AREDAI Augmented Reality Based Educational Artificial Intelligence System

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Abstract: The technology of Augmented Reality is emerging and latest development in mobile world, permitting, inclusion of external data on top of the camera input and produce the output in 3D user friendly form. AR is used in many areas such as gaming world, navigation system, tourism, and education tool etc..The main objective of our project is to present next generation of school students with a multipurpose educational tool which can be used ubiquitously in an educational environment. It consists of an Augmented Reality information display module with optional Immersive Virtual Reality display, powered by Image processing and Optical Character Recognition. It also has the feature of detecting any pre-determined objects and getting information about the object. There is also an Optical Character Recognition which extracts text from the books and gets information about the text. It also includes a safe-search option by using certain keywords for blocking inappropriate content through the application.

Index Terms: Educational Tool, Augmented Reality, OCR, Educational Intelligence

I. INTRODUCTION

The technology of Augmented Reality is emerging and latest development in mobile world, permitting, inclusion of external data on top of the camera input and produce the output in 3D user friendly form. AR is used in many areas such as gaming world, navigation system, tourism, and education tool etc. Generally, many android and iphone applications are created using Image processing algorithms and computer vision technology. Major technology involved in our proposed idea is Augmented Reality and virtual reality. AR is an emerging technology which involves superimposing of virtual objects on to the real world using image processing [1,2].With the help of advanced AR technologies like object recognition and computer vision, information about the environment and its objects can be overlaid on to the real world, that is the information about the surrounding real world of the user become interactive and can be digitally manipulated.

Virtual reality is an immersive technology that is used to create immersive environments that are fantastical or similar to the real world, thereby creating an experience that is not possible in ordinary physical reality. A person using virtual reality equipment is able to "look around" the artificial world, move around in it, and interact with virtual features. Another important technology we have used is OCR that is optical character recognition [3,4]. It is electronic conversion of images of typed, handwritten or printed text into machine-encoded text, whether from a scanned document, a photo of a document, a scene-photo, or from a subtitle text superimposed on an image. Web scraping is otherwise called as web data extraction which is basically used to extract datafrom the websites. It is a form of copying, in which specific data is gathered and copied from the web, typically into a central local database or spreadsheet, for later retrieval or analysis. Web crawlers can be used for web scraping. RESTfulapi is a resource based web api. It uses available http verbs to perform web scraping operations based on the context. So it is mainly used in web scraping. Furthermore, we have used NLP which stands for Natural Language Processing which is a part of machine learningbasically used to convert the user audio or text input in a form that could be understood by the system and vice versa for output.

II. RELATED WORK

The major problem faced by students today is the decline in interest for reading textbooks as they have moved on to other e-learning techniques. Only 20% of the students actually use textbooks while the rest use inaccurate tutorials and guides. While textual information may be good for rote learning, it has been found that students learn conceptually better with the help of multimedia content. But then again, there a multiple sources for multimedia content in YouTube. Traditional techniques of teaching methodology as we comprehend it are becoming an element of the past. They are becoming more and more digitized and are being driven by technological know-how innovations. In fact, the schooling and education enterprise (so-called EdTech) is to attain $252 billion with the aid of 2020, growing at a 17% annual rate. Among the most important developments in EdTech, augmented truth rightfully takes a main position. With greater than one billion users predicted to be part of the trend with the aid of 2020, it opens a pool of opportunities for educational

establishments and businesses.

AR is currently being utilized across disciplines in primary, secondary and higher education, and has been located to amplify the educational success degrees and motivations of college students [6,12,13].Fotaris et al. [7], in a latest systematic overview of 17 research between 2012 and 2017, conclude that AR in training can probably impact the students' attendance, knowledge transfer, talent acquisition hands-on digital experience in education of a variety of domains. Chris Lytridis[15] and his team developed ARTutor, It is a platform that consists of an AR authoring tool that permits educators to increase existing books (either in printed or in electronic format) in an handy and simple way barring the want of programming knowledge, and a mobile utility that is usedto get right of entry to and engage with the academic AR content covering the textbooks.

Galina Ivanova [14,9] introduced an augmented truth textbook for future blended education. Nazatul [9] has improve a new mobile application that can be an additional tool in gaining knowledge of science. This software referred to as iSains used to be developed primarily based on RapidApplication Development methodology for two topics which are the day and night, and moon phases.

This proposal has been made to create a one-stop solution for students for the betterment of themselves. Our solution enables and actually encourages students to use the textbook along with providing authentic and conceptually clear visual –multimedia content which is incorporated in existing textbooks using Augmented Reality and AI.Our solution also does not disrupt the reading habit of the student.In fact, it nurtures the students reading habit and encourages students to use the official textbook.

