AR LIBRARY-BASED APP USING UNITY 3D

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Abstract - In this paper, we explore Virtual Reality and Augmented Reality within social learning spaces, such as classrooms and museums, while also extending into relevant social interaction concepts found within more reality-based and social immersive media frameworks The system was designed taking into account the user requirements of library personnel and visitors. Active Visitor aims at the engagement of a library visitor through advanced AR services that permit book annotation through a mobile app and the sharing of such information in broader communities through specific social services This paper proposes an Augmented Reality (AR) based application which aims to solve users spatial unawareness at the library by providing an AR shelf searching system, and to assist students and newcomers by providing a mobile guide with library information services into the library. Based on advances in image processing technology and Web-enabling technologies for mobile devices, mobile Augmented Reality (AR) and Virtual Reality (VR) have developed rapidly Evaluation results suggest that the proposed system is an efficient attempt toward a system that transforms libraries into active digital social environments, while it offers a new avenue for additional revenue for libraries.

Index Terms-- Augmented reality, Social learning spaces, library, rendering interactive computing, a mobile guide, spatial augmented reality

1. INTRODUCTION

Traditional earlier systems for book tracking within the library make use of static desktop computing with database systems that only had the classification call numbers of the books instead of providing guidance to users for services and spatial awareness. because of this fact, many constraints become more apparent, students could be confused about the situation of the resources and their own location after querying within the library system until he/she asks the librarian staff to appear up the shelf numbers or by doing manually by searching each shelf by his own, in fact, this can be time-consuming. But the very fact is that not every user will ask about the way to use and seek material; it absolutely was found that 75 to 85 percent of scholars using a library for research purposes described terms of fear and confusion in their initial response to library research.

Augmented reality could be a relatively new field of technology, only in recent years, it has become so popular on account of the latest development platforms. Augmented Reality (AR) is one of the foremost promising contemporary technologies that have the potential to utterly change how people react to the important world, practically transforming reality into an enhanced digital environment stuffed with interesting and useful information. Augmented reality like most of the established technologies will be utilized in every field of day-to-day life. The attraction of augmented reality is its simplicity.the book.

2. EXISTING METHODOLOGY

In the existing system, the standard libraries are less interactive with the scholars. Though the stack contains labels it's difficult to navigate through the stacks and seek out the proper section. Similarly, a number of the libraries are digitized but they're accessible from systems that are available inside the library. And also the number of systems available is very less that leads to reduced accessibility. Accessing the library from the digital world is difficult and also it's less user-friendly. To beat these drawbacks, we've got proposed an application using augmented reality (AR).

3. PROPOSED METHODOLOGY

Most Augmented Reality apps in libraries are within the research and development phase though they represent a profound opportunity for increased access to print and digital library collections. AR applications can yield an interesting and interactive information experience. Applications that overlay graphical data are well matched for in-library engagement furthermore as off-site real-world interaction with library content. Mobile augmented reality applications offer much for the mixing of library resources into users' information environments. Libraries, through further research and development efforts, can still expand and extend the library presence in this environment through augmented reality applications.

4.SYSTEM ARCHITECTURE

The System Architecture diagram represents the process and implementation of the components under this system. Initially, the user scans the target image using the mobile app the respective image will be extracted, detected, and feature matched. So that the information of the recognized target image will be displayed in an overlaid format to the user using augmented reality. The three main processes are followed during marker recognition are **Input:** The image is captured using the onboard camera or the camera connected to the system. It will be either captured as a live still image or as a video, preferably a video is employed, and therefore the input is then moved to processing further down the steps. **Grayscale**

Conversion: The input frame is completed within the intensity plane and so converted to the grayscale. The input of an android phone is given in RGB format then it's converted into grayscale. **Thresholding:** After this, the image is converted into a binary image so that a binary image component analysis is often performed. Two varieties of thresholds are employed for the conversion: Adaptive Threshold and Global Threshold.

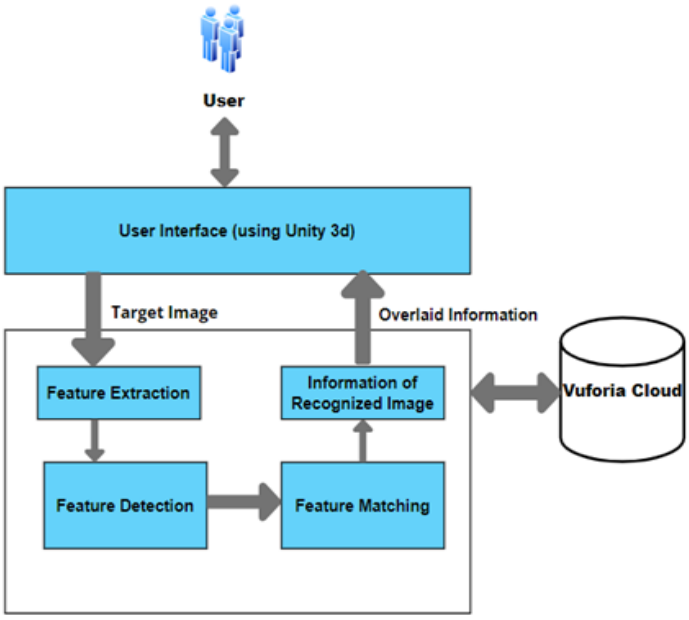

Fig -1: System Architecture

3.FLOW OF PROCESS

Figure 2 illustrates the flow of process of the proposed method.

