CONVERSION OF 2D IMAGES INTO 3D USING AUGMENTED REALITY WITH LABELS

Major Project Report Phase -I

Submitted To

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For

The Partial Fulfillment of Degree

of

Bachelor of Technology

in

Computer Science & Engineering

By

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DECLARATION BY THE CANDIDATE

We the undersigned solemnly declare that the Major Project Phase - I work entitled **"CONVERSION OF 2D IMAGES INTO 3D USING AUGMENTED REALITY WITH LABELS"** is based on our own work carried out during the course of our study under the supervision of **Mrs. Sumitra Samal.**

We assert that the statements made, and conclusions drawn are an outcome of the project work. We further declare that to the best of our knowledge and belief that the report does not contain any part of any work which has been submitted for the award of any other degree/diploma/certificate in this University/deemed University of India or any other country.

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CERTIFICATE OF THE SUPERVISOR

This is to certify that the Major project phase - I report entitled **"CONVERSION OF 2D IMAGES INTO 3D USING AUGMENTED REALITY WITH LABELS"** is a record of project work carried out under my guidance and supervision for the partial fulfillment of the award of the degree of Bachelor of Technology in the faculty of Computer Science & Engineering of Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.) India.

To the best of my knowledge and belief the report

i) Embodies the work of the candidate himself

ii) Has duly been completed.

iii) Fulfills the partial requirement of the ordinance relating to the B.Tech. degree of the University

iv) Is up to the desired standard both in respect of contents and language for being referred to the examiners.

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CERTIFICATE BY THE EXAMINERS

The project report entitled **"CONVERSION OF 2D IMAGES INTO 3D USING AUGMENTED REALITY WITH LABELS"** has been examined by the undersigned as a part of the examination of Bachelor of Technology in the faculty of Computer Science & Engineering of Chhattisgarh Swami Vivekanand Technical University, Bhilai.

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LIST OF SYMBOLS

,	Comma
.	Full Stop
‘’	Inverted Comma
()	Parenthesis
:	Colon
-	Hyphen
“”	Double Inverted Comma
[]	Angular Bracket

LIST OF ABBREVIATIONS

AODV	Ad hoc On demand Distance Vector
AR	Augmented Reality
IMAR	Image Processing through AR
UI	User Interface
JDK	Java Development Kit
apk	Android Package Manager
RAM	Random Access Memory
OS	Operating System

LIST OF FIGURES

ABSTRACT

Student occasionally find it challenging to learn from books because they can only grasp things in 2D. It takes a lot of effort and time to envision each component and comprehend how it works while learning. Modern technologies benefit students by minimizing the amount of time they need to know. In this Project, we use the idea of augmented reality to create a straightforward mobile instructional application. Augmented reality for a mobile device is a relatively young but expanding area of mobile application. It makes it possible to combine the physical experience of the actual world with information-based virtual reality. This project examines how the link is created and the valuable and entertaining uses of this technology. The proposed system will give a 3D representation of an image.

Keywords: Augmented Reality, 2D to 3D conversion, Unity 3D, 3D models, Vuforia.

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CHAPTER-1

INTRODUCTION

1.1 OVERVIEW

Due to the limited amount of 2D visuals they receive in books, students occasionally find it challenging to study from them. It is challenging and time-consuming to imagine each component while studying and comprehending how it works. Students in other countries benefit from cutting-edge technology, which reduces their learning time. However, in India, either these technologies are not available to our kids yet or they are not yet aware of them. Therefore, we are employing AR technology to address this issue.

Augmented reality is referred to as AR. One of the current significant trends in technology is augmented reality (AR). The technology known as augmented reality (AR) enlarges our physical world by adding layers of digital data on top of it. The goal of augmented reality (AR) is not to completely replicate real settings in virtual ones. Directly overlaying sounds, films, and pictures over an existing environment is augmented reality (AR).

These days, augmented reality (AR) is regarded as one of the most significant technology trends. The era of augmented reality (AR) adds layers of digital information to our actual world. To replace actual virtual ones, AR no longer creates false worlds. With augmented reality (AR), the immediate environment is enhanced with noises, motion pictures, and graphics. Users who see objects in augmented reality (AR) can notice features and the scale of an object that they cannot see from a plain photograph. Exploration is the key component of AR, which ultimately helps pupils learn and comprehend. Studies are being impacted by the COVID-19 pandemic because online programmers have replaced traditional classroom instruction. However, this program will prove useful for both students and teachers.

For instance, a biology instructor can swiftly go over all the key aspects relating to a certain body area, and students will pick it up quickly thanks to the 3D model that is readily available to them (through the app). We used the cross-platform gaming engine unity to create this application. The photograph will be scanned by this application, which will then superimpose a 3D image to aid in immediate visualization and a better understanding of how it appears in the actual world. The purpose of this project is to maximize the benefits of augmented reality applications in education.The AR modifies the impression of reality by overlaying computer-generated graphics on top of aview of the physical real-world surroundings.

There are 4 types of augmented reality today:

- Markerless AR
- Marker-based
- Projection based AR
- Superimposition based AR

1. **Markerless AR**

   Markerless Augmented Reality is used to denote an AR application that doesn't need prior knowledge of a user's environment to overlay 3D content into a scene and hold it to a fixed point in space. Markerless Augmented Reality (AR) is the preferred image recognition method for AR applications. Learn how it works, the advantages of markerless AR, and how industries and companies benefit from incorporating this technology into their products and services.

2. **Marker-based AR**

   This type of AR, also known as recognition-based AR or image recognition, relies on identification of markers/user-defined images to function. Marker-based AR requires a marker to activate an augmentation. Markers are distinct patterns that cameras can easily recognize and process, and are visually independent of the environment around them; they can be paper-based or physical objects that exist in the real world. Maker-based AR works by scanning a marker which triggers an augmented experience (whether an object, text, video or animation) to appear on the device. It usually requires software in the form of an app, which enables users to scan markers from their device using its camera feed.

3. **Projection-based AR**

   Projection AR, sometimes also referred to as spatial AR, is a method of delivering digital information within a stationary context. It focuses on rendering virtual objects within or on a user’s physical space. It is one of the simplest forms of AR where light is projected onto a surface. The interaction occurs by touching the projected surface physically.

In projection AR the user is not limited to any device as virtual objects are integrated directly into the environment; users and target objects are also able to move around the environment within a specified zone, in which both the fixed projector and supporting camera for tracking are placed. Projection-based AR methods may be used to create illusions about depth, position, and orientation of an object.

4. Super-imposition based AR

Superimposition AR involves either partial or full replacement of an original view of an object with an augmented view of the same object. In this type of AR, object recognition plays a vital role because an app cannot replace an original object with an augmented one if it cannot identify the original object. This type of AR has been popularized by social platforms such as Instagram, Facebook, and Instagram using filters.

1.2 PROJECT OVERVIEW

Technology is used in Smart Education through Augmented Reality (IMAR) application. It is really simple to get to. The items are included in the search since we think that seeing something is the best method to learn about it. Users who see objects in augmented reality (AR) might see features and the scale of anobject that they might not otherwise notice from a plain picture. Exploration is the foundation of AR, which eventually guides children toward learning and comprehension.

Due to the COVID-19 epidemic , studies are being impacted because online classes have replaced offline instruction. But both teachers and students will find this program useful.For instance, a biology teacher can swiftly go over all the key aspects relating to a particular body component, and with the student's access to the 3D model (through the app), they would be able to pick it up quickly.

We used the cross-platform gaming engine unity to create this application. This program will scan the image and overlay a 3D image to aid in better understanding how it appears in the real world and to aid in speedy visualization.

The term Augmented Reality (AR) describes the combination of the physical world and the virtual (computer-generated) world. The actual image is photographed and then "augmented" with additional layers of digital data. Before designing the system, a lot of distinct components must be considered. It takes some expertise and experience to build modules and interfaces, create the architecture, and choose the right components. Comparable to using systems theory in product development is the design process. The parts that describe the process are listed below.

A. Image Capture

Real-world photos are captured via a camera and displayed. The device camera takes pictures of the 2D images from the book that will be made into 3D. It's important to capture images properly.

B. Image Processing

A fundamental shift in how people engage with data will be facilitated by augmented reality (AR), a major generation. For diverse input sources, augmented reality uses a variety of image processing techniques. Various outputs can be produced based on the input sources.

C. Marker Recognition

A Marker is an image (it might be anything) that can be uniquely identified and cannot be confused with other images, as it is the point of entry for virtual materials into the physical world. The application is designed to find the marker in any scene and provide information about its position and orientation.

D. Markerless Recognition

Markerless Augmented Reality (AR) refers to a type of software that may overlay virtual 3D content onto a scene and keep it fixed in the designated area without prior knowledge of the user's surroundings. The primary method for photograph recognition in Augmented Reality (AR) systems is markerless. This photo processing is different from the opposite reputation in that it employs a marker created from the photographs that are taken using the camera rather than a predefined marker. Two steps make up this process:

1. Preprocessing:
It is the initial stage of the scanned image's processing. The environment is recreated in three dimensions using pictures obtained from various angles.

