AUGMENTED REALITY APPLICATIONS - THE FUTURE

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1.0 ABSTRACT

This paper aims at exploring the possible future of Augmented Reality. The need for a system providing contextual information is very high considering the information overload in the present day. With the easy availability of Smart Phones in the market, it is easy for building a system that aims for continuous User feedback and participation. Augmented Reality is an emerging subject with scope for wide applications. Here we see the implications of such a technology in 2 fields. Online Shopping has become an attractive scenario for both sellers and buyers over the last years but the "look and feel" senses are still too important to get rid of them. Imagine a future where augmented reality (AR) is part of our lives. Our mobile devices enable to add "extra" projected information onto everyday reality everywhere. It is obvious to think that this future there will be a new form of electronic commerce, where businesses deploy marketing campaigns through AR and the customers use their devices to get detailed product information on site.

Key-Words: *- Augmented Reality, Urban Infrastructure, Contextual and Real time Information.*

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2.0 INTRODUCTION

In the world filled with exponentially increasing Information. 90% of world's online data was created in the last 2 years alone. This sums up the amount of digitalization of data that is happening in the present day. The problem of Information Overload demands continuous refinement of Information and contextualizing it for a user to use it at the right place and right time. Augmented Reality can be a solution to this problem.

Augmented Reality (AR) "allows the user to see the realworld, with virtual objects superimposed upon orcomposited with the real world. Therefore ARsupplements reality". In other words, AR constitutes an extra layer of information over a real time object. AR can be definedas having three main characteristics: It combines real and virtual elements, in interactive real-time, which areregistered in 3-D. There are many enabling technologiesthat are required to make useful and compelling ARapplications, including display devices, trackingtechnology, calibration techniques, and interfaces andvisualization.

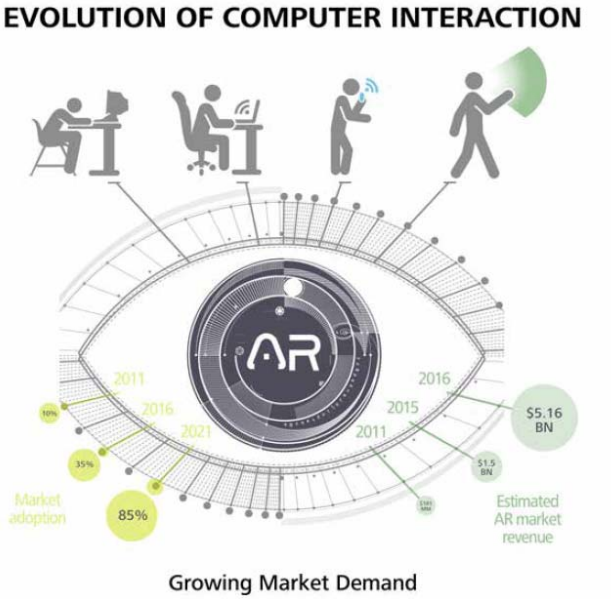
Augmented Reality is on everyone's lips at the moment because the new technology is being quickly adapted and lots of new and valuable applications have become available to users – for the most part free. By Augmented Realitywe understand the computer assisted augmenting of perception by means of additional interactive information levels in real time. The distinction between AR and Virtual Reality: in the case of Virtual Reality, the user is totally immersed in a virtual world that has no connection with reality.

AR can be used both with a PC or notebook and with a smartphone. The camera recognizes defined images (picture recognition) and on demand accesses stored functions or material via the Internet. These can be information, pictures or films that supplement real situations and, depending on circumstances, create a useful addition. The business models of AR are in the broadest sense advertising, subscriptions or Pay per Download.

Since Lego began using AR and the successful implementation of the technology in department stores, the toy industry has had a point of reference. But people are often unaware and underestimate the fact that AR could be applied in many more contexts.

The ambitious goal of AR is to create the sensation that virtual objects are present in the real world. To achieve the effect, software combines virtual reality (VR) elements with the real world. Obviously, AR is most effective when virtual elements are added in real time. Because of this, AR commonly involves augmenting 2D or 3D objects to a real-time digital video image.