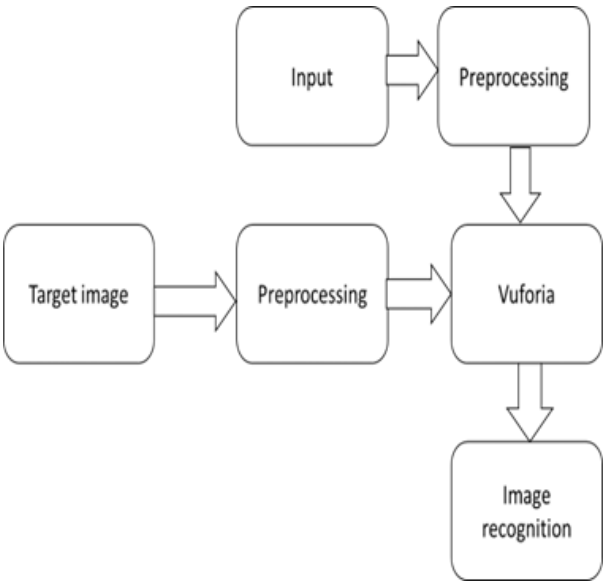

Fig -2: Flow of Process

3.1. Open AR Library App

Initially open the ARLibrary application to scan the target image which has been built using unity 3d.

3.2. Scan Target Image

Scan the Target Image using mobile camera.

3.3. Marker Recognition

A marker is a picture (it might be anything) that may be uniquely identified and not be confused with another image because it is the gateway through which virtual elements may be brought into the real world. The application is programmed to acknowledge the marker in an arbitrary scene and provides details of its location and orientation. To acknowledge a marker, the subsequent steps are followed:

- Input
- Grayscale Conversion
- Thresholding

3.4. Image Processing

The software must derive real-world coordinates, independent of camera, and camera images. That process is named image recognition and uses different methods of computer vision, mostly associated with video tracking. Markers are visual cues that trigger the display of virtual information. A bit of paper with some distinct geometries may be used. The camera recognizes the geometries by identifying specific points within the drawing.

3.5. Vuforia Cloud

Vuforia is an augmented reality software development kit (SDK) for mobile devices that allows the creation of augmented reality applications.To start, Vuforia's Developer Portal is set up, and an account is formed. Once logged in, a developer page is on the market. A license key works as an ID to make an application in Unity using Vuforia.This license key's created within the developer page with the assistance of a "License Manager". Next, the "Target Manager" is employed to feature Image Target in Unity. This can be done by adding a picture Target database and filling in the details. Images are added to the newly made database. Vuforia supports various styles of targets sort of a single flat image, cylindrical, cuboidal, 3D image, etc. Lastly, this Image target database is downloaded for importing into Unity. This is often finished the assistance of the "Download Dataset".

3.6. Feature Extraction

It consists of two parts. the first stage is to detect interest points, fiducial markers, or optical flow within the camera images. This step can use feature detection methods like corner detection, blob detection, edge detection or thresholding, and other image processing methods. The second stage restores a real-world arrangement from the data obtained within the primary stage. Some methods assume objects with known geometry (or fiducial markers) are present within the scene. in a very number of these cases, the scene 3D structure should be calculated beforehand. If part of the scene is unknown simultaneous localization and mapping (SLAM)

can map relative positions. If no information about scene geometry is out there, structure from motion methods like bundle adjustment is employed. Mathematical methods employed within the second stage include projective (epipolar) geometry, geometric algebra, rotation representation with exponential map, Kalman and particle filters, nonlinear optimization, and robust statistics.

3.7. Overlaid Information

The information of the recognized target image will be displayed in an overlaid format to the user using augmented reality.