2. Real-time Processing:
The feature point is retrieved from the live stream using SURF after the files that are kept in the database are imported first [2]. Then, using the orientation and purpose of the actual-international coordinate obtained from the acquired image, the 3D components are rendered.

CHAPTER-2

PROJECT REQUIREMENT ANALYSIS

2.1 PROJECT OBJECTIVE IN DETAIL

The IMAR App's main goal is to assist students in learning and, more especially, in understanding concepts more quickly and simply. Because understanding ideas and concepts are more crucial for pupils than memorizing facts. To start, learning concepts makes it easier for pupils to learn other things, and they can make up facts on their own. For instance, by understanding the right view of a human body component, students will find it easier to explore the concept and they do not need to memorize the solution for each unique problem. This is because comprehending ideas and concepts open the mind and improve the imagination.

A live view of a physical environment in which aspects are improved by computer-generated sensory inputs is known as augmented reality (AR). To facilitate interactions, manipulations, and active participation by students as well as to provide supplemental information that improves knowledge acquisition with an integrative approach, augmented reality (AR) is used in education to enhance lecture notes, 3D models, or other objects with multimedia. As a cutting-edge technology, AR has fundamentally changed the way that E-learning is done, moving it away from textbook learning and toward immersive virtual experiences.

It is anticipated that our new AR educational software with extended functions will provide the basis for the establishment of a comprehensive set of AR-based E-learning materials which form a valuable component of the curriculum for education to benefit students from more disciplines in the future.

The aim of this project is to maximize the positive impacts of AR applications in education. The key elements in strategies for optimized use of AR in the learning and teaching is both during lectures/ tutorials and through self-exploration where individualized experience is achieved with participatory learning in a student-centered manner.

2.2 SOFTWARE REQUIREMENTS

2.2.1 DEVELOPER'S REQUIREMENTS

2.2.1.1 OS: Windows 10 64bit / macOS 10.12+

2.2.1.2 Vuforia-AR-Support

2.2.1.3 Unity 2017.3.0p4

2.2.1.4 Android Studio

2.2.1.5 Visual Studio

2.2.1.6 JDK

2.2.1.7 HTML, CSS, Bootstrap

2.2.2 END USER'S REQUIREMENTS

2.2.2.1 Android 9 or above

2.3 HARDWARE REQUIREMENTS

2.3.1 DEVELOPER'S REQUIREMENTS

2.3.1.1 Graphic card with DX10(shader model 4.0) capabilities

2.3.1.2 Processor: i7 6700HQ or above

2.3.1.3 RAM: 8GB or above

2.3.1.4 Storage: 25GB

2.3.2 END USER'S REQUIREMENTS

2.3.2.1 Smart Phone

2.3.2.2 RAM: 2GB or above

2.3.2.3 Storage: 2GB

2.4 MODULAR REQUIREMENTS

There are mainly three modules:-

- UI Module
- AR Module
- Database Module

2.4.1 UI MODULE

This is the module that the AR client (user) will interact upon opening the app. The camera will be opened by default when the app is opened. So that the user can scan the image that he/she wants to get the 3d image. And then the 3d image will also be shown in this module.

Figure 2.4.1 UI Module

The UI Module also consists of the IMAR Website. The IMAR Website is developed to get all the target images i.e., the 2D image of any object. In this website user can download images as well as our the apk file of the IMAR application in their smart phone. It provide a platform to easily access the application.

2.4.2 AR MODULE

This module will run in the background i.e., the user cannot see the work that is being done in this module. In this module, the app will check whether the scanned image is present in the database or not. If the image is not present in the database then there willbe no change in the UI Module. And if the image is present in the database then the 3d image will be superimposed over the scanned image.

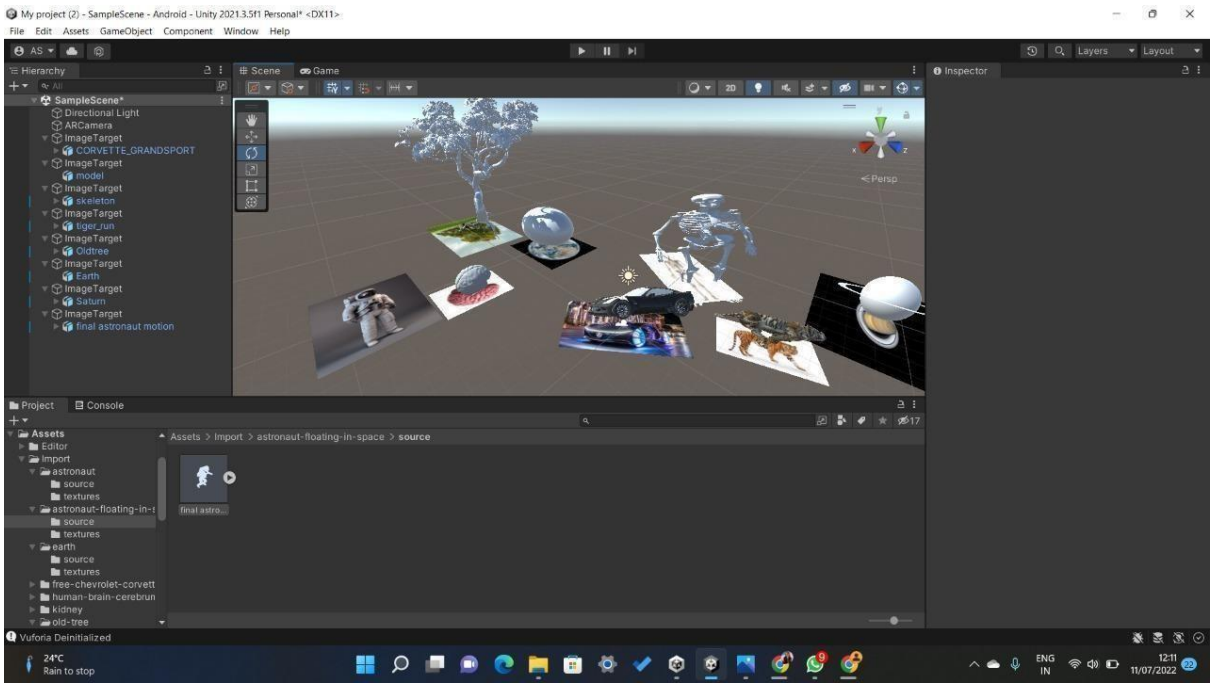


Figure 2.4.2 AR Module

2.4.3 DATABASE MODULE

Database servers are some of the most complicated nodes in a network often because they are shared across many applications. The database module collects information about the connectivity of each schema within your database host, and integrates client connections into our overall connectivity architecture. Assessments with the Database Module active are able to map server dependency to the schema level so an organization can understand what particular data sets an application may be dependent on. This Module contains the database. It basically has all the images that the usercan scan and get the 3d view.

