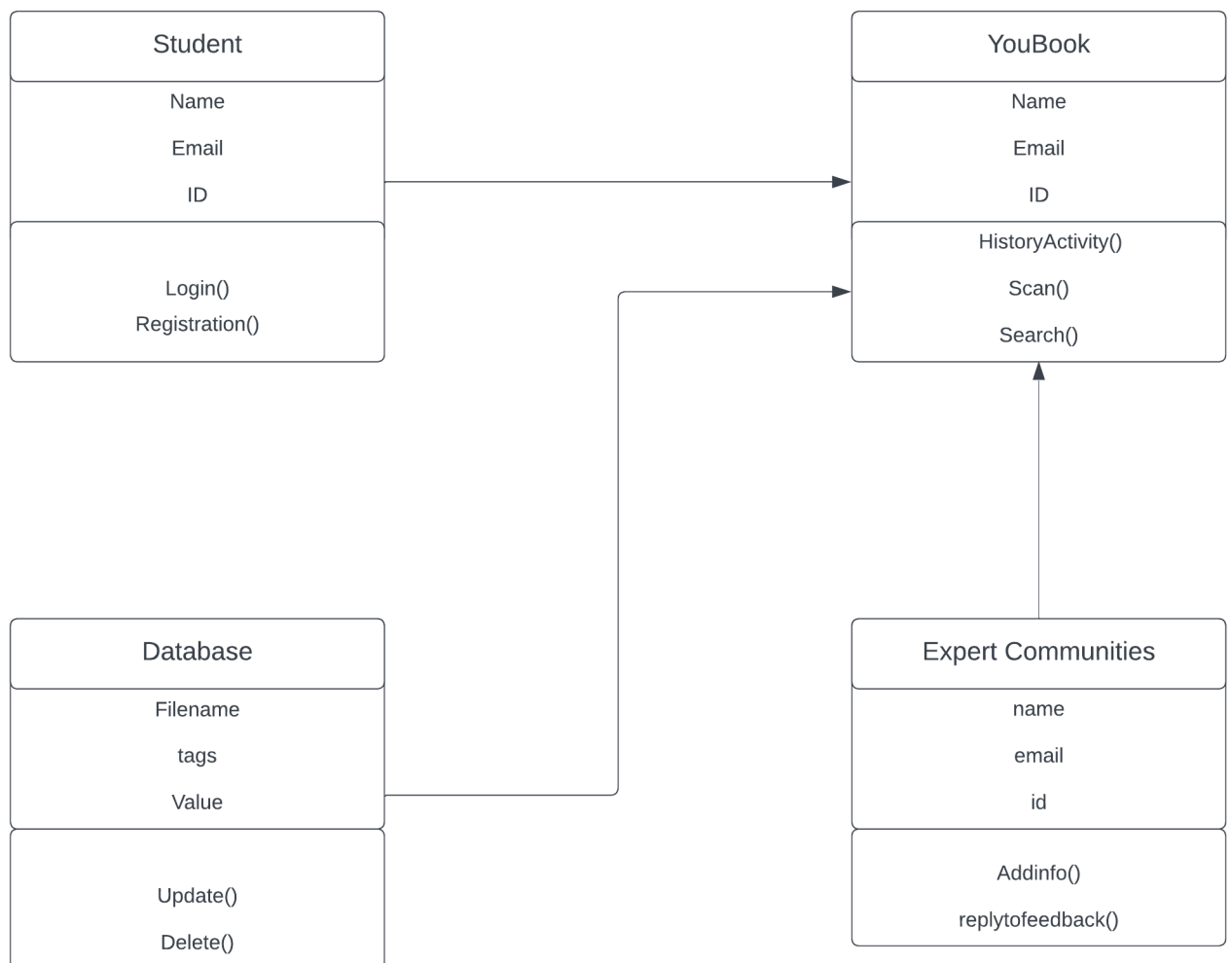
4.4 Sequence Diagram:



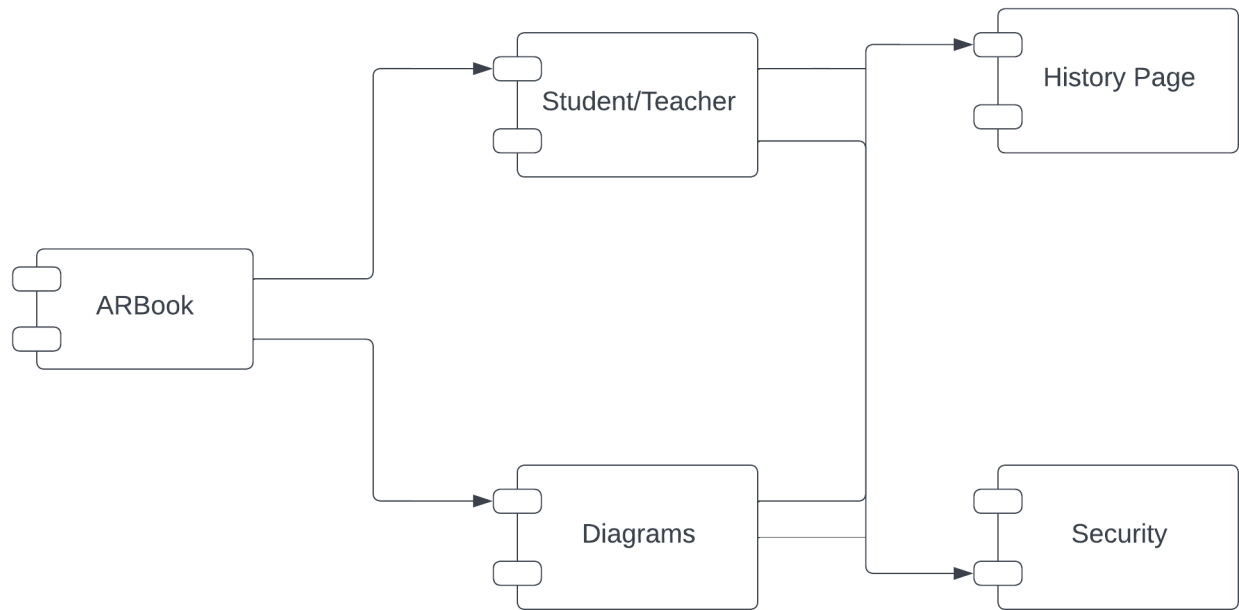
4.5 Activity Diagram:



4.6 Class Diagram:



4.7 Component Diagram:



5. RESULTS

YouBook

Welcome

Enter Name

Enter Email

Enter Password

Confirm Password

Create

Back



YouBook

LOGIN

Enter Email

Enter Password

Login

[forgot password?](#)

Create new account



What is Array?

Description: An array is a group of similar elements or data items of the same type collected at contiguous memory locations.

[View](#)

Uploaded On: 05-03-2023

What is Stack

Description: A Stack is a linear data structure that follows the LIFO (Last-In-First-Out) principle.

[View](#)

Uploaded On: 06-03-2023

What is Queue

Description: Queue is referred to be as First In



Back



What is Array?

Description:

An array is a data structure that stores a collection of elements in a contiguous block of memory. It is a type of data structure that can store a fixed-size sequential collection of elements of the same type. Each element in an array can be accessed using an index, which is an integer value that represents the position of the element in the array.

Arrays are commonly used in programming to store and manipulate large sets of data, such as lists of numbers, characters, or objects. Arrays are often used to implement other data structures such as stacks, queues, and hash tables.



Back

Good Books & Notes :

Following books provides a comprehensive overview of data structures and algorithms, with a particular focus on problem-solving through algorithmic puzzles.

Data Structures and Algorithms Made Easy in Java" by Narasimha Karumanchi

Get

Cracking the Coding Interview: 189 Programming Questions and Solutions" by Gayle Laakmann McDowell

Get

Code Complete: A Practical Handbook of Software Construction" by Steve McConnell

Get

Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein

Get

05-03-2023

Practise Questions:





Operating System

What do mean by OS? operating system An operating system (OS) is the program that, after being initially loaded into the computer by a boot program, manages all of the other application programs in a computer.

Open



Computer Network

An interconnection of multiple devices, also known as hosts, that are connected using multiple paths for the purpose of sending/receiving data or media. Computer networks can also include multiple devices/mediums which help in the communication between two different devices

Open



Data Structure

What is data structure definition?



Back

Practise Questions:

What is the time complexity of accessing an element at a specific index in an array with n elements?

