Digital Newspaper Using Augmented Reality

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Abstract Augmented reality (AR) is a recent technology that provides the users with an enhanced and interactive experience with the digital world, by combining real-time objects and computer-generated images and videos. This project aims to focus on the integration of AR with the newspaper. Since the daily newspapers provide only limited content about an article, this application will allow the users to have detailed information about an event with the help of video clips and interactive images. The application provides a feature where the users will be redirected to the online website as soon as they click on the media on their screen, where they can learn more about the respective commercial and the user can bookmark an article. The process of linking media files with the article's image will be implemented using Unity and Vuforia. The application will be developed using Android Studio.

Keywords Augmented reality · Unity · Vuforia · Android studio · Newspaper

1 Introduction

A newspaper is a set of printed papers that have daily or weekly updates of current happenings around the world to provide readers with up to date information on current affairs. These are printed daily or weekly by an organization. The count of newspaper readers has been reduced across the world due to the introduction of digital news such as e-news or news feeds. This can be termed as the impact of digitalism. The reading habit of newspaper among youngsters has reduced gradually. Smartphones along with Internet facilities have reduced the impact of newspapers on people. The online coverage of the news is far more than what a single newspaper holds. At this

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rate, the next generation might not be seeing a newspaper at all. Though e-readers have a wide user base, many people still prefer printed newspapers.

To increase the count of users of the printed newspaper, we need to make newspapers much more interesting. This project is aimed at digitizing traditional newspapers with the use of augmented reality. This will not only make newspapers more interesting but will add more value and information to it.

In today's world, augmented reality [1] is one of the popular and highly efficient technologies which provide the users with an enhanced and interactive experience with the digital world, by combining real-time objects with computer-generated images and videos. Publications and marketing are increasingly using augmented reality to increase the interactivity of the users [2]. Communication through multiple channels and integrating the old style with the existing material, i.e., by combining digital and print media [3], creating a competitive advantage and bringing in new revenue can be achieved by AR which can boost the advertising market. Transformation of traditional newspapers which is an offline media into digital can be done through AR publications. With AR, the user will be able to view both content and illustration in one screen and a camera [4]. The newspaper will gain a new cutting edge along with an increase in the number of readers after the implementation of augmented reality.

2 Literature Survey

The features of augmented reality science textbooks [5] review several pieces of literature concerning the features of augmented reality (AR)-based textbook that could be applied for science learning in schools to make the learning process effective and interesting. Usually, science is considered as a difficult subject by the students to understand. So, considering this, AR is used in textbooks to make science more interesting and fun. This technology offers the students with ultimate imaginary and makes them experience as well as understand the concept behind science through video, audio, and graphics. This helps students to overcome the fear of science and as well as understand the concepts. The AR technology used here is marker-based, in this, an AR code is used as a key to uniquely identify the element to find a related video, audio, or graphics from the database. Our proposed system uses marker-based technology which does not have an AR code but instead uses any content available on the page to identify objects from the database. Moreover, the above system is only limited to the students who wish to study science but our system can be used by all the users who read the newspaper.

Marker-based AR has an inherent drawback, i.e., requirement of markers which may be costly and limit the development of the application. The markerless technology which uses visual or depth information of the captured scene top estimates the camera pose. A markerless AR framework is designed that simultaneously considers mobility, accuracy computation complexity. It can achieve real-time 3D environment

reconstruction by using mobile equipped with a depth camera and Inertial Measurement Units [6]. But markerless tracking requires high computational power.

AR is also combined with virtual reality (VR) to create Magic Book [7] to help users immerse themselves in a completely different world. Here, users can just scan or view the contents of the book with specialized equipment to experience the features provided by the book. VR users can see other VR users represented as life-sized virtual avatars, while AR users will see VR users as miniature avatars in the scene.

A user study trends in augmented reality and virtual reality research [8] paper describe the trends of how user studies have been incorporated into AR and VR. Also, the author presents implications on what needs to be taken into account when planning a user study in the field of AR and VR research. Both AR and VR research tend to incorporate the user study into their research to test the effectiveness or efficiency of their research. It was discovered that the rate of conducting user studies in the past three years of AR and VR research was less than 50%. The rate tells us that AR and VR research need to work with their users more in their research. Both AR and VR research are for human users and failure to understand users' needs and requirements of AR and VR research will result in user frustration or cause an unsatisfactory experience. Therefore, user-based evaluations, either formative or summative or both of them, need to be taken into account in the design and development of AR and VR research to produce more usable outcomes for their users.

