AUGMENTED REALITY BASED ASSISTANCE

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ABSTRACT: **The concept of Augmented Reality can be explained as a superimposition of computer generated two dimensional or three dimensional objects over the real time scene acquired into the capturing device. Thus Augmented Reality adds additional information to the real scene and this can be implemented with the help of markers. The development of the application is simple and easier in case of AR. This idea is extended to the development of Augmented Reality based book that act as a tour guide. This travel guide can give all the basic information regarding the necessities of a finer travel around the places of the destinations. The application will detect the markers found in the real scene and superimpose them with multimedia data giving enormous information. The application can also be made to redirect to the web links for easy access of certain other utilities by interaction. The same idea can also be utilized in engineering laboratories to understand the working of the circuit by visualizing the working of the same circuit where the diagram itself can be used as a marker and thus enhancing the self learning among the students.**

Keywords: Augmented Reality, Markers, real environment, Multimedia

Introduction:

The Augmented Reality can be explained as a technique of adding additional information to the real environment by overlaying virtual objects that are usually computer generated. The virtual objects may be a two dimensional or three dimensional. Augmented Reality is not the simulation of reality it takes the real object or the scene as a base and superimposes contextual data over it to enhance the perception and improves understanding of the subject. AR based learning can help students by supplementing existing worlds rather than creating new ones. The augmented reality system developed can be installed and accessed in a desktop computer, smart phones or can be projected through any kind of supporting display systems.

The augmented reality system can be characterized as that does [4]

- Combining the real world with the virtual world and generate augmented scene
- Should be interactive
- Allows registration of virtual objects to corresponding real object.

The block of an Augmented Reality system is shown as

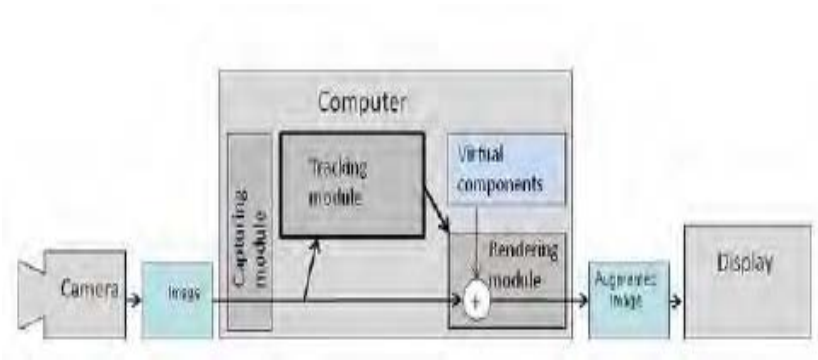


Fig 1. AR Block Diagram

The real time scene is captured from the real environment through the camera by the capturing module. The Tracking module has to track the object from the real scene and corresponding virtual object need to be positioned properly hence it determines the orientation. The rendering module serves for the purpose of combining the computer generated virtual components to the captured scene at the position determined by the tracking module. The Augmented image obtained can be visualized in a display device chosen suitably.

Markers:

There are two types of simple augmented reality, they are marker-based which uses cameras and visual cues, and markerless which make use of location data such as a mobile's GPS and compass. Markers are 2D images kept usually bi-tonal (black and white) thus eliminating the problem of detecting different shades and the ambience. The purpose of these markers to provide required information by allowing the augmented reality system to track them and orient the information on them, and they do it properly. The markers that are in use are Maxi code markers, QR code and AR markers. The maxi code markers are used in USA for postal purposes. The Quick Response codes are generally used in navigating to websites, whereas the AR markers are used in Augmented Reality. The QR codes are not able to cover wider field of view and thus the capturing device has to be more accurate and enhanced image processing may be required. But AR markers can cover a good field of view and can be easily and quickly detected .Since AR markers show efficiency they are adopted for developing our application.