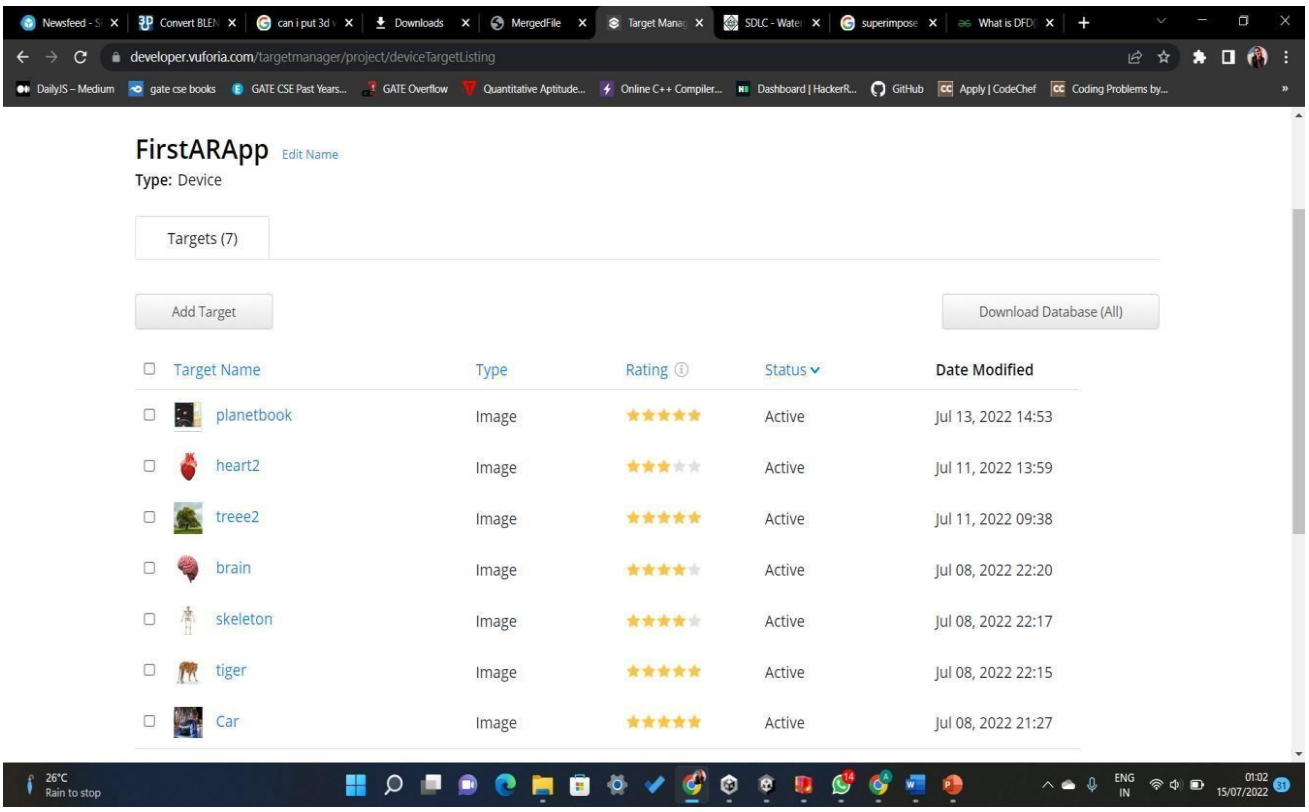


Figure 2.4.3 Database Module

CHAPTER-3

PROBLEM IDENTIFICATION AND DESIGN

3.1 FLOWCHART

A flowchart is a picture of the separate steps of a process in sequential order. It is a generic tool that can be adapted for a wide variety of purposes, and can be used to describe various processes, such as a manufacturing process, an administrative or service process, or a project plan. It's a common process analysis tool and one of the seven basic quality tools.

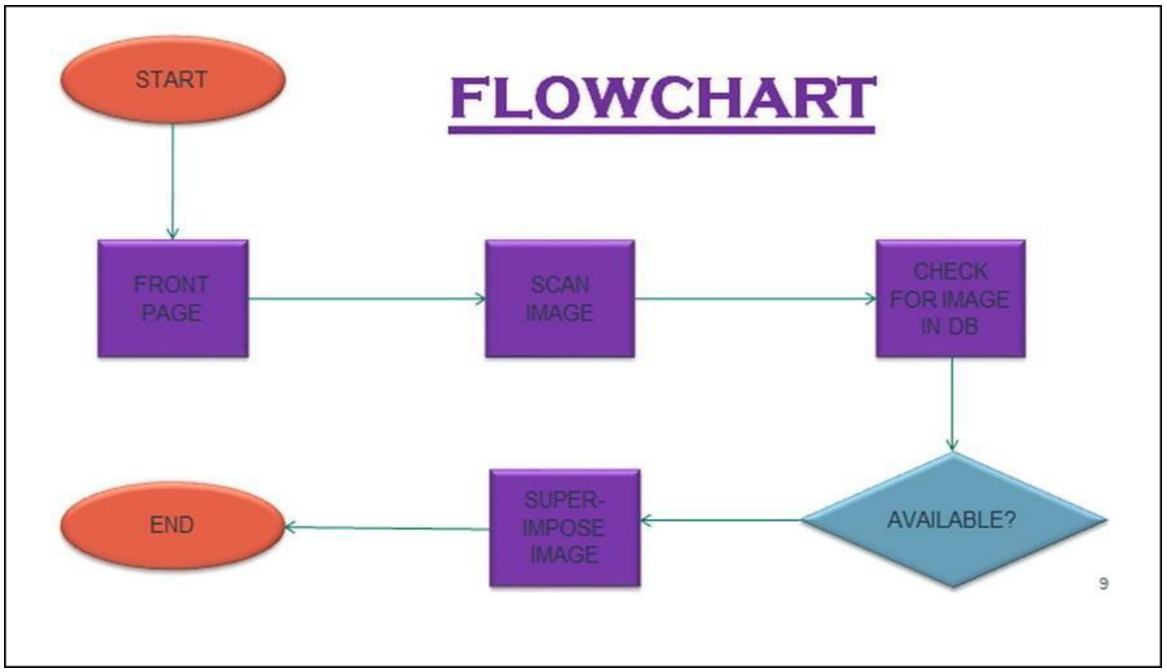


Figure 3.1 Flowchart

INPUT: 2D graphics taken from a textbook as input.
OUTPUT: 3D model of the input image is the output.
PROBLEM DESCRIPTION: Identification of the 2D image and presentation of its 3D model for enhanced viewing.
Step I: Start.
Step II: Scan the 2D image from a textbook or which is displayed on a screen.
Step III: The application will check whether the image is present in Vuforia Database or not.
Step IV: If the image is not present, then nothing will be displayed.
Step V: If present, then the user will get to see a 3D model of the given image.
Step VI: End.

3.2 DATAFLOW DIAGRAM/MECHANISM

A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination. Data flowcharts can range from simple, even hand-drawn process overviews, to in-depth, multi-level DFDs that dig progressively deeper into how the data is handled.

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It can be manual, automated, or a combination of both. It shows how data enters and leaves the system, what changes the information, and where data is stored.

The Data Flow Diagram has 4 components:

• Process:
Input to output transformation in a system takes place because of process function. The symbols of a process are rectangular with rounded corners, oval, rectangle or a circle

- Data Flow:

Data flow describes the information transferring between different parts of the systems. The arrow symbol is the symbol of data flow. A relatable name should be given to the flow to determine the information which is being moved. Data flow also represents material along with information that is being moved.

• Warehouse:
The data is stored in the warehouse for later use. Two horizontal lines represent the symbol of the store. The warehouse is simply not restricted to being a data file rather it can be anything like a folder with documents, an optical disc, a filing cabinet.

- Terminator:

The Terminator is an external entity that stands outside of the system and communicates with the system.

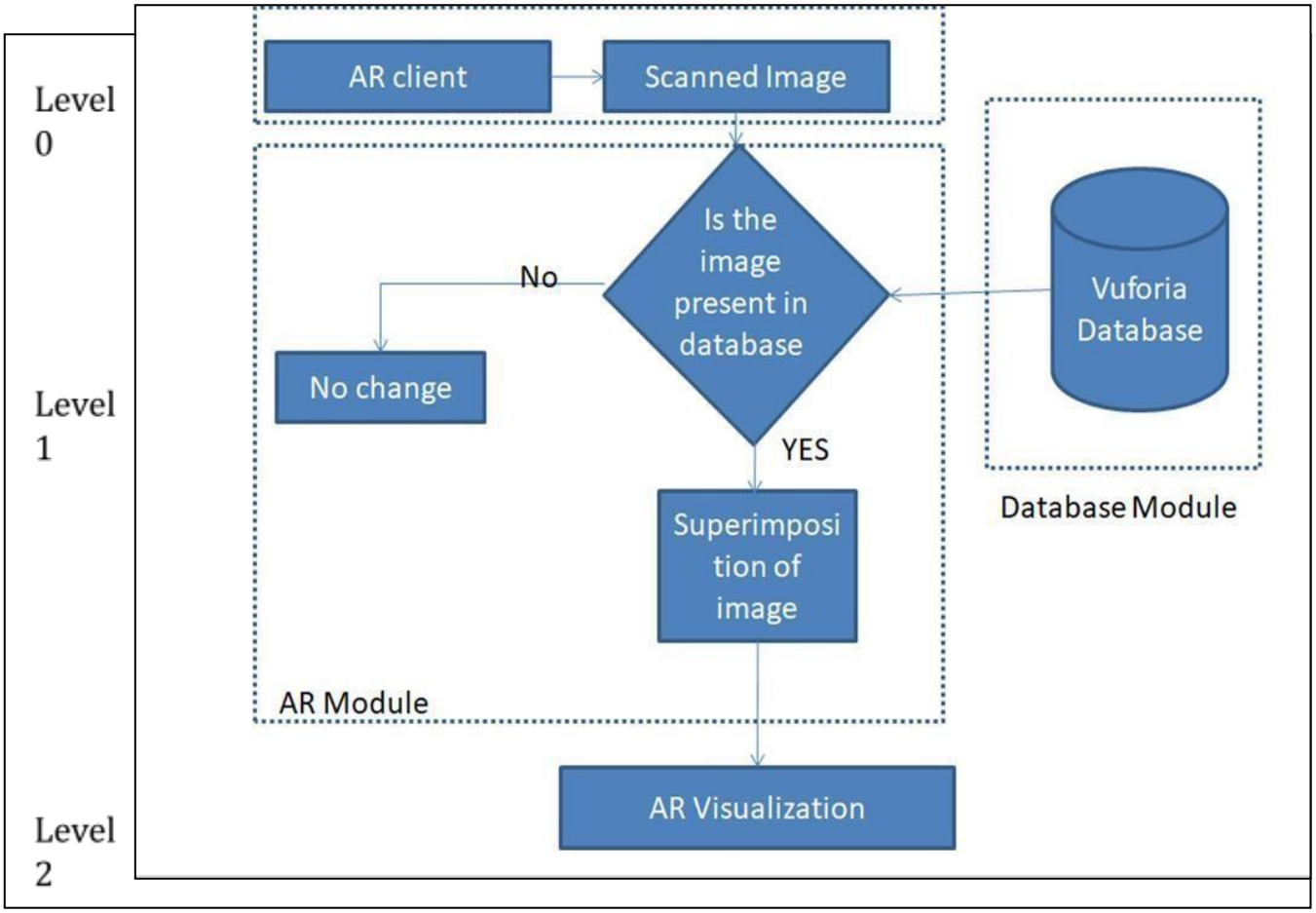


Figure 3.2 Data Flow Diagram

3.3 USE CASE DIAGRAM

In the Unified Modelling Language (UML), a use case diagram can summarize the details of your system's users (also known as actors) and their interactions with the system. To build one, you'll use a set of specialized symbols and connectors. An effective use case diagram can help your team discuss and represent:

- Scenarios in which your system or application interacts with people, organizations, or external systems
- Goals that your system or application helps those entities (known as actors) achieve
- The scope of your system

It is essential to analyze the whole system before starting with drawing a use case diagram, and then the system's functionalities are found. And once every single functionality is identified, they are then transformed into the use cases to be used in the use case diagram.