The simplest example of visual AR is overlaying a 2D image on digital video. However, it is also possible to add 3D objects— they can be rendered so that they appear to belong to a scene containing real 3D objects. Generally speaking, adding a 3D object to real-time video makes for a more impressive demonstration of AR technology. When virtual objects are added to a scene, it is known as visual AR. By definition, AR elements are not visible to the naked eye, so visual AR relies upon some sort of display. This display can be as simple as a computer monitor or a television, or it could be something more advanced—such as a see-through eyepiece on a head-mounted display (HMD). New options are becoming available as many AR researchers are focusing their efforts on interfaces such as handheld devices, webcams, and more advanced HMDs.



Growing Market Demand

3.0 APPLICATIONS

This paper covers the application of Augmented Reality in 2 scenarios

1) For Underground damage control while digging
2) For Marketing Products.

3.1 For Underground damage control while digging

The underground space in urban environments is a spider's web of electric lines, gas lines, cable TV lines, fiber optics, telephone cables, traffic signals, street lighting circuits, drainage and flood control facilities, water mains and waste water pipes. In some locations, major oil and gas pipelines, national defense communication lines and mass transit rail/road tunnels, all compete for place underground.

Locating underground pipes and other infrastructure prior to excavation has long been a problem area due to complexity involved and the large number of variables over which accurate control is not possible. This section deals with the current state of affairs in terms of locating utility lines and limitations in them. There are methods like *Ground Penetrating Radar (GPR), Electromagnetic Technique, Magnetometer Technique, Resistivity Methods, Acoustic Detection Systems, Infrared Thermography, Subsurface Utility Tracing and Vacuum Extraction.*

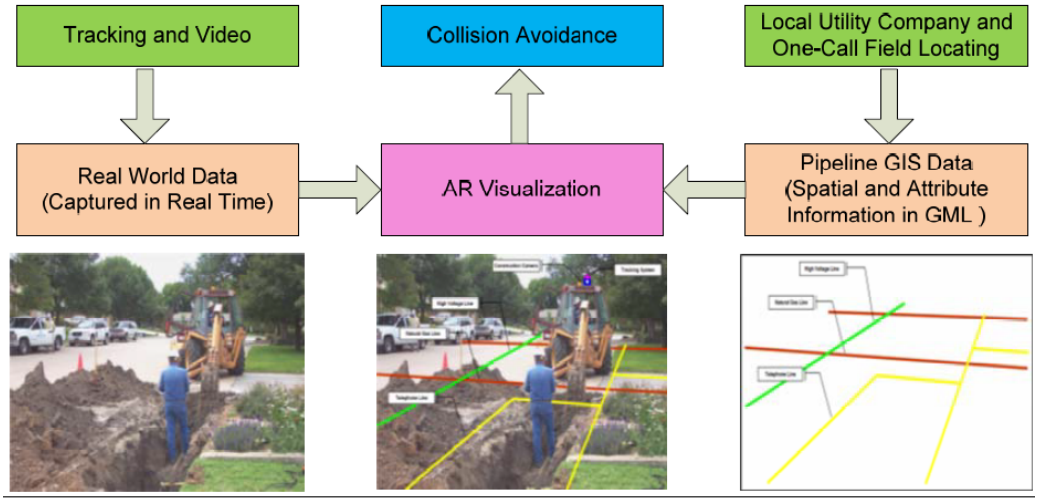


Figure 1: Data Flow for Collision Avoidance System Using Augmented Reality

The advantage of such a technology over using spray paint, stakes or flags to mark the approximate location of the utility is that unlike the existing methods, the location indicators remain in the operator's view even after the top layer has been excavated away. Furthermore, the superimposed 3D pipe models can be color coded allowing the operator to easily identify the pipe(s) the crew is interested in. As can be seen in Figure 1 above, other attribute information such as depth, material of pipes, etc. can be annotated over the pipes thus giving the excavator additional information.