In the future, eBooks are expected to replace the traditional book and references as studying material because of the advances in Information Technology (IT) [9].

A mobile application has been developed combining the use of traditional printed media and augmented reality to boost the popularity of the traditional Malaysian games [10]. The mobile application provides interactive features to allow the user to interact and manipulate the 3D objects to increase the efficiency of the game.

According to the research conducted, print media is in crisis due to the digital media. Print media is losing its hold on advertisements—its main source of income to digital media. According to the author [11], the crisis of print media can be avoided by creating a hybrid version that is using AR technology in the print media.

The evolution of the smartphone has also fueled the use of augmented reality in a phone [12]. The smartphone plays an important role in the application of augmented reality if studied closely AR can be implemented in the phone using the application as a media and various features of the phone can be used for the implementation to improve the experience of AR.

3 Application Description

Digital newspaper is an Android application that is intended to provide users with add on information apart from the one present on the printed newspaper. This includes additional videos/animation related to particular news, article, advisement, or the user can directly open a website from their phone just by scanning related articles. This is

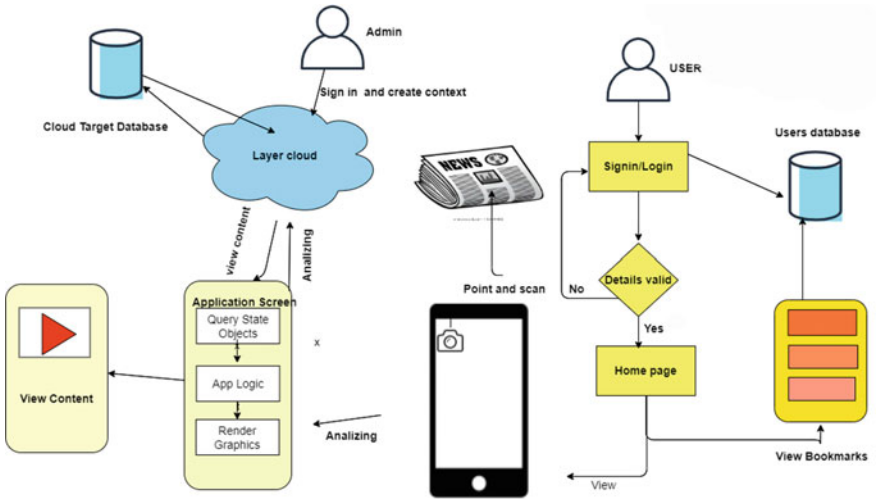

Fig. 1 Architectural diagram of digital newspaper

implemented using AR. The traditional newspaper lacks much of the information due to lack of space, etc. By scanning the contents of the newspaper, the users can view additional graphics, objects, videos, etc., on their mobile application. This is also used to make advertisements more interesting and engrossing. The digital newspaper also provides users with bookmarking facilities as shown in Fig. 1.

The main objective of digital newspapers to provide a hybrid version of the traditional print media and digital media, to reduce the declined number of users of the print media.

The components used for creating digital newspapers are smartphone or Android Phone, Android Studio, Unity3D, and Vuforia.

3.1 Smartphone or Android Phone

The smartphone is used by the user for launching and using the application which facilitates the digital newspaper functionality like scanning the 2D images present in the newspaper for advertising purposes or achieving additional news article related information. The camera of the smartphone is used for scanning, and related output can be seen on the smartphone screen.

3.2 Android Studio

Android Studio would be used for creating the Android application which would be run on the user's Android phone, through which the user can operate and use various functions.

3.3 Unity 3D

Unity 3D is a graphics and physics engine that is used to build scaleable applications that can be built for multiple platforms with the same codebase. Platforms supported by Unity include Linux-x86/x86-64, Mac-x86/x86-64, Windowsx86/x86-64, iOS, Android, and WebGL. Unity uses C for internal scripts and logic.

3.4 Vuforia

Vuforia is used to create an augmented reality application, and it can be considered as an augmented reality Software Development Kit for mobile devices. It provides detection and tracking of image targets by using feature detection, a feature is any point in an image. It was available as a plug-in for Unity. Vuforia has the following components

AR Camera: the camera can be used to track the objects.

Tracker Image: The tracker image is the most essential part of this SDK. A tracker image is required for a device's camera to recognize a reference and track it. The orientation and actual size of the tracker image directly affect the same attributes of the superimposed images. Any image can be assigned as a tracker image. The features of the target image effectively determine how well the target is tracked by the tracker. The JPEG or PNG images in RGB or grayscale are supported by image targets.