4. Augmented Reality

Augmented reality (AR) is an interactive experience of a real-world environment where the objects that reside in the real world are enhanced by computer-generated perceptual information, sometime across multiple sensory modalities, including visual, auditory, haptic, somatosensory and olfacto ry. AR can be defined as a system that fulfills three basic features: a combination of real and virtual worlds, real-time interaction, and accurate 3D registration of virtual and real objects. The overlaid sensory information can be constructive (i.e. additive to the natural environment), or destructive (i.e. masking of the natural environment). This experience is seamlessly interwoven with the physical world such that it is perceived as an immersive aspect of the real environment. In this way, augmented reality alters one's ongoing perception of a real-world environment, whereas virtual reality completely replaces the user's real-world environment with a simulated one. Augmented reality is related to two largely synonymous terms: mixed reality and computer-mediated reality.

4.1. Context Design

Context Design focuses on the end-user's physical surroundings, spatial space, and accessibility that may play a role when using the AR system. Designers should be aware of the possible physical scenarios the end-user may be in such as: Public, in which the users use their whole body to interact with the software. Personal, in which the user uses a smartphone in a public space. Intimate, in which the user is sitting with a desktop and is not really moving. Private, in which the user has on a wearable. By evaluating each physical scenario, potential safety hazards can be avoided and changes can be made to greater improve the end-user's immersion. UX designers will have to define user journeys for the relevant physical scenarios and define how the interface reacts to each.

4.2 Interaction Design

Interaction design in augmented reality technology centers on the user's engagement with the end product to improve the overall user experience and enjoyment. The purpose of interaction design is to avoid alienating or confusing the user by organizing the information presented. Since user interaction relies on the user's input, designers must make system controls easier to understand and accessible. A common technique to improve usability for augmented reality applications is by discovering the frequently accessed areas in the device's touch display and designing the application to match those areas of control. It is also important to structure the user journey maps and the flow of information presented which reduce the system's overall cognitive load and greatly improve the learning curve of the application.

4.3 Visual Design

Visual design is the appearance of the developing application that engages the user. To improve the graphic interface elements and user interaction, developers may use visual cues to inform the user what elements of UI are designed to interact with and how to interact with them. Since navigating in an AR application may appear difficult and seem frustrating, visual cue design can make interactions seem more natural. To solve this issue, designers should apply visual cues to assist and encourage users to explore their surroundings.

5. Target Image

For Creating a Target image add Target tracker, Add Target image, add a 3D object, Target tracking effects-fixed or moveable, test target image.

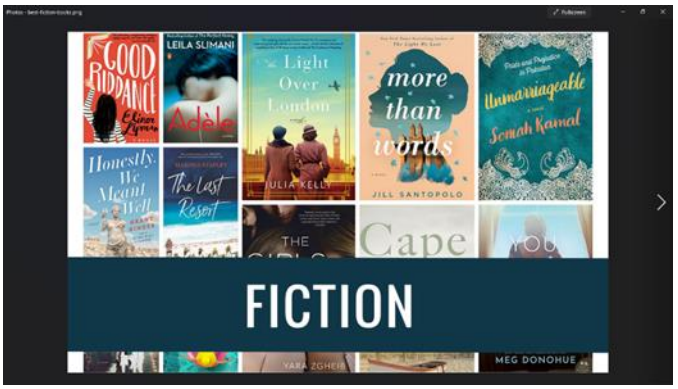

Fig -3: Sample Target Image

Fig -4: Sample Screenshot of Output

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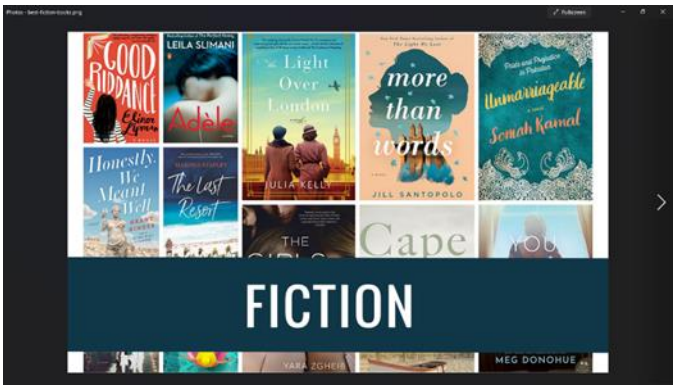

Fig -3: Sample Target Image(Input)

Fig -4: Sample Screenshot of Output

6. Conclusion

This paper proposes a method to digitize the library and makes an interaction library system with the customers. This project makes finding of the books easier compared to the conventional one. Augmented Reality increases the utilization of the application with attractive appearance. The objective of the project was successfully implemented. The system "Implementation of real-time image processing in augmented reality" is implemented where a user can hover a camera over a page and procure augmented information like book details, or evidence on this page. It's a system where no typing or searching is required for getting information. Since the application will be deployed on any smartphone, a student can use it at his/her convenience. Also, there's no need for any extra maintenance for this application thus making it a cheap solution. The interactivity aspect of this application like showing the overlaid information allows the user to grasp the concept from every angle.

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