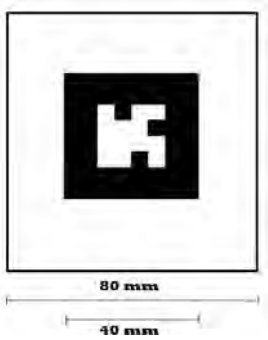


Fig 2. Marker

Marker Tracking Procedure:

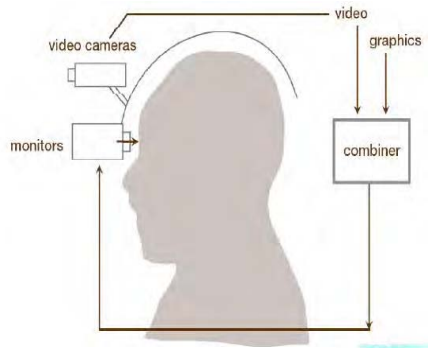
The markers being used in this work are generated using the AR toolkit Marker Generator. The markers are generally square with maximum of 32x32 pixels and black or white border contrasting the central image for appropriate detection among the other markers while matching the template. Moreover markers should not possess rotational symmetry. The AR toolkit captures the marker and creates a pattern file containing the details of the marker which is then used for the template matching. [1] In the first stage of marker tracking the marker's black borders, are found out by detecting connected groups of pixel values below a certain gray value threshold. Then the track of each group is extracted, and is surrounded by four straight lines which are denoted as potential markers. The distortion can be removed by finding out the borders of all the potential markers. Once the central pattern of a marker is brought to the front view we can sample a grid of NxN gray values. These gray values form a feature vector that is compared to a library of feature vectors of known markers by correlation. The output of this template matching is a confidence factor. Confidence factor refers to the level of similarity between the marker and the matched template. If this confidence factor is greater than a threshold level, the marker is considered found. It is not that only one marker should be used, multiple markers each being overlaid with different objects at the same time is also possible.

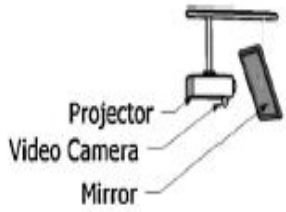
Software support and requirements:

We can use the software developed by Adobe Systems called Adobe Flash Builder which is available in three editions standard, premium and educational. It is an Integrated Development Environment. It consists of built in editor for doing action script or MXML codes. It also consists of an active debugger for easy manipulation of error detections and corrections. Further a high resolution capturing device [5] is required to acquire the markers from the real environment precisely.

Augmented Reality Displays:

However the scene can be nicely augmented using the Augmented reality technique with the help of suitable software, it is necessary for the requirement of a suitable displaying device to view the combination of the real and virtual environment. Displays are of different types [2] Head-worn displays (HWD), handheld displays, Projection displays.





In case of the head worn displays, depending upon the combiner the displays are categorised as Optical see through, Video see-through, and Retinal Display[3]. The hand held devices are usually smart phones or tablets that support augmented reality. The projection display system uses a digital projector and a video camera. With the projector fixed on the ceiling and its light beam bent by a reflective mirror, the image is projected on the ground. A computer is used to add virtual components to the video obtained.

Areas of Application:

Augmented Reality is used for wide number of applications in recent years and research has been going on different parts of the world to explore more on this wonderful technique. It actually changes the perception of our view towards the environment.

Navigation:

Navigation applications are made possible with the help of GPS network which detects the position of the geographical location and thus yielding information. With the help of camera and the GPS the user can view the route of the destination lively.

Sightseeing and tourism:

There are many applications for augmented reality in the sightseeing and tourism. A live view of a museum can be developed such that each object in the museum can be best explained with 3D models or other historical details can be overlaid. With a Smart phone equipped with a camera, tourists can walk through historic sites and see facts and figures presented as an overlay on their screen. These applications use GPS and image processing to fetch data from an online database.

Military purposes:

The Head Up Displays are used in fighter planes that help the pilots to view the altitude, velocity, horizon line in addition to other data on a transparent display before them. The Head-Mounted Display (HMD) is used by ground force. Critical data such as enemy location can be shown to the soldier within their line of sight. This technology is also used for simulations of training purposes.