Markers: Vuforia uses markers as a point of reference to display the objects. The easiest way to create a marker is to generate a QR code. But markers can also be images which are required to be unique. Images are used in digital newspapers as markers.

Working: After downloading the application, the user has to register and is required to create a unique account. After registration, user is free to use the application according to his/her convenience. The user just requires to scan the image and then the respective object would be superimposed on top of the targeted image. The user would also have the facility for bookmarking the article which he/she would like. The bookmarked article would be saved and the user can view the bookmarked contents whenever he/she wants. The application is very simple to use and thus can be used by a wide variety of users.

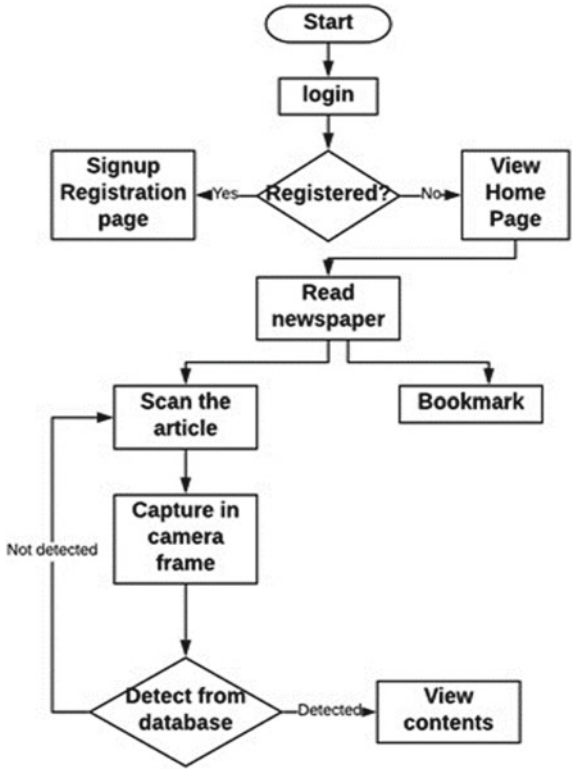

Fig. 2 Flow diagram of digital newspaper

When the user scans the image, the Vuforia SDK compares the image to the images in its database and searches the matching image. Once found, the linked object is displayed in the same plane as that of the target image as long as the target image is in the camera plane of the phone. Thus, the user can view various videos or images associated with the target image on the user's phone. This is explained in Fig. 2.

The admin is required to link all the images with its respective videos, animation, and graphics before the newspaper is out for publication. This process is carried out in the backend part. The backend part is implemented using Vuforia and Unity. Vuforia provides the database required.

4 Implementation Details

In digital newspaper, the user can view various contents related to the scanned image, which is linked at the backend by the newspaper authority. The application intended to digitalize the traditional newspaper. When a particular article is scanned, the user would be able to view various contents related to the scanned image, which would

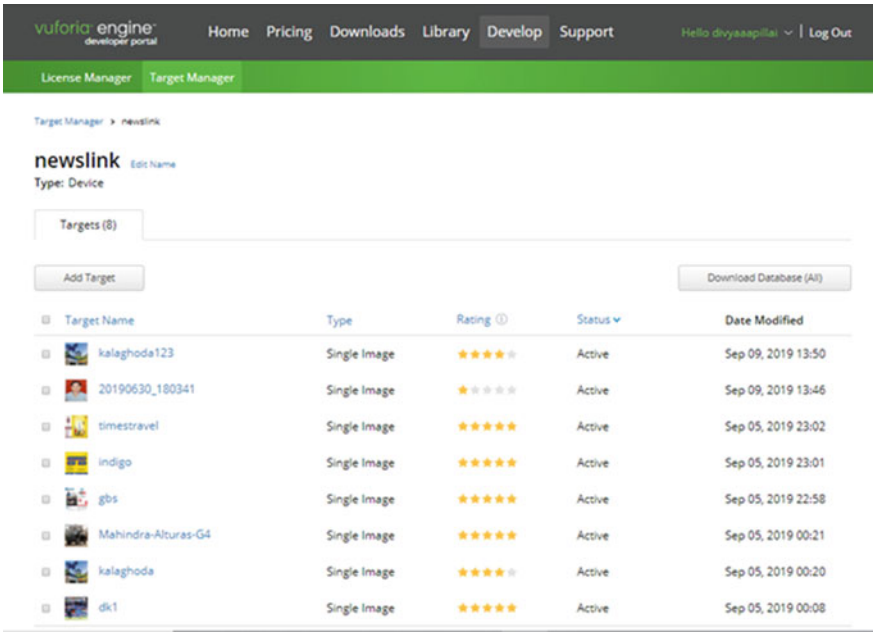

Fig. 3 Database created in Vuforia

be linked at the backend by the newspaper authority. The database would be created in Vuforia which would consist of all the image targets and videos that are required. The database for digital newspaper is shown in Fig. 3.