After that, we will enlist the actors that will interact with the system. The actors are the person or a thing that invokes the functionality of a system. It may be a system or a private entity, such that it requires an entity to be pertinent to the functionalities of the system to which it is going to interact.

Once both the actors and use cases are enlisted, the relation between the actor and use case/ system is inspected. It identifies the no of times an actor communicates with the system. Basically, an actor can interact multiple times with a use case or system at a particular instance of time.

Following are some rules that must be followed while drawing a use case diagram:

1. A pertinent and meaningful name should be assigned to the actor or a use case of a system.
2. The communication of an actor with a use case must be defined in an understandable way.

The purpose of a use case diagram in UML is to demonstrate the different ways that a user might interact with a system. In the Unified Modeling Language (UML), a use case diagram can summarize the details of your system's users (also known as actors) and their interactions with the system. To build one, you'll use a set of specialized symbols and connectors.

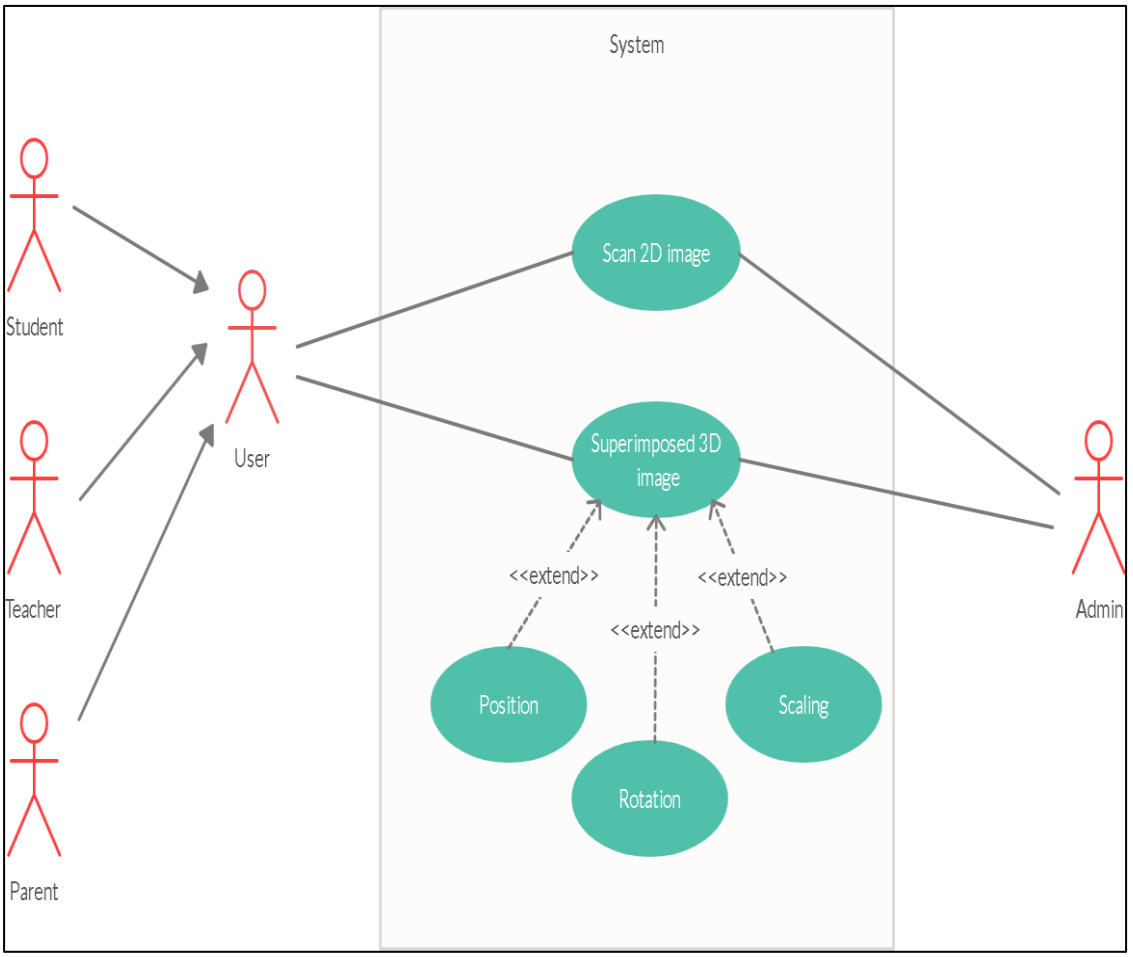


Figure 3.3 Use Case Diagram

3.4 ER DIAGRAM

ERD stands for entity relationship diagram. People also call these types of diagrams ER diagrams and Entity Relationship Models. An ERD visualizes the relationships between entities like people, things, or concepts in a database. An ERD will also often visualize the attributes of these entities.

By defining the entities, their attributes, and showing the relationships between them, an ER diagram can illustrate the logical structure of databases. This is useful for engineers hoping to either document a database as it exists or sketch out a design of a new database.

An ER diagram can help businesses document existing databases and thereby troubleshoot logic or deployment problems or spot inefficiencies and help improve processes when a business wants to undertake business process re-engineering. ERDs can also be used to design and model new databases and make sure that engineers can identify any logic or designflaws before they're implemented in production.

- Document an existing database structure
- Debug, troubleshoot, and analyze
- Design a new database
- Gather design requirements
- Business process re-engineering (BPR)

When documenting a system or process, looking at the system in multiple ways increases the understanding of that system. ERD diagrams are commonly used in conjunction with a data flow diagram to display the contents of a data store. They help us to visualize how data is connected in a general way, and are particularly useful for constructing a relational database.

Following are the main components and its symbols in ER Diagrams:

- Rectangles: This Entity Relationship Diagram symbol represents entity types
- Ellipses: Symbol represent attributes
- Diamonds: This symbol represents relationship types

• Lines: It links attributes to entity types and entity types with other relationship types

• Primary key: attributes are underlined

• Double Ellipses: Represent multi-valued attributes

This model is based on three basic concepts:

• Entities

• Attributes

• Relationships

1. Entity:
A real-world thing either living or non-living that is easily recognizable and nonrecognizable. It is anything in the enterprise that is to be represented in our database. It may be a physical thing or simply a fact about the enterprise or an event that happens in the real world.

2. Attributes:
It is a single-valued property of either an entity-type or a relationship-type.

3. Relationships:
Relationship is nothing but an association among two or more entities.

One-to-one − When only one instance of an entity is associated with the relationship, it is marked as '1:1'. The following image reflects that only one instance of each entity should be associated with the relationship. It depicts one-to-one relationship.

One-to-many − When more than one instance of an entity is associated with the relationship, it is marked as '1:N'. The following image reflects that only one instance of each entity on the left and more than one instance of an entity on the right can be associated with the relationship. It depicts one-to-many relationship.

Many-to-one − When more than one instance of an entity is associated with the relationship; it is marked as 'N:1'. The following image reflects that only one instance of each entity on the left and only instance of an entity on the right can be associated with the relationship. It depicts many-to-one relationship.

Many-to-many − Each record of the first table can relate to any records (or no records) in the second table. Similarly, each record of the second table can also relate to more than one record of the first table. It is also represented an N: N relationship.

Participation Constraints:
• Total Participation: Each entity is involved in the relationship. Total participation is represented by double lines..
• Partial Participation: Not all entities are involved in the relationship. Partial participation is represented by single lines.

Weak Entity Type:
The entity sets which do not have sufficient attributes to form a primary key are known as weak entity sets and the entity sets which have a primary key are known as strong entity sets. Weak entity is dependent on strong entity to ensure the existence of weak entity.