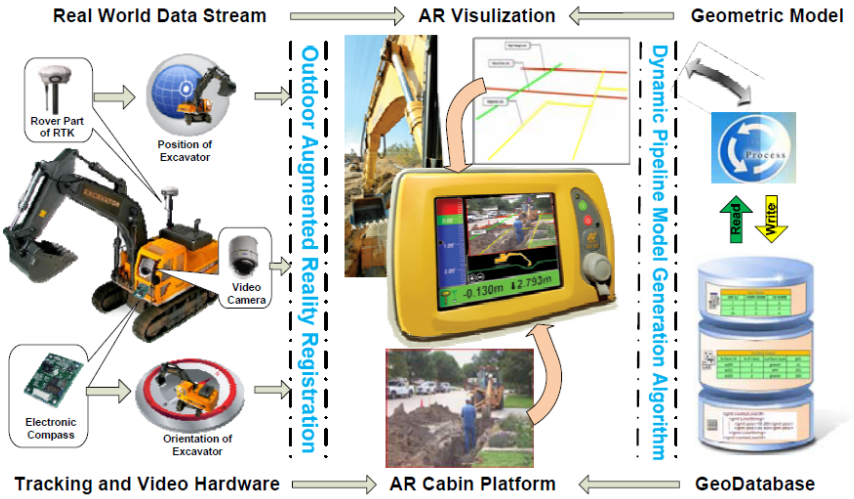


Figure 2: The architecture of visual excavator-utility collision avoidance framework

As Figure 1 shows, to implement the AR view of pipelines on the excavation site, two data resources are needed: the pipeline GIS data and the real world data. The two data resources are retrieved independently and integrated byAR software in real time to render the augmented view. Many local utility companies establish Geodatabases (GIS Databases) for their underground assets. The GIS data is transported via GML. In the GML schema, geographical coordinates, geometric characteristics and other attribute information of the pipelines are represented. At the same time, the real world data contains the real time tracking data and video stream of the real excavation scene. The tracking data supplies the AR system with position and orientation of backhoe, which is used for establishing the camera reference coordinate system with the origin at the video camera. The CAD models of pipelines, which are originally represented under the geographical coordinate system, can thus be aligned with the new camera reference system, calibrated and superimposed on the video sequence representing the real world.

3.2 For Marketing

The applications of AR vary greatly and can apply to a myriad of marketing and sales aims. So today'sAR applications can find or navigate to brands and stores, via logos, scan in mobile coupons that can then be redeemed create multimedia use of analogue print brochures or adverts, visually display and create the experience of brand worlds, create transparency and access to products that need to be explained, retrieve supplementary services/information on demand based on situation and context, carry out target-group-specific focusing of advertising messages, facilitate interactive window-shopping to increase frequency of shop visits etc.

In essence, employing AR mostly means quantitative expansion of brand perception and qualitative enhancing of brand attraction before, during and after buying. As well as prolonging the act of buying, the point to be stressed here is the (emotional) involvement of potential customers that is enhanced just as much by interaction, additional information and multimedia entertainment as by presenting what is concrete, relevant and useful.

An example: Interactive instructions for using a smartphone

With the 3D-tracking of Metaio, it will be much easier to master servicing and maintenance work in future. All users have to do is point their smartphone at an object. The technology immediately analyses it and gives instructions how, for example, the box can be opened or the toner in the printer can be changed. With the help of this technology, printed operating instructions will become increasingly redundant in the future.

If we apply this functionality to the instructions accompanying games, it means all that written material and small print is replaced by a user-friendly and lively presentation of interactive instructions.

Traditional distribution channels have evolved to attract new costumers used to the online world [Andrews, 2004]. If the appearance of Internet involved the most important change in people shopping manners in years, the application of Augmented Reality may entail the most outstanding evolution for the next decades.

Imagine a future where anyone with an AR application can find what they need during their walking way to the office by pointing at it, something we might call shopping cart assistant. We might use this wizard to any type of need: food, technology, services,fashion, etc. An specific scenario is being be designed to

provide such services. Following, three ideal stages of deployment are described:

1 . Network based Geolocation: Although it is common to find mobile devices with GPS and compass as well as plenty of AR applications, a large percentage of mobile phone users are still unaware of them. In a first phase an Internet center for customers and stock management was developed based on a social network portal such Facebook. The aim of the portal is to let costumers select products and create shopping cart in such way the system will indicate uses the nearest shop selling the desired product whenever they prefer. The geolocation of users is based

in service provider's network infrastructure so a larger amount of users can user the service. No special handsets or applications are needed in

order to use it.During this first version, nearby shops are displayed in a map along the costumers location. As detailed in section 4, a product stock system and a geolocated shop list database must be maintained. Although the services provided by this version must be improved the application will be easily known and used thanks to a viral environment, which is social media. The expansion of the application will soon attract new brands and manufacturers willing to add their stock to the database. Meanwhile, the information regarding users tastes will rapidly increase. Such information will afterwards be very valuable.