Digital newspaper is an Android application which consists of various modules.

4.1 URL Redirection

The first module includes redirection to the commercial websites on scanning the advertisement or article. This is done by assigning the targeted image that is the image present in the article using Unity and Vuforia and linking it with the URL of the website to which it is to be redirected. When the user scans the image, the website gets opened on the user's phone.

The target image is stored in the Vuforia database and is assigned using Unity. The button is created in Unity which would appear when the user scans the target image. By clicking the button, the user would be redirected to the linked website.

4.2 Video Playback

The second module consists of the linking article image (marker/target image) to the related objects (image, video, or graphics) in the database. So that when the user scans the image, related object is displayed. This is done with the help of Vuforia and Unity. This involves mostly the backend part of which includes image detection and recognition. In digital newspaper system, Vuforia is used along with Unity2D for displaying respective contents in augmented reality (AR) and Android app development kit for developing Android applications. Vuforia provides a software platform for developing AR applications. Vuforia helps the application to recognize the images and objects which is declared as a marker and helps to perform the declared operation, in this case, it is to display the linked images, videos, and animation. Vuforia acts as a database to store the marker images and linked objects.

In traditional markers like QR code, etc., special black and white lines or patterns are required which would be unique and would uniquely identify the detected image. But Vuforia's image tracker detects and tracks normal images with the help of the natural features found and compares it with different images to identify it uniquely. The targeted image is compared with the images present in the Image Database of the Vuforia and is compared with all the images to identify the image which is currently the target. Once found, the Vuforia will track the image until in the camera's field of view and would display the mentioned object on the tracked image's plane.

Vuforia Target Manager helps to create target images and images could be saved using JPG or PNG format in RGB and Grayscale. Features extracted are then saved in the database, and this database is later used for the comparison while tracking process as runtime comparison. Vuforia gives the application the feature to display AR objects by the scanning process.

4.3 Bookmarking

The fifth module provides bookmarking facilities. So, the user can save the article which he/she likes. The article which is to be saved is also identified uniquely and saved in the database. When the user wants to view them, the system searches its database and displays it. The bookmarked article will be mostly an image in JPG or JPEG format.

5 Result

The Android application that would be created would be having three options to navigate the users, URL redirection, video playback, and bookmarking. The user is free to choose any of the three options.

Fig. 4 Button on the image target

If the user chooses the URL redirection option, then the user is required to scan the image targets present in the newspaper. Different Image Targets would be present throughout the newspaper which would be assigned using Vufoia and Unity by the admin.

Then, the button is assigned using Unity which would be overlapping the current image target when the user scans the image target using their android phone. The button is shown in Fig. 4.

If the user chooses video playback option then again, the procedure of scanning the image targets is same as URL redirection, the only difference is that here the video would be overlaid on the image target and would start playing automatically till the android device is scanning the image target as shown in Fig. 5.

Fig. 5 Video projected on top of image target

6 Conclusion

Once digitization is implemented in newspapers, the readers would benefit on a large scale with more information and knowledge as well as get comfortable with modern technology. The digital newspaper uses Unity and Vuforia to create image targets and to add various functionality related to augmented reality. Vuforia provides a database to store the image targets and associates video, graphics and animation. Android Studio is used to create an android application to facilitate the user to use digital newspapers from their android mobile phones or smartphones. The digital newspaper will also allow the user to save any content they need and access it in the future. With convenient provision for redirecting to online websites of commercial articles and advertisements, it proves to be a user-friendly application and will also reduce the ever-declining demand of newspapers due to the digital media, by providing more opportunities in the advertising field.

The future scope of the project would focus on automating the linking of the videos or URL to the image target automatically which is static now. More focus would be given on using 3D models, so the user would be able to explore more just by one click. Thus, the scope of the project could be increased and this project could be used more efficiently.

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