A) $O(\log n)$

B) Arrays can be accessed randomly

C) $O(n^2)$

D) $O(1)$

Change Question

05-03-2023

Ask Anything :

Enter Your Feedback Related To This Topic



Back

Ask Anything :

Enter Your Feedback Related To This Topic

Enter Your Name:

Ankush

Enter Your Email:

ankushpethe30@gmail.com

Enter Your Message:

Submit



6. OTHER SPECIFICATION

6.1 Advantages:

- 6.1.1 Accessibility:** ARbook offer enhanced accessibility features, such as Scan the diagram or topic name and it get you to the that particular topic with the deep scan feature. Also there is voice explanation option of that topic in which user can chose the language option. These features provide a more inclusive experience for learning.
- 6.1.2 Convenience and Instant Access:** With ARbook you can easily scan the topic with the deep scan feature and easily get eliminating the need to visit physical bookstores or wait for delivery. This convenience allows readers to start getting knowledge on topic with the 3D models of that regarding topic, which is particularly beneficial for time-sensitive or spontaneous reading choices.
- 6.1.3 Interactive Features:** ARbook often include interactive elements such as 3D models, hyperlinks, annotations, and interactive quizzes. These features enhance the reading experience and make ARbook particularly engaging for educational purposes, interactive voice explanation, or reference materials.
- 6.1.4 Searchability and Navigation:** ARbook provide robust search functions, enabling readers to quickly locate specific keywords, phrases, or chapters. Additionally, ARbook often include youtube hyperlinks, bookmarks, and quizzes, making navigation between sections seamless and efficient.
- 6.1.5 Space and Storage:** ARbook eliminate the need for physical storage space as they are stored electronically. This advantage is particularly valuable for individuals with limited living space or those who prefer a clutter-free environment.
- 6.1.6 Updates and Revisions:** ARbook can be updated and revised more easily than printed books. Authors and publishers can release new editions or make edits to content, ensuring readers have access to the most up-to-date information.
- 6.1.7 Global Availability:** ARbook can be accessed and purchased from anywhere in the world,

provided there is an internet connection. This accessibility eliminates geographic restrictions and enables readers to explore books from various cultures and languages.

6.2 Limitation:

- 6.2.1 Device Dependence and Compatibility:** ARbook require electronic devices, such as e-readers, tablets, or smartphones, to be accessed. This dependence on technology means that readers must have a compatible device and a reliable power source to read ARbook. Additionally, different ARbook formats and DRM (Digital Rights Management) restrictions can limit compatibility across various devices and platforms.
- 6.2.2 Distractions and Multitasking:** Digital devices used for reading ARbook can also serve as a source of distractions. Notifications, internet access, and other apps can tempt readers to multitask, leading to reduced focus and potentially affecting the reading experience.
- 6.2.3 Eye Strain and Screen Fatigue:** Prolonged reading on electronic devices, such as tablets or smartphones, can lead to eye strain and screen fatigue. The backlighting and glare from screens may cause discomfort or difficulty in reading for extended periods, especially for individuals sensitive to digital displays.
- 6.2.4 Dependency on Technology and Power:** ARbook require electronic devices with functioning batteries and access to power sources. If the device's battery dies or there is a power outage, the ability to read ARbook is temporarily halted, unlike printed books that are always accessible.

6.3 Application:

- 6.3.1 Education and E-Learning:** ARbook play a significant role in education and e-learning. They are used as textbooks, reference materials, and supplementary resources in schools, colleges, and universities. ARbook facilitate interactive learning experiences with multimedia elements, search functionality, and annotation features.
- 6.3.2 Professional and Technical Resources:** ARbook are valuable resources for professionals in various fields, including medicine, law, engineering, and business. They provide up-to-date information, research papers, and industry-specific knowledge. Professionals can access ARbook for continuous learning, research, and reference purposes.

6.3.3 Training and Instruction Manuals: ARbook can serve as training and instruction manuals, particularly in fields that require visual demonstrations or step-by-step guidance. By overlaying virtual elements on the pages, users can follow instructions, view animations, and interact with virtual objects, improving comprehension and retention of information.

6.3.4 Entertainment and Learning: ARbook can offer interactive and gamified experiences, combining traditional reading with virtual elements. Users can engage in interactive puzzles, quizzes, or games that are seamlessly integrated into the book, creating an entertaining and immersive reading experience.

7. CONCLUSION AND FUTURE WORK

7.1 Future Scope:

In the future, ARBook hold immense potential for enhanced interactivity, personalization, and adaptivity. With advancements in augmented reality technology, readers can look forward to a more dynamic and engaging reading experience. ARbook could incorporate voice commands, gestures, and haptic feedback, allowing users to interact with characters and objects within the book itself.