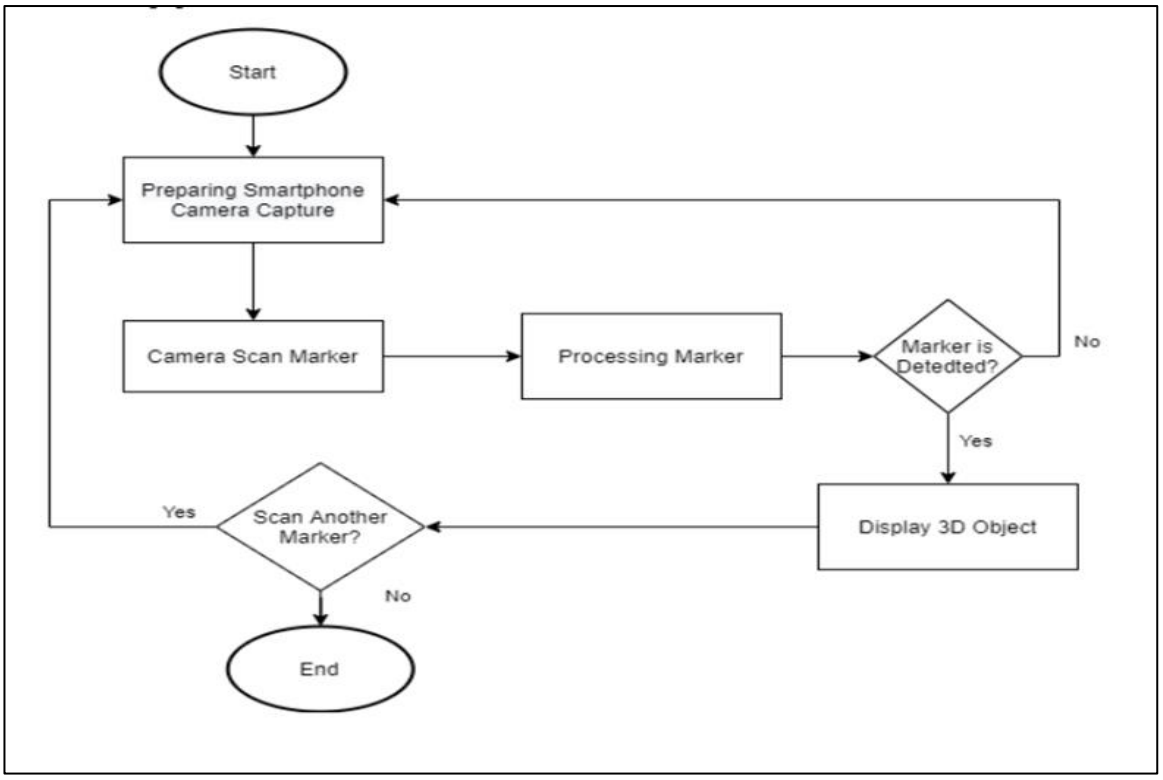


Figure 3.4 ER Diagram

3.5 ALGORITHM

Use Transform. Rotate to rotate GameObjects in a variety of ways. The rotation is often provided as an Euler angle and not a Quaternion.

PARAMETERS

Parameter	Description
relativeTo	Determines whether to rotate the GameObject either locally to the GameObject or relative to the Scene in world space.
eulers	The rotation to apply in euler angles.
xAngle	Degrees to rotate the GameObject around the X axis.
yAngle	Degrees to rotate the GameObject around the Y axis.
zAngle	Degrees to rotate the GameObject around the Z axis.
axis	The axis to apply rotation to.
angle	The degrees of rotation to apply.

Table 3.5 Parameters

3.6 SDLC MODEL

Software Development life cycle (SDLC) is a spiritual model used in project management that defines the stages include in an information system development project, from an initial feasibility study to the maintenance of the completed application.

There are different software development life cycle models specify and design, which are followed during the software development phase. These models are also called "**Software Development Process Models**." Each process model follows a series of phase unique to its type to ensure success in the step of software development.

3.6.1 WATERFALL MODEL

The Waterfall Model was the first Process Model to be introduced. It is also referred toas a **linear-sequential life cycle model**. In a waterfall model, each phase must be completed before the next phase can begin and there is no overlapping in the phases.
Waterfall approach was first SDLC Model to be used widely in Software Engineering to ensure success of the project. In "The Waterfall" approach, the whole process of software development is divided into separate phases. In this Waterfall model, typically, the outcome of one phase acts as the input for the next phase sequentially.

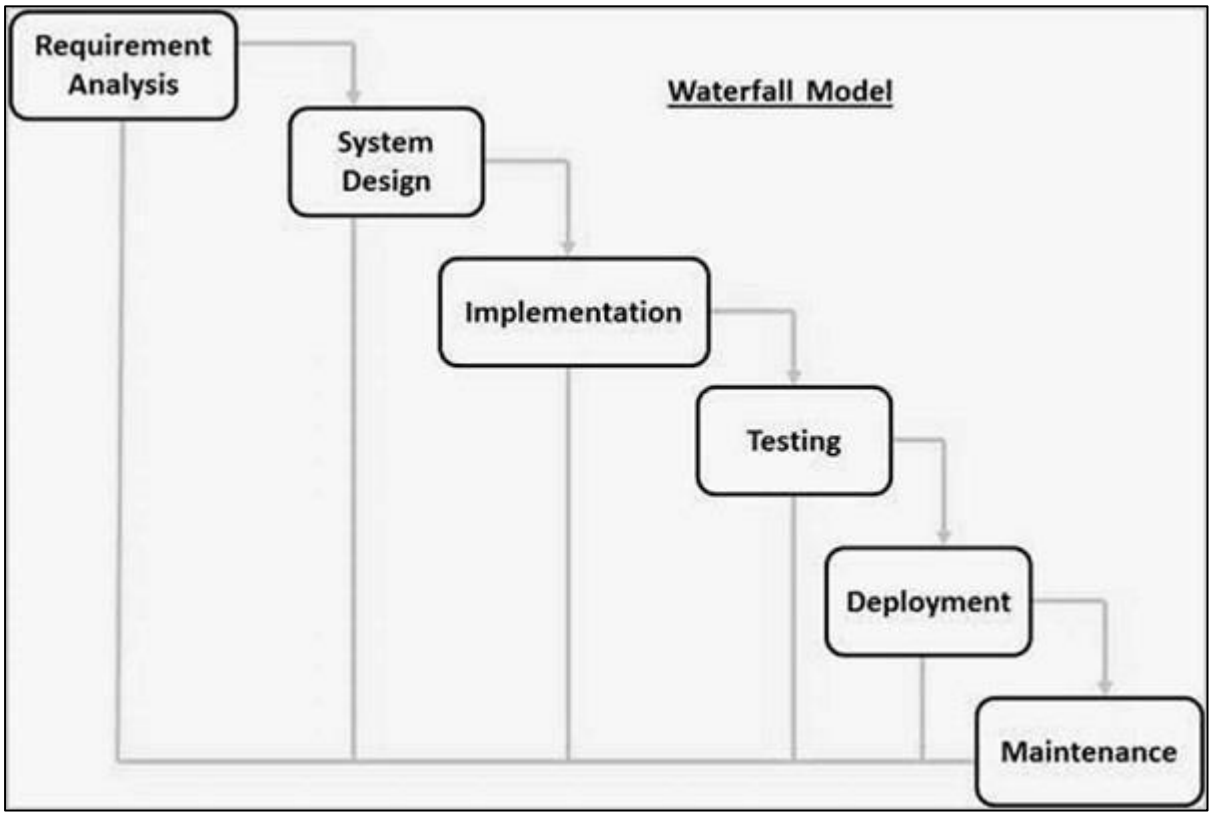


FIG. 3.6 WATERFALL MODEL

3.6.2 PHASES OF WATERFALL MODEL

1. **REQUIREMENTS:-** All possible requirements of the system to be developed are captured in this phase and documented in a requirement specification document. In this phase, you must define the requirements. 2D images from the book which is used to get desired 3D image.

2. **ANALYSIS:-** The system specifications are analyzed to generate product models and business logic to guide production. This is also when financial and technical resources are audited for feasibility.Analyzing the image to convert them into correct and authentic 3D models.

3. **DESIGN**:- A design specification document is created to outline technical design requirements, such as the programming language, hardware, data sources, architecture and services.Front Page from the user to select camera so that it can capture the2D image.

4. **IMPLEMENTATION:-** The source code is developed using the models, logic and requirement specifications designated in the prior phases. Typically, the system is coded in smaller components, or units, before being put together.Implementing using Unity and Vuforia.

5. **TESTING :-** This is when quality assurance, unit, system and beta tests identify issues that must be resolved. This may cause a forced repeat of the coding stage for debugging. If the system passes integration and testing, the waterfall continues forward.Using 2D images to convert them into 3D models.

6. **MAINTENANCE:-** Corrective, adaptive and perfective maintenance is carried out indefinitely to improve, update and enhance the product and its functionality. This could include releasing patch updates and new versions. Adding more images in database, labelling.

CHAPTER-4

METHODOLOGY

4.1 SOFTWARE USED

- **OS: Windows 10 64bit / macOS 10.12+**
  An OS is system software that manages computer hardware, software resources, and provides common services for computer programs.

- **Unity 2017.3.0p4**
  The unity version used is 2017.3.0p4. Unity is, simply put, the world's most popular game engine. It packs a ton of features together and is flexible enough to make almost any game you can imagine.