III.   METHODOLOGY

The proposed idea is to design a system that can enhance the learning experience of students by augmenting the prescribed textbooks which they follow with additional smart features. This system has to be incorporated in a mobile android application.

The proposed idea consists of 6 modules which are integrated together for a complete solution for enhancing the learning process for students.

- AR module
- VR module
- OCR module
- Web scraping
- Chatbot module
- Object Detection module

A. AR Module

In the augmented reality module, the entire textbook content is used as fiducialmarkers[which can be captured by the camera interface. Proper simplified description would be provided using AR incorporated on the camera interface screen, corresponding to the textual content captured by it. Also various images in the textbook can be augmented with videos approved by educational board for enhanced learning experience with modern technology.

B. VR Module

In VR module, learning experience can be further simplified and illustrated bydisplaying the content on a large screen in a virtual room using VR headset. The content will be dynamically generated based on the fiducial marker that was scanned while turning on VR interface. There will also be a virtual model of the subject of the fiducial marker.

C. OCR module

Optical character recognition moduleis a module used in the camera interface wherein if the user points the camera interface towards a particular text in the textbook. The OCR module will extract the textual content of the image and send it to the web scraping module. This enables the user to get the meaning and context of the words in the textbook.

D.Web Scraping

For each textual content material extracted from the photo by means of the OCR module, particular description is supplied to the person which is gathered from the web, and generally into a central nearby database or spreadsheet, for later retrieval or analysis with the help of a web crawler.

E.Chatbot Module

This module provides a virtual chatbot to the user which can be used to attain additional information about a particular topic or content. Chatbot will accept the input in audio or text format and based on the request from the user, will provide the corresponding output information.

F.Object Detection Module

This module provides an additional feature which can provide description for various real world objects or entities, specifically the various equipments and machinery used in laboratories by the student. Here a video of the object from all the sides is made and then divided into frames and given as input to the tensor flow so that the object can be detected from any angle or side by the camera interface. Once the object is detected, the corresponding description for the object is displayed on to the camera interface screen.
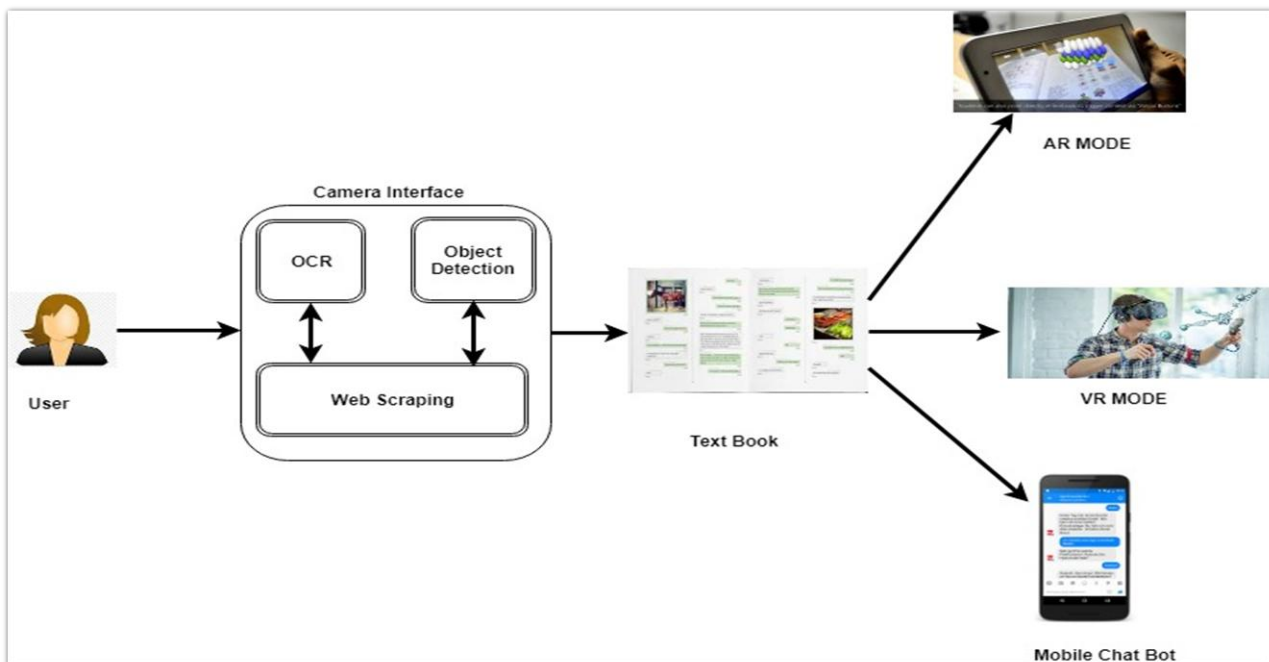
Figure (a). Architecture diagram of AREDAI