Furthermore, ARBook may adapt to the individual reader's preferences, learning style, and reading level. Real-time adjustments in content, interactive elements, and difficulty levels would create a truly personalized learning journey. Additionally, collaborative and social features could be integrated, enabling readers to connect with others, participate in shared reading experiences, and engage in collaborative storytelling.

Moreover, gamification elements, such as challenges, achievements, and rewards, might be incorporated to make the reading experience more enjoyable and motivate readers to continue learning. As technology advances, the future of ARBook looks promising, bringing about exciting possibilities for interactive and immersive reading experiences.

7.2 Conclusion:

Through the utilization of augmented reality technology and image processing, our application aims to create 3D models from 2D pictures, providing an innovative and immersive learning experience for students. Traditional learning materials often rely on static images and textual information, which can limit students' understanding and engagement. Our application addresses this limitation by transforming 2D pictures into interactive 3D models, allowing students to explore and interact with virtual objects in a three-dimensional space.

By leveraging augmented reality, the application overlays virtual elements onto the real-world environment, enhancing the visualization and comprehension of complex subjects. Students can simply capture or upload a 2D picture, and the application utilizes advanced algorithms to extract the necessary information and convert it into a 3D model. This streamlined process eliminates the need for students to search through numerous webpages to find relevant 3D models or images, saving time and effort.

Overall, our application bridges the gap between static images and interactive learning, utilizing augmented reality and image processing techniques to create an immersive and informative learning experience. By simplifying the process of converting 2D models to 3D and combining them with comprehensive educational content, we aim to empower students with a powerful tool for visualizing and comprehending various subjects, ultimately enhancing their learning outcomes.

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9. Test Models

TEST MODEL 1 :

Login test case

Test Case ID	Test Case	Test Case I/P	Actual Result	Expected Result	Test case criteria(P/F)
001	Enter The Wrong username or password click on submit button	Username or password	Error comes	Error Should come	P
002	Enter the correct username and password click on submit button	Username and password	Accept	Accept	P

TEST MODEL 2 :

Registration test case

Test Case ID	Test Case	Test Case I/P	Actual Result	Expected Result	Test case criteria(P/F)
001	Enter the number in username, middle name, last name field	Number	Error Comes	Error Should Comes	P
001	Enter the character in username, middle name, last name field	Character	Accept	Accept	p
002	Enter the invalid email id format in email id field	<u>Kkgmail.com</u>	Error comes	Error Should Comes	P
002	Enter the valid email id format in email id field	kk@gmail.com	Accept	Accept	P
003	Enter the invalid digit no in phone no field	99999	Error comes	Error Should Comes	P
003	Enter the 10 digit no in phone no field	9999999999	Accept	Accept	P

APPENDIX A: Software Information

Unity:

Unity is a powerful cross-platform game development engine that is widely used for creating interactive experiences, including games, simulations, virtual reality (VR), and augmented reality (AR) applications. It provides a robust set of tools, features, and a user-friendly interface that enables developers to bring their ideas to life.

Unity allows developers to create games and applications for various platforms, including desktop, mobile devices, consoles, and even web browsers. It supports multiple programming languages, including C# and UnityScript, making it accessible to developers with different coding backgrounds.

With Unity, developers can design and build 2D and 3D environments, create realistic physics simulations, implement complex gameplay mechanics, and integrate audio and visual effects. It offers a wide range of assets and resources in its Asset Store, including pre-built models, textures, animations, and scripts, which can significantly speed up development time.

Vuforia:

Vuforia is a widely used augmented reality (AR) development platform that offers a range of tools, libraries, and APIs for creating AR applications. Its robust image recognition capabilities are a key feature, allowing developers to detect and track images or objects in the real world. With marker-based tracking, Vuforia can recognize predefined visual markers or images and track their position and orientation in real-time, enabling the overlay of digital content on top of recognized markers. The platform also supports extended tracking, which ensures that the AR experience continues even when the marker is out of view, maintaining the virtual content's alignment with the real world.

Vuforia goes beyond image recognition and includes object recognition capabilities. This feature enables developers to recognize and track 3D objects, allowing users to interact with physical objects by overlaying digital information or animations on them. Vuforia seamlessly integrates with the Unity game development engine, making it a popular choice for AR development within the Unity environment. It also supports other platforms, including Android, iOS, and UWP.

Firebase:

Firebase Realtime Database is a NoSQL cloud-hosted database offered by Google as part of the Firebase platform. It utilizes a JSON tree structure to organize and store data, allowing for flexible and hierarchical data representation. One of its key advantages is real-time synchronization, where any changes made to the database are instantly propagated to all connected clients. This feature enables developers to build applications that provide live updates and real-time collaboration.