- **Vuforia-AR-Support**
  Vuforia is an augmented reality software development kit (SDK) for mobile devices that enables the creation of augmented reality applications. It uses computer vision technology to recognize and track planar images and 3D objects in real time. So Vuforia-AR-Support is used in the unity software to support AR.

- **Android Studio**
  Android studio is used as a support in the unity game engine. This is used to generate the apk file from the unity game engine.

- **Visual Studio**
  Visual studio is used as an editor to write the code for the website. The website is made to provide the users the images to scan and they can also download the apk file from the website.

- **JDK**
  JDK is the Java Development Kit. It is also used as a support for creating the apk file.

- **HTML, CSS, Bootstrap**
  This is the language used to make the website.

4.2 HARDWARE USED

- **Graphic card with DX10(shader model 4.0) capabilities**

  Graphics Card is the most important component. It is a piece of computer hardware that produces the image we see on a monitor. It does this by converting data into a signal that the monitor can understand.

- **Processor: i7 6700HQ or above**

  A processor is a small chip that resides in computers and other electronic devices. Its basic job is to receive input and provide the appropriate output. While this may seem like a simple task, modern processors can handle trillions of calculations per second.

- **RAM: 8GB or above**

  RAM is short for "random access memory" and RAM is one of the most fundamental elements of computing. RAM is the super-fast and temporary data storage space that a computer needs to access right now or in the next few moments.

- **Storage: 5GB**

  A minimum of 5GB of storage is required in the hard disk. As the software used i.e., Unity, Android Studio, JDK , etc. uses a lot of space. And also after the generation of the application that will also reside in the same folder.

4.3 WORKING PRINCIPLE

A. Augmented Model

The models are then added on top of the markers once the system has completed all of the recognition steps. You can find it under the Assets folder called "Model." The model is made a child of Image Target for it to appear over Image Target. Simply dragging and dropping the model prefab into the Hierarchy panel will accomplish this. When the Image Target is spotted by a mobile device's camera, all of the target's offspring show up at once. This module will operate in the background; thus, the user won't be able to see the work being done.

B. Running the Application

When the application is deployed, the installation package becomes accessible. The camera module will launch after the package has been installed. To render the relevant graphics, all the user needs to do is move the camera over the specified text or image. The 3D model will be displayed simply. The app will determine in this module whether or not the scanned image already exists in the database. There won't be any changes to the UI Module if the image isn't in the database. The 3D picture will be superimposed over the scanned image if the image is found in the database.

Here is a list of the equipment and procedures needed to use augmented reality to transform 2D photographs into 3D images.

A. Vuforia

Qualcomm Connected Experiences produced Vuforia. It is a platform for software that makes the best and most inventive encounters with augmented reality. Superior image recognition software from Vuforia is supported by several platforms including Android, iOS, Unity, and web-based browsers.

B. Unity 3D

A cross-platform IDE for game development is Unity3D. It can create sophisticated apps as well. It has extensive 3D design tools and supports Vuforia, making the implementation of augmented reality apps considerably simpler and quicker. It is written in C#.

C. Setting up Vuforia

The implementation is carried out in Vuforia and Unity. The Developer Portal for Vuforia is set up so that you must first register an account before you can begin working. A developer page can be accessed after signing in. When utilizing Vuforia

to construct an application in Unity, a license key serves as the ID. This license key is generated using a "License Manager" on the developer website. The next step in adding an Image Target in Unity is to use the "Target Manager." By including the Image Target database and filling up the information, this is accomplished. The brand-new database is updated with the photographs. Finally, Unity imports this target picture database from the download.

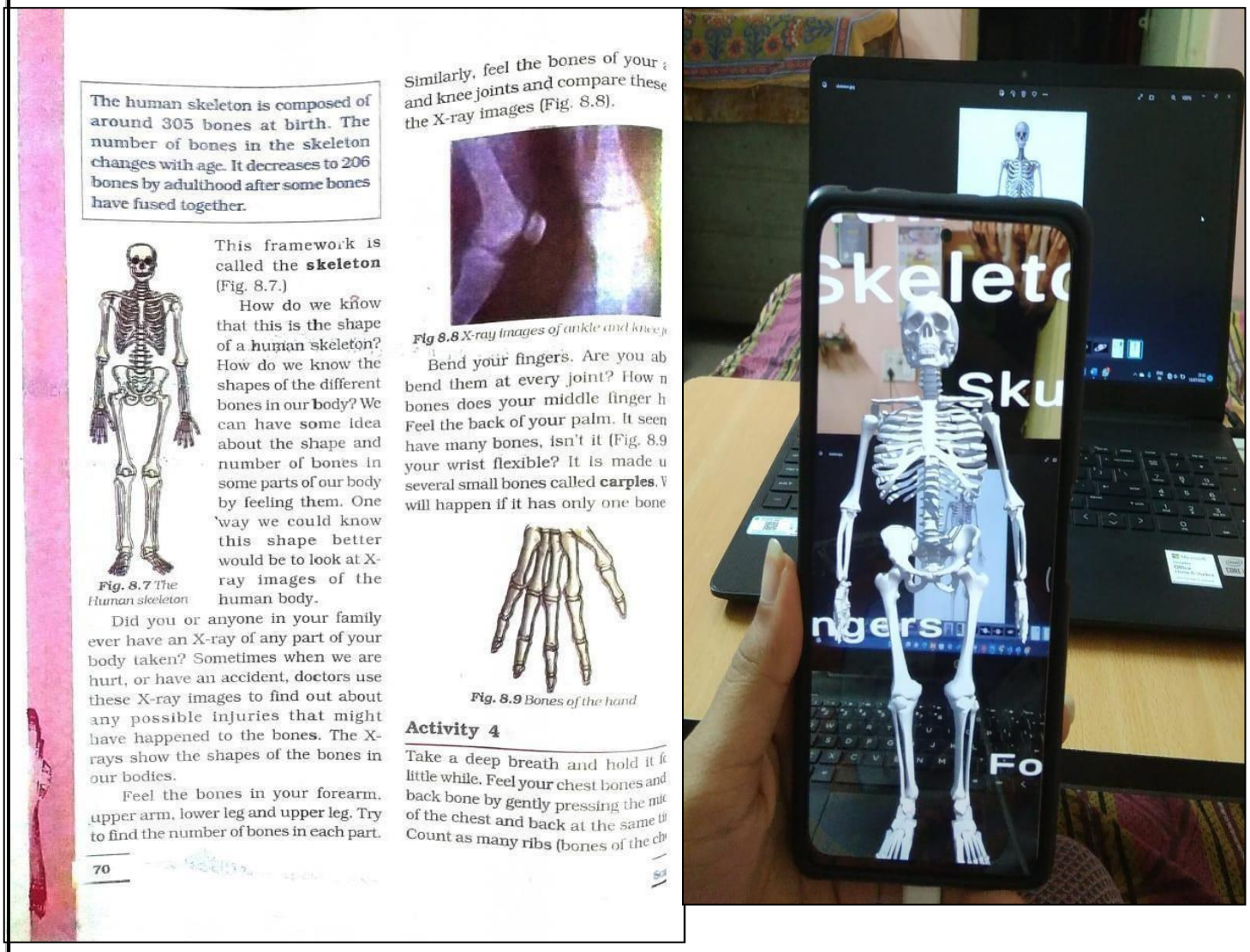
D. Integrating with Unity

The cross-platform application engine Unity, created by Unity Technologies, offers a foundation for creating 2D and 3D games or app sceneries. An Augmented Reality camera prefab from Vuforia is called "AR Camera." ." The "Prefabs" folder contains an Image Target that is added to the scene. Fig. The Image Target shown in Figure 6 was added to Unity and was obtained by importing the Vuforia dataset.

CHAPTER-5

TESTING & SNAPSHOTS

5.1 TEST TO CHECK THE QUALITY OF TARGET IMAGE



The human skeleton is composed of around 305 bones at birth. The number of bones in the skeleton changes with age. It decreases to 206 bones by adulthood after some bones have fused together.

Fig. 8.7 The Human skeleton

This framework is called the **skeleton** (Fig. 8.7.)

How do we know that this is the shape of a human skeleton? How do we know the shapes of the different bones in our body? We can have some idea about the shape and number of bones in some parts of our body by feeling them. One way we could know this shape better would be to look at X-ray images of the human body.

Did you or anyone in your family ever have an X-ray of any part of your body taken? Sometimes when we are hurt, or have an accident, doctors use these X-ray images to find out about any possible injuries that might have happened to the bones. The X-rays show the shapes of the bones in our bodies.

Feel the bones in your forearm, upper arm, lower leg and upper leg. Try to find the number of bones in each part.

70

Similarly, feel the bones of your a and knee joints and compare these the X-ray images (Fig. 8.8).