IV. DEVELOPMENT OF AREDAI

Rapid Application Development (RAD) has been selected as the methodology for the development of cell applications AREDAI. There are four major phases in RAD are planning, design, improvement and implementation. In addition to this, the associated software in developing the utility were: 1)Eclipse Integrated Development Environment (IDE) for Android platform improvement using Java (The Eclipse Foundation, 2013), 2) Metaio Software Development Kit(SDK)(metaio GmbH, 2014) for augmented reality development, and 3) GIMP for photo enhancing (The GIMP Team, 2013). Since AREDAI was developedto integrate AR,the framework used in this work was based totally on the augmented reality framework developed by using Metaio. The framework for the application is proven in Fig (b) and Fig (c).

General hardware Requirements are smart phonephone,Serverand VR headset (Optional)

The technology stack of client and server side is given below:

Tech-Stack

Application Side

Mobile Application
C# Scripts
C# wrapped java code
DVM
System OS: Android
Hardware: Mobile phone

Figure (b) .Layers in Client Side

Server Side

Server	
Python	Modules
	Flask
	Requests
	BeautifulSoup4
	Tensor flow
	Re
	Scrapy
Python Interpreter	
System OS: Windows/ Linux	
Hardware: Web server with High Speed Network	

Figure (c).Layers in Server Side

V. USECASES

The following are some of the scenarios in which the proposed system performs optimally under the conditions.
1.Student wants to learn about a particular topic in a subject.

- The student scans the image.
- AR content will be superimposed upon it.
- Student gets the information.

2. Student wants more information.

- The student enters into VR mode.
- Live data from Web scraping is presented along with additional information

3. Student searches for inappropriate content

- Server recognizes the profanity.
- Returns a warning message to the student

4. Student want to learn about an instrument in the laboratory

- The student points towards the pre-trained instrument
- The instrument is recognized using the ML agent.
- The Web scraper gets information about the instrument and sent to the mobile application.
- The instrument is not trained
  - The picture will be sent to the server for processing into an automated system which clusters the image.
  - The ML agent is trained in regular predefined intervals and updated in the application.

5. Student wants to learn about a particular word

- The student scans the word
- It gets recognized using the TesseractWrapper and sends it as a request to the web scraper.
- The web scraper returns information back to the student application
- The web scraper couldn't find the word
  - It looks for the next matching word using Google.

Feasibility:

The proposed idea doesn't require any device with advanced or accelerated hardware. It can be implemented using existing Smartphone technology in a cost-effective implementation.

VI.   TESTING

AREDAI is made out of various highlights that should be tried further. Each element, just as the entire framework, should be assessed with explicit estimations as per the objectives of the assessment. Henceforth, the assessment objectives must be resolved ahead of time. The Technology Acceptance Model (TAM) endeavours to foresee innovation acknowledgment by individual clients. As indicated by way of TAM, the patron noticed usability and price of an innovation are two determinants of its selection. In this manner, the comfort and cost of AREDAI ought to be assessed, however any conceivable effect on the gaining knowledge of procedure. In light of this model, it was once chosen to end the developmental evaluation of AREDAI in two stages: (a) the subjective appraisal of the equipment through few evaluators, and (b) checking out in an instructive setting via a better number of understudies.

Right now, the essential length of developmental assessment has been finished. The precept goal of this prepare was basically to guarantee right venture of the product, and get establishing input with recognize to the cost of AREDAI. The evaluators have been two folks from tutorial body of workers of the School of Computing .The remarks has been acquired from the experts are the usability of each the composing device and the portable software have been perceived, just as the curiosity of the voice-controlled digital mentor.

In the 2nd stage, which is to pursue, both developmental and summative evaluation are wanted to show up amid the following semester. The goal of this evaluation stage is to encompass university understudies in trying out all components of the stage, as some distance as each ease of use and instructive esteem. An exploratory approach is right now being intended to meet each of these targets. As indicated via this trial technique, the understudies will be isolated into two gatherings. The important gathering will be entrusted with creating enlarged books, and the second gathering will evaluate the instructive gain of using these increased books for pay attention distinctive subjects. The aftereffects of the take a look at approach will be measured in an equipped way making use of distinctly structured surveys, which will be organized by for the most part mentioned techniques for estimating consumer experience and ease of use.

VII.   CONCLUSION

Thus, a beneficial and recommended thinking for school systems that can be used through school Students was once proposed, barring involving an large revision of already present textbooks. This cell utility permits users to receive remarks on the spot (Real-time) and reduces delay. It provides a cellular consumer the convenience to acquire records with ease from a single image taken.

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