The Firebase Realtime Database also offers robust offline support, allowing applications to continue functioning even when the device is offline or has a weak internet connection. It maintains a local copy of the data on the client device, and once the connection is restored, it automatically synchronizes the changes with the server.

OCR.space:

The OCR.space API, offered by OCR.space, is a cloud-based Optical Character Recognition (OCR) service that provides convenient integration of OCR capabilities into applications, websites, or workflows. This API allows developers to extract text from various sources, including images, PDF files, and scanned documents. By employing advanced OCR algorithms, the API ensures accurate text extraction from these sources.

One notable feature of the OCR.space API is its extensive language support. It can recognize and extract text in a wide range of languages, making it suitable for multilingual applications.

Tinkercad:

Tinkercad is an online platform that provides a user-friendly and intuitive environment for creating and designing 3D models, circuits, and simulations. It is primarily aimed at beginners and students, offering a simple yet powerful toolset for learning and exploring the world of 3D design and electronics.

Tinkercad's design capabilities cover a wide range of 3D modeling and simulation tasks. Users can create basic shapes, manipulate and combine them to form complex objects, and apply various modifications such as scaling, rotating, and aligning. Additionally, Tinkercad provides tools for adding colors, textures, and even custom shapes to enhance the visual appeal of designs.

Text-to-speech convertors:

Online text-to-speech converters like Speaktoo are helpful for various applications, including accessibility for individuals with visual impairments, creating voice-overs for videos or presentations, or simply listening to written content instead of reading it. These converters typically employ advanced algorithms and synthetic speech technology to generate natural-sounding voices and accurate pronunciation of the text.

Users can typically customize aspects such as the speed, pitch, and volume of the generated speech to suit their preferences. Some text-to-speech converters may also offer additional features like multiple language support, different voice options, and the ability to save or download the generated audio files.

APPENDIX B: Project Plan

In this chapter we are going to have an overview about how much time does it took to complete each task like- Preliminary Survey Introduction and Problem Statement, Literature Survey, Project Statement, Software Requirement and Specification, System Design, Partial Report Submission, Architecture Design, Implementation, Deployment, Testing, Paper Publish, Report Submission and etcetera. This chapter also gives focus on stakeholder list which gives information about project type, customer of the proposed system, user and project member who developed the system.

Stakeholder Plan

S r. N o .	Stakeholder	User
1	Project Type	AR Book
2	Customer	Any one
3	User	User

System Implementation Plan

The System Implementation plan table, shows the overall schedule of tasks compilation and time duration required for each task

Phase	Task	Description
1	Analysis	Analyze the information related to project topic

2	System Design	Assign the module and design the process flow Control
3	Implementation	Implement the code for all the modules and integrate all the modules
4	Testing	Test the code and overall process whether the process works properly Test the code and over all process whether the process works properly
5	Maintenance	Modification of a software product after delivery to improve performance or maintainability

Project Estimate

Sr. No	Milestone Name	Milestone Description
1	Requirement Analysis	Complete specification of system
2	High level Design	Identify the modules and the different entities and their relationship
3	Detailed Design	GUI Design, program specification etc
4	Build	Writing code for different modules
5	Testing	Test the different modules together
6	Final review and Deployment	Checking all the requirements are fulfilled

Project Milestone

RECONCILED ESTIMATES

Estimate Reconciliation means the process of revising a previously Completed Package. Reconciling estimates empirically and technically is necessary with the estimated project size, we can use historical data to estimate the project effort (in person-month) and cost.

PROJECT RESOURCES

- Designer: To design systems and perform requirement gathering.
- Developer: To develop a system and provide it to tester for testing.

RISK MANAGEMENT

- **Technical Risk:** The probability of loss incurred through the execution of a technical process in which the outcome is uncertain. Untested engineering, technological or manufacturing procedures entail some level of technical risk that can result in the loss of time, resources, and possibly harm to individuals and facilities. Like mobile phone battery off, network error in user and server, multiple requests at time.
- **Operational Risk:** Operational risk is the prospect of loss resulting from inadequate or failed procedures, systems failures. Fraud or other criminal activity. Any event that disrupts processes, like user registration, login, send requests to service providers.
- **Schedule Risk:** Schedule risk is the risk that the project takes longer than scheduled. It can lead to cost risks, as longer projects always cost more, and to performance risk, if the project is completed too late to perform its intended tasks fully.