2 . AR-Market: The second phase of the development includes new technologies such GPS and AR. In many situations, we may be too busy or otherwise unable to fully observe and interpret our environment. Augmented reality is possibly the best choice in order to help understand the reality. For instance, AR

Compass based applications will help individual simply needs with assistance when finding an specific shop.

3. AR-Social Networking: People is very used to take into account others opinions and experiences when making decisions. Different people presented with the same options may likely have opinions and make personalized decisions based on experiences, observations, and suggestions from others. The AR Networking comprises a vast variety of resources, services, attractions so as to meet unique demands of individuals. In view of the wide selection of options presented in many aspects of everyday existence, a person can live and work more efficiently with at least some external assistance in regulating, monitoring,

and advising decisions in a retail setting. In order to provide such services, data-mining techniques are being developed so different advices may show up in the users display screen in different moments. When pointing the mobile phone to a disco, the system will tell us what kind of shoes the disco costumers use. If we focus our device to a shop, the system will inform us if our friends normally go there or if clothes sold may be of our taste.

There are typical links on your Web pages that customers can click on, and which allow them to perform some of the functions described above. In our use-case the we will propose two methods for object/product identification:

● **RFID**: normally passive Ultra-HighFID tag can be read at ranges of up to 30feet (approximately 10 meters) there is another one that can be read at larger distances. The user wear (or have on their mobile)

passive tags which are read by antennae placed on the "Ad-Man" who is wearing the objects could be of the user's interest. UHF based tags instead of Low or high frequency last generation tags provide accurate readings with specially designed antennas.

● **QR Codes**: are now used in a much broader context, including both commercial tracking applications and convenience oriented applications aimed at mobile phone users.

In this case, an "Add-Man" can wear a QR Code, and the user can photo or record this "Ad-Man" to get the information stored on the QR Code, like an address or URL to get more details about the product of interest. When the user is close enough to an "interesting" or just "readable" object in the first case or has interpreted the QR Code in the second case, the user will be able to get the relevant information about the object or product and from mobile or other device, have the following interactions availability:

- Add to our shopping cart in the mobile.
- Compare with other similar products.
- Look for the nearest place to try it or buy iton a "sky-view map" or by using a compassto get there.
- Share with friends this product even byusing social networks.
- know if some friend is already using thisproduct and know their opinion (dependingon privacy limitations).
- Save to favorites products and getinformation about the brand.

The use of solid state compasses has grown over the last months improving geolocation and augmented reality developments. In the case of this project our aim is to use the compass to locate the shops where we can find the products of our list just by positioning the mobile in any direction. The system will show a

tag with relevant information (distance, stock, price) of the shops located in the direction where the webcam is focusing.

Once shop is selected, the user can choose to be guided to the shops address by the mobile in a turn-by-turn basis. The cost of the Internet connection needed to locate places within a map has been also improved. Users will be able to download both the map and de list of places (mostly

shops) given a location. The download process takes place every time the user is interested.The information is update via a webservice without the need of the user interaction.

It is true that not all consumers are eager to embrace a new media shopping experience.Early adopters and the new "millennial" generation, however, will tilt the playing field towards a multi-touchpoint strategy and away from the retailer's control. Retailers should take action today to:

- Identify their core target shoppers
- Understand how they interact with media—today and tomorrow
- Develop a multi-touchpoint strategy that fits the brand and matches shopper behavior
- Listen to consumers' voices in these touchpoints, and respond appropriately
- Offer a one-brand experience everywhere

If managed well, this strategy offers the opportunity to reduce the cost of acquiring, serving, and maintaining customer relationships.

4.0 CONCLUSION

Technology and consumer behavior are changing at a dizzy pace. Retailers and companies that wait for others to drive touchpoint adoption will be left behind. In the post-recession world, there are no fast-growing new markets. Growth will come at the expense of the competition. To survive and grow, retailers must continually look for the competitive advantage that will help them differentiate their brand.

Focusing on key touchpoints ensures that customers have an experience that reinforces your brand promise. Listen to customers at these touchpoints and you will almost certainlyhear things you didn't know. Providing information consumers want—when, where, and howthey want it—will attract new shoppers and increase conversion. Listening to consumers and responding to their needs will help keep those customers and build brand loyalty.

Thus, augmented reality can be the future in more than many industries. Presenting contextual information in real time is the need of the hour. The challenges associated with such Technology need to be addressed to make it more meaningful.

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