Fig 8.8 X-ray images of ankle and knee j

Bend your fingers. Are you ab bend them at every joint? How n bones does your middle finger h Feel the back of your palm. It seem have many bones, isn't it (Fig. 8.9 your wrist flexible? It is made u several small bones called **carples**. W will happen if it has only one bone

Fig. 8.9 Bones of the hand

Activity 4

Take a deep breath and hold it fo little while. Feel your chest bones and back bone by gently pressing the mid of the chest and back at the same ti Count as many ribs (bones of the ch

Figure 5.1 Test Case 1

Procedure: Choose an android phone with IMAR installed in it. Take print outs of the target image on two papers, one with high quality and another with low quality image. After scanning both the images with IMAR following observations were noticed.

Observation:- From the right side of image we observed that due to the poor quality of target image , the respective 3D object is not superimposed over it but it is clearly visible on the left side.This happens because of the difference in the quality of target images.

Conclusion: This proves our point that it is necessary to have clear image for IMAR to work.

5.2 TEST TO CHECK WHETHER THE LABELLING OF OBJECT IS SHOWING OR NOT:-

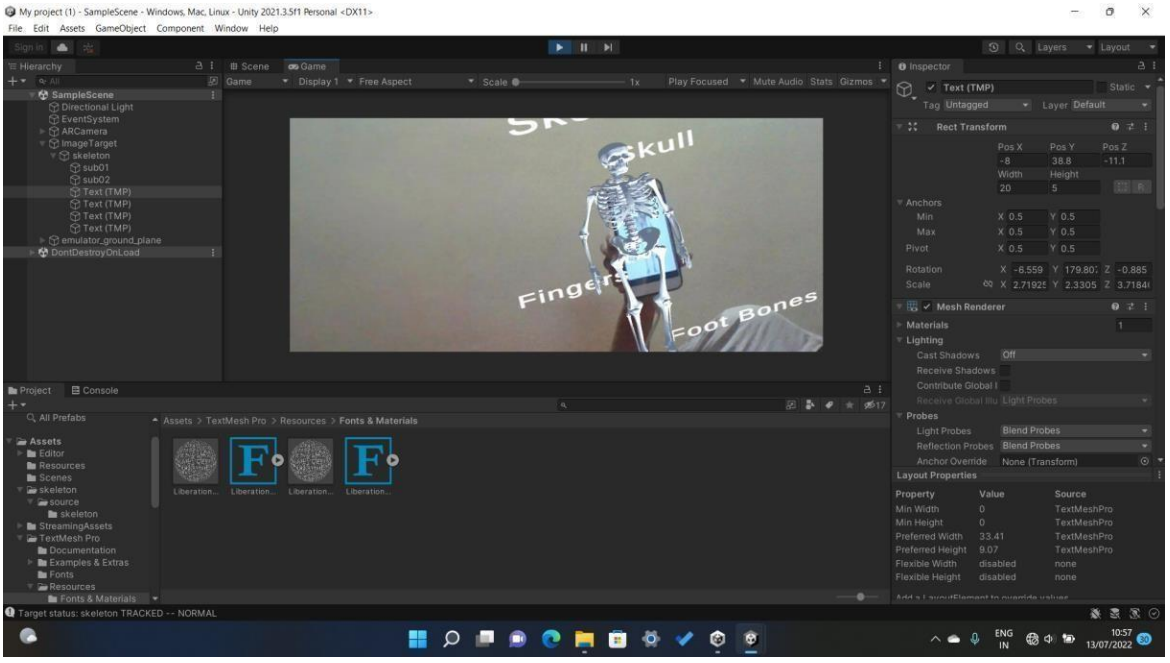


Figure 5.2 Test Case 2

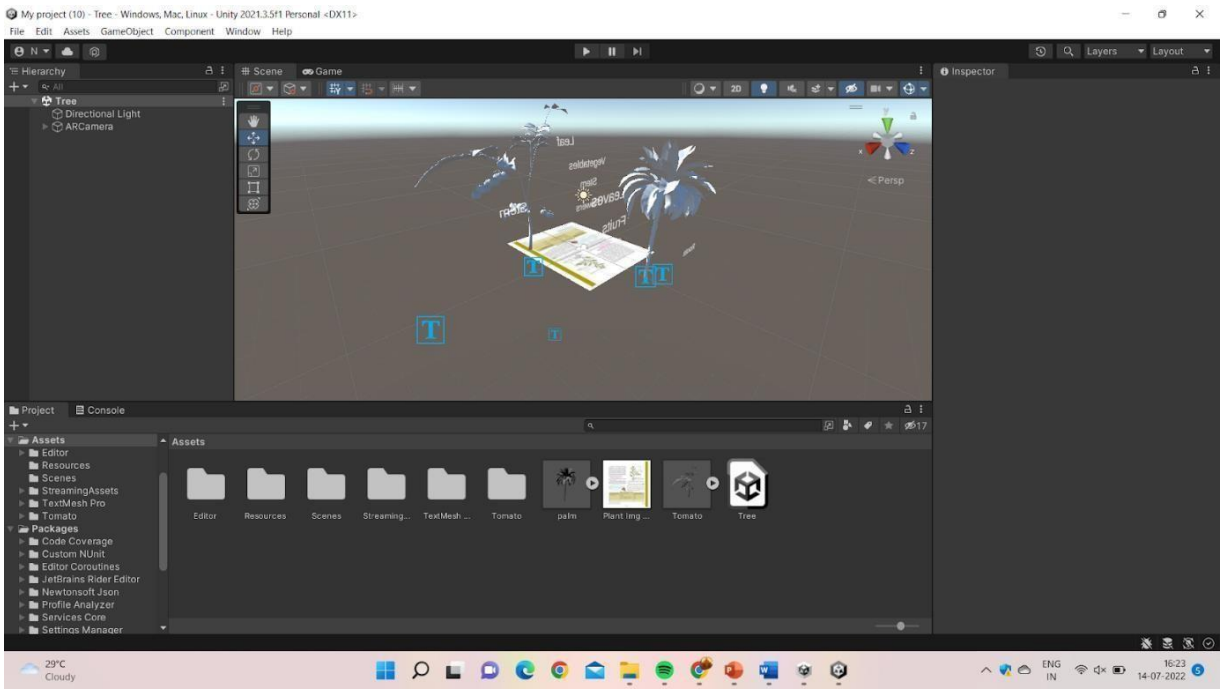


Figure 5.2 Test Case 2

Procedure: Choose an android phone with IMAR installed in it. Scan the target image. We observed that the 3D image is showing labels.

Observation: We observed that the 3D image is showing labels but its is not showing with an arrow mark.

Conclusion: This proves that it is necessary to show a labelled diagram with an arrow mark. We will work on that so that the image should be properly labelled.

CHAPTER-6

RESULT & DISCUSSION

6.1 RESULT

The system is set up so that when a user moves their camera over a website, an augmented display, such as a 3D model, a video, or a description of the page, appears. It is a method that eliminates the need for searching or typing to obtain information. By enabling youngsters to acquire new ideas using graphical representations, the application lends a helping hand to young learners. A student can use the program whenever it's convenient for them because it can be installed on any smartphone. Additionally, this program doesn't require any additional maintenance, making it a cost-effective choice. The interactive features of this program, such as the 3D model view, enable the user to comprehend the idea from all sides.