PROJECT SCHEDULE

PROJECT TASK SET

Major Tasks in the Project stages are:

Task 1- Requirement Gathering

Requirements gathering is a process that involves researching and documenting the project's exact requirements from start to finish. It is the process of determining what your projects need to achieve and what needs to be created to make that happen.

Task 2- Literature Survey

It is an overview of the previously published works on a specific topic. It provides a description, summary, and critical evaluation of these works in relation to the research problem being investigated.

Task 3- System Design

Systems design is the process of defining the architecture, product design, modules, interfaces, and data for a system to satisfy specified requirements. The basic study of system design is the understanding of component parts and their subsequent interaction with one another.

Task 4- Functionality Implementation

Implementation is the process that turns strategies and plans into actions in order to accomplish strategic objectives and goals. It is the part where developers actually write code and build the application according to the earlier design documents and outlined specifications.

Task 5- Testing

Building software is not the end. It must be tested to make sure that there aren't any bugs and that the end-user experience will not negatively be affected at any point. During the testing stage, developers will go over their software with a fine-tooth comb, noting any bugs or defects that need to be tracked, fixed, and later retested

Priority (High to Low)	Risks	Back-up plan
1	Schedule	Overtime
2	Operational	Validation
3	Business	Marketing
4	Technical	-

- Task 1: Requirement Gathering
- Task 2: Literature Survey
- Task 3: System Design
- Task 4: Functionality Implementation
- Task 5: Testing

TEAM ORGANIZATION

TEAM STRUCTURE


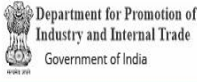


Whatever activities are done related to the project that we all showing all details login to our guide.

All the reports are noted to the guide.

Work Task	Description	Duration
Literature Search	Related work done for conceptual data similarity	6 weeks

System analysis	Critical analysis and comparison of technologies studied and results achieved in research	4 weeks
Design and Planning	Modeling and design and dataset searching or creation	8 weeks
Implementation on	Divided into phases	
Phase A	Implementation module 1	2 weeks
Phase B	Implementation module 2	2 weeks
Phase C	Implementation module 3	2 weeks
System Testing	Test System quality, fix errors if any and improve if needed. Test system for different data sets	3 weeks
Final Report	Prepare and upload Initial Report	2 weeks
Initial Report	Prepare and upload Initial Report	2 weeks

APPENDIX C: Copyright Certificate



Home | Edit Profile | Change Password

Welcome Chetan Desale (Applicant) [User Home](#) [Options](#) [Logout](#)

Online Services

[e-Filing of Application](#)

[Pending Application for Form XIV](#)

[Status of the Application](#)

[Details of Processing Fee](#)

[Check List](#)

[Workflow](#)

[Upload Discrepancy Reply](#)

[Pre-Hearing Documents](#)

[Hearing Documents](#)

[Upload Work & Documents](#)

[Re-Upload Work By Applicant](#)

[Make Repayment](#)

[Pending Payment](#)

[Payment History](#)

[Objection Petition](#)

Select Form Type :

Form XIV

 1 Registered,

☐ Submitted ☒ Registered

Search By Diary / Title :

List of Registered Application(s)

ROC Number	Old DiaryNo	Work Title	Class of Work	Submitted By	Submitted On	Status	Documents	Work Atatus
L-122905/2023		AR Book With 3D Animation	Literary/ Dramatic	Chetan Desale	18/11/2022	Registered	View	Submitted

Shows :

1 - 1000

APPENDIX D: Participation Certificate





APPENDIX E: Information of Group Members

Name : Udayraj Sudhakar Kothawade

Date of Birth : 24/11/2000

Gender : Male

Permanent Address : At Post Dahiwade Chalisgaon

E-Mail : kothawadeudayraj24@gmail.com

Mobile/Contact No: 8411062665



Name : Ankush Dilip Pethe

Date of Birth : 30/08/2001

Gender : Male

Permanent Address : Anand Colony Morshi, Amravati

E-Mail : petheankush30@gmail.com

Mobile/Contact No: 9067736921



Name : Chetan Kakaji Desale

Date of Birth : 31/10/2001

Gender : Male

Permanent Address : Jogeshwari Nagar, Malegaon

E-Mail : desale31chetan@gmail.com

Mobile/Contact No: 8975337995



Name : Disha Sagar Pawar

Date of Birth : 22/12/2001

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