Medical field:

The use of AR for medical purposes is highly supported. With the help of AR the medical students can practice and learn surgeries in a controlled atmosphere. 3D model of human organs can be used for study and analysis. It can be used to brief the patients, the complications of the problem. Augmented reality improves the sensory perception of a surgeon. This technology can be combined with MRI or X-ray systems and bring everything into a single view for the surgeon. Registration of a 3D model of a human brain is possible and it helps in neurosurgery.

Maintenance and Repair:

Augmented reality can provide the superimposed imagery of the various parts of the vehicle to the mechanic with the use of HMDs. Each part can also be named. It allows the trainees to learn the work by simulation instead of making expenditure for training.

Gaming:

Gaming is one of the astounding applications of the Augmented Reality. It gives the feel of playing in the real environment. The availability of computer technology for gaming supports this. There are numerous AR games available for the Android and Apple smart phones.

Advertising and Promotion:

The usage of AR technique for marketing products yields a fruitful result. Through AR customers can view the 3D model of the object they purchase and can get the specifications without querying. The usage of the product can also be visualized lively.

Project and illustration:

(a) In this work we are going to implement the AR technique to tourism industry by developing a travel book. The book will be equipped with markers and each marker will be allocated uniquely for different sites. While viewing the marker on the camera or any displaying device they are overlaid with the video playing. Certain other utilities are also provided for the user. The buttons added on the screen can navigate to sites that help you to book your hotels and view the nearby visits. More over a navigation to Google maps is also made available for users to find their route.

Sample output:

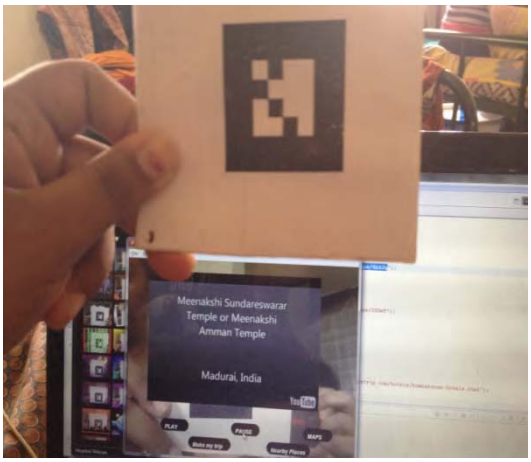


Fig 3. Display of Video

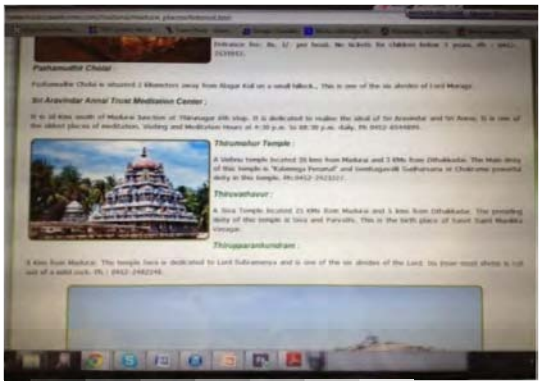


Fig 4. Page displaying Nearby Places

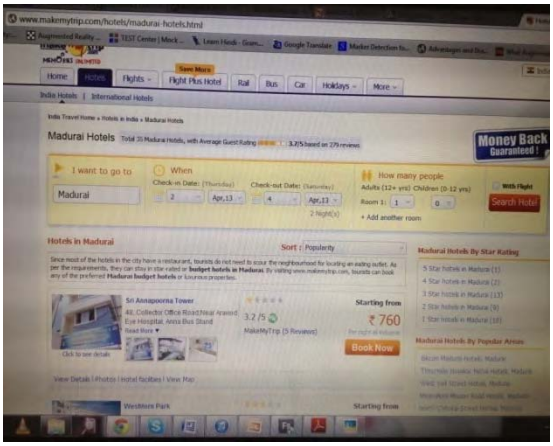


Fig 5. Page displaying list of Hotels

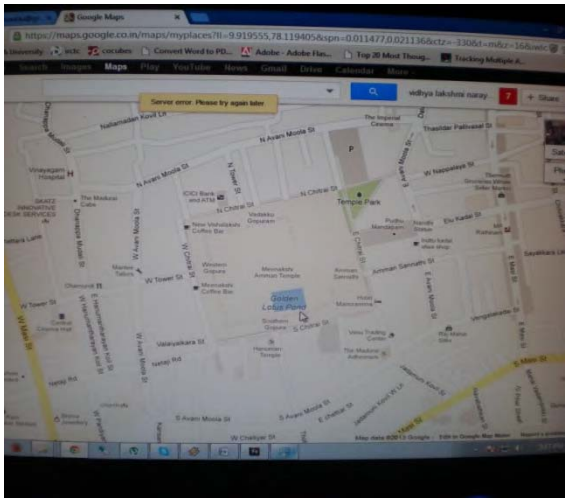


Fig 6. Page displaying Google Maps

Advantages:

The AR technique allows interaction with the program to navigate to various links through buttons simply, thus integrating the various requirements at one place. This product can be released as a mobile application and is portable. Since only markers are used the travel book can contain huge information in very less paper or even paperless in case of softcopies. Being a web based application, updating the software is simpler. The multimedia data can be fetched from the external links, thus it occupies less application memory in your device.

(b) In this work we have also considered implementing the same procedure for education purposes. We can use the circuit diagram enclosed in borders as marker. The circuit markers can be overlaid with the detail of working of the circuit or other specifications. This would allow the students to learn effectively by their own.

Sample output:

The sample output shows a circyuit of half wave and full wave rectifier explained through a video.

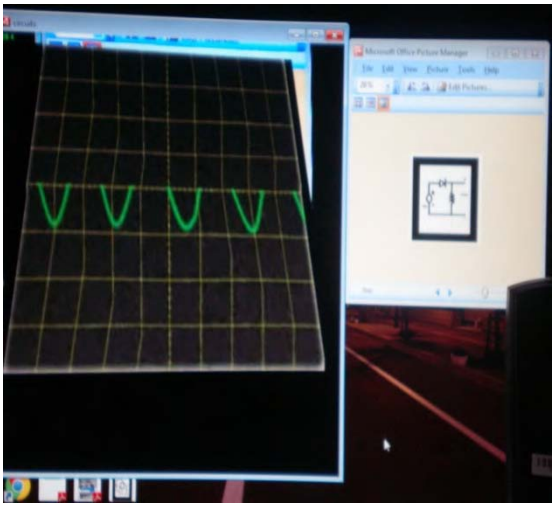


Fig 6. Graph showing Half wave Rectifier

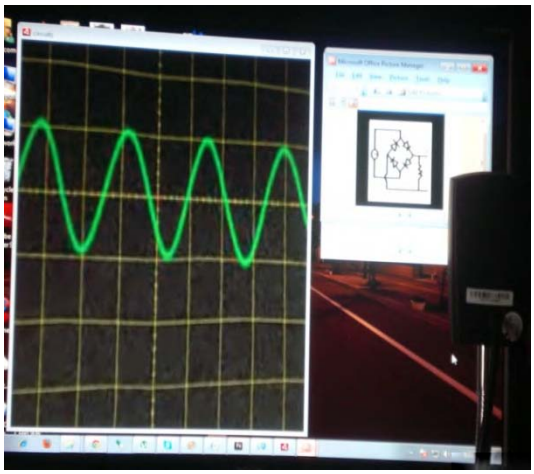


Fig 7. Graph showing Full wave Rectifier

Conclusion:

In this work we have presented an idea of developing Augmented Reality application for a tourism industry and have adopted the same concept for education. It provides high flexibility and usefulness in every field wherever we implement. The probability of error is minimum which makes it very reliable and it has a scope for a great development in the near future making a way for newer and more innovative applications.

Reference:

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