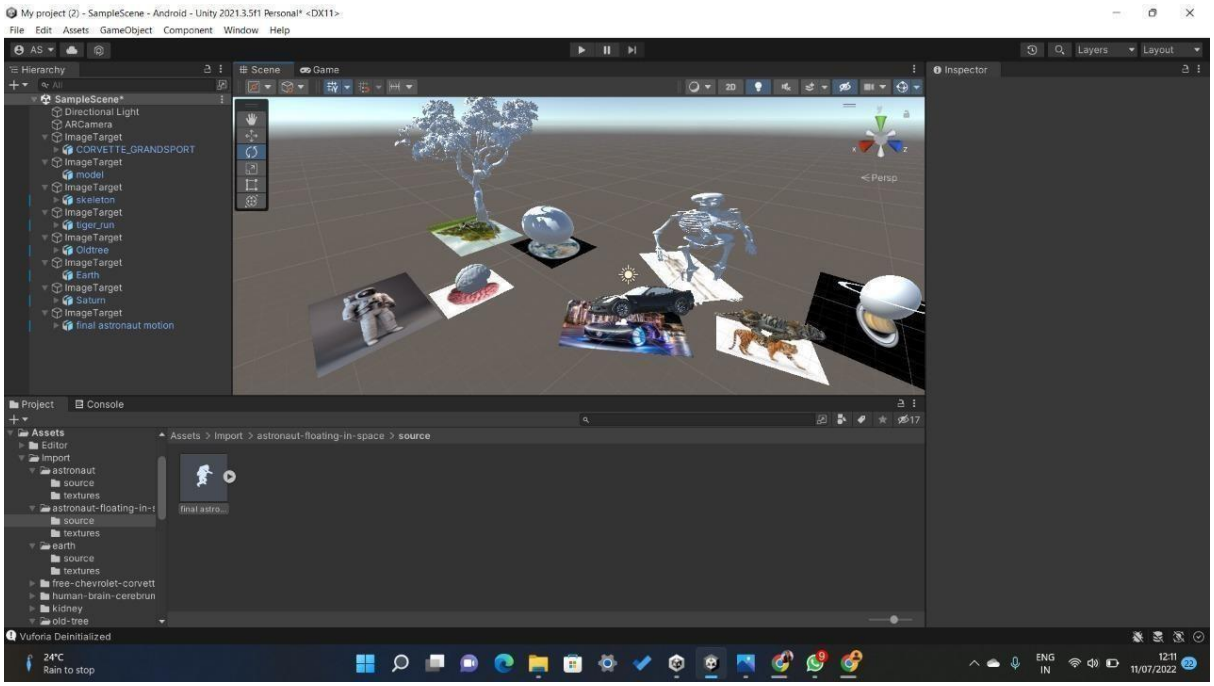


Figure 6.1 Final View

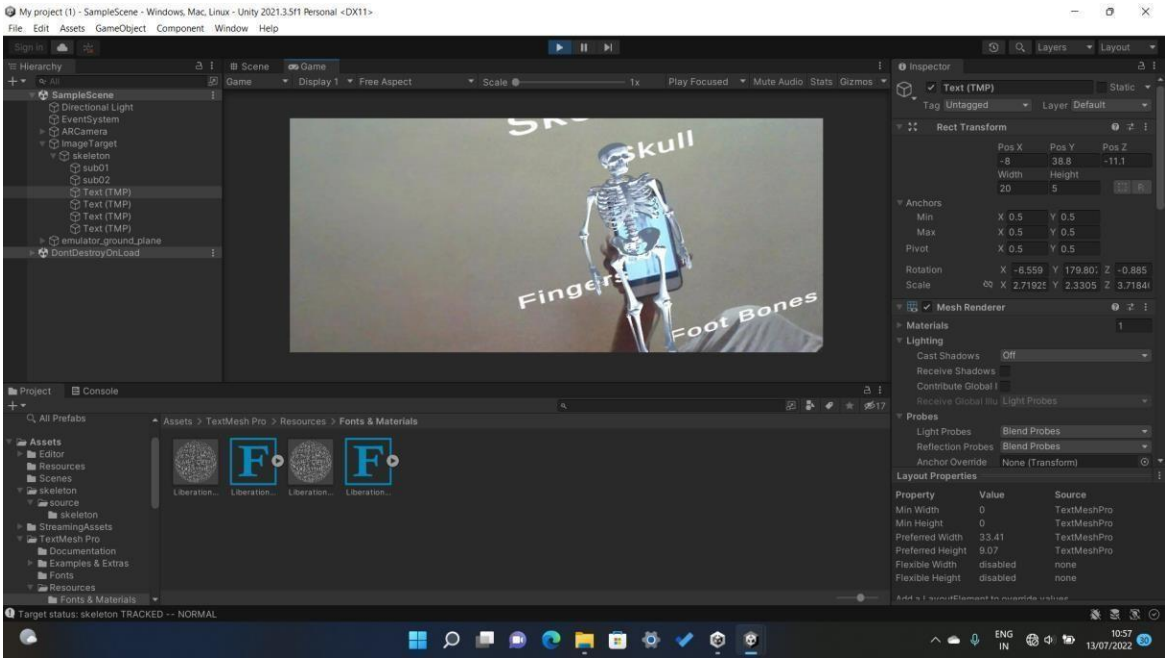


Figure 6.2 Final View

CHAPTER-7

CONCLUSION & FUTURE SCOPE

7.1 CONCLUSION

Modern society strives to make its world smart. The role of education in this process is to meet the challenges of the changing world and prepare learners to become fullyintegrated members of society.

Objects of research of the current work are innovative and effective tools and technologies that can transform education. They allow to create an environment where the training is consistent with the needs and characteristics of digital learners and present-day society. The specific purpose of the work is to reveal the potential of Augmented Reality to transform education into Smart education.

Augmented reality in the educational sector could be a huge game-changer towards how children learn. The technology will provide students with immersive content that will help them understand the concepts. With the help of engaging 3D models, students can grasp complex information in an easier manner providing them with a wider understanding of topics.

Researchers have been paying close attention to augmented reality technology recently. This project will benefit educators everywhere and demonstrate its effectiveness in the field of education. The goal of contemporary society is an intelligent world. In this process, education's job is to educate students about the difficulties of a changing world and to help them become fully contributing members of society. The present work's study focuses on effective and cutting-edge technology and tools that have the potential to revolutionize education [4]. They enable the development of learning environments that are in tune with the requirements and traits of contemporary society and digital learners. The work's specific goal is to demonstrate the wonders of augmented reality in turning education into smart education. The use of augmented reality in teaching could fundamentally alter how kids learn. Students will receive immersive content via this technology to aid in idea understanding [5]. Students can more readily learn complicated information and have a deeper understanding of topics when presented with engaging 3D representations. This application will be highly beneficial for kids because education has changed from traditional classroom instruction to virtual instruction. IMAR's 3D depiction of items will aid in helping them understand various concepts better.

7.2 SCOPE OF FURTHER WORK

- Since education has been shifted from classroom teaching to virtual teaching this application will be very helpful for students.
- Since IMAR provides 3D visualization of objects it will help in deepening their understanding about different things.
- In the future we are planning to add more labels to different part so it will help them to identify each section properly.
- We are also planning to add panel to it thus making it more user friendly.

CHAPTER-8

REFERENCES & PUBLICATIONS

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Department of Computer Science & Engineering
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PAPER PUBLICATION AND CERTIFICATE

Application of Augmented Reality for Enhancement of Teaching Learning Process.

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Abstract - Students occasionally find it challenging to learn from books because they can only grasp things in 2D. It takes a lot of effort and time to envision each component and comprehend how it works while learning. Modern technologiesbenefit students by minimising the amount of time they need to learn. In this research, we use the idea of augmented reality to create a straightforward mobile instructional application. Augmented reality for mobile devices is a relatively young but expanding area of mobile applications. It makes it possible to combine the physical experience of the actual world with information-based virtual reality. This article examines how this link is created as well as the useful and entertaining uses for this technology. The proposed system will give a 3D representation of an image.

Keywords -*Augmented Reality, 2D to 3D Conversion, Unity 3D,3D models, Vuforia.*

I INTRODUCTION

Augmented reality is referred to as AR. These days, augmented reality (AR) is regarded as one of the most significant technical trends. The era of augmented reality (AR) adds layers of digital information to our actual world. To replace actual virtual ones, AR no longer creates false worlds. With augmented reality (AR), the immediate environment is enhanced with noises, motion pictures, and graphics. Users who see objects in augmented reality (AR) cannotice features and the scale of an object that they cannot see froma plain photograph. Exploration is the key component of AR, which ultimately helps pupils learn and comprehend. Studies are being impacted by the COVID-19 pandemic because online programmers have replaced traditional classroom instruction. However, this programmer will prove useful for both students andteachers. For instance, a biology instructor can swiftly go over all the key aspects relating to a certain body area, and students will pick it up quickly thanks to the 3D model that is readily available to them (through the app). We used the cross-platform gaming engine unity to create this application. The photograph will be scanned by this application, which will then superimpose a 3D image to aid in immediate visualization and a better understanding of how it appears in the actual world. The purpose of this project is to maximize the benefits of augmented reality applications ineducation.

I. LITERATURE REVIEW

The term Augmented Reality (AR) describes the combination of the physical world and the virtual (computer-generated) world. The actual image is photographed and then "augmented" with additional layers of digital data [2]. In recent years, numerous articles and study findings have been published by increasingly renowned universities, research institutions, and organizations from around the world. These findings demonstrate the use of augmented reality as a tool for human-computer interaction. Beforedesigning the system, a lot of distinct components must be considered. It takes some expertise and experience to build modules and interfaces, create the architecture, and choose the right components [3]. Comparable to using systems theory to product development is the design process. The parts that describethe process are listed below.

A. Image Capture

Real-world photos are captured via a camera and displayed. The device camera takes pictures of the 2D images from the book that will be made into 3D. It's important to capture images properly.

B. Image Processing

A fundamental shift in how people engage with data will be facilitated by augmented reality (AR), a major generation[2]. For diverse input sources, augmented reality uses a variety of image processing techniques. Various outputs can be produced based on the input sources.

C. Marker less Recognition

Marker less Augmented Reality (AR) refers to a type of software that may overlay virtual 3D content onto a scene and keep it fixedin the designated area without prior knowledge of the user's surroundings. The primary method for photograph recognition in Augmented Reality (AR) systems is marker less[4]. This photo processing is different from the opposite reputation in that it employs a marker created from the photographs that are taken using the camera rather than a predefined marker. Two steps makeup this process:

1. Preprocessing:

It is the initial stage of the scanned image's processing. The environment is recreated in three dimensions using pictures obtained from various angle

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has contributed a paper titled

Application of Augmented Reality for Enhancement of Teaching Learning Process

in 3rd International Conference on Sustainable Research in Engineering Science and Management (ICSRESM-2022) held during December 16, 2022 on Shri Shankaracharya Institute of Professional Management and Technology, Raipur, Chhattisgarh, India We wish the authors all the very best for future endeavors.

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