

Standards for AR with Print: Call for a New Initiative

A position paper for the International AR Standards Meeting February 17-19, 2011

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Abstract— Planar objects are well suited for visual feature recognition and will be the basis of many AR experiences because they are widespread, and easy and inexpensive to produce for augmentation purposes. Furthermore, publishers of print media content hold enormous repositories of information that could be made available to end users in engaging ways with AR and be revenue sources for both AR and print industries.

Currently, print and publishing content is managed in systems which are incompatible with AR content publishing and management systems. This paper suggests that experts in print CMS and AR CMS should collaborate to develop open interfaces for the future.

I. INTRODUCTION

In comparison with digitally distributed and “digestible” information, printed materials are limited in that they are not easily updated, they deteriorate, and they do not support interactivity in the dimensions which are possible with digital media. But print and paper are not dead. Many people share a vision of the future in which any printed material, from a poster, a sign or a package to a printed page in a newspaper, magazine or book, can provide its reader more value than what the original material was designed to convey.

When combined with a camera, algorithms that detect the content of the page, and platforms that retrieve associated digital data, printed surfaces will provide value beyond what is possible with either print-only or digital-only content.

In fact, due to the fact that planar (2D) objects are much easier for visual recognition than 3D objects, print will be used more widely as a suitable “trigger” for AR than natural or other man-made objects that do not have a stationary position on the globe. Print will remain in use if for nothing more than to disambiguate and accelerate routine searches on real world objects by AR applications. Further, AR can be systematically used for sight and hearing impaired people, effectively “translating” from one communication medium to another.

This position paper examines some of the obstacles to the development of print as a medium for initiating AR experiences for users and concludes that it would be beneficial to all the players in the ecosystem if a new initiative were formed to work out graceful and scalable solutions for the future of AR with print.

II. A SCENARIO FOR THE FUTURE

We are in a transitional time. Today, content owners are in the process of moving from print to digital media for reaching their target audiences. The print-on-paper and the digital domains are both providing content to users. Content is being broadcast and, at the same time, completely personalized. Increasingly, new media versions of content, designed from the beginning for use in the digital world, are commanding equal or more resources than the print equivalents.

In the information cycle, we are on the left hand side of Figure 1. When we complete the cycle this diagram shows, content will be available to users in print, on the web, on tablets and using AR-enabled devices of all types without effort on the parts of the publishers or the users.

III. STATE OF THE ART

In this section we are referring exclusively to AR that is independent of the user’s location. Before natural feature recognition was widely available on desktop systems and for many applications on mobile using today’s processors, AR experiences are triggered by a fiducial marker or “fiducial”[1]. The camera detects the fiducial, software extracts the most unique “features” of the marker, these are matched to previously designated features stored in a database, in a similar fashion to QR codes, and an application sends a digital file (or an “object”) to the user’s terminal [2]. The digital file associated with the fiducial in advance is made to appear in real time and in alignment with the marker. The digital label or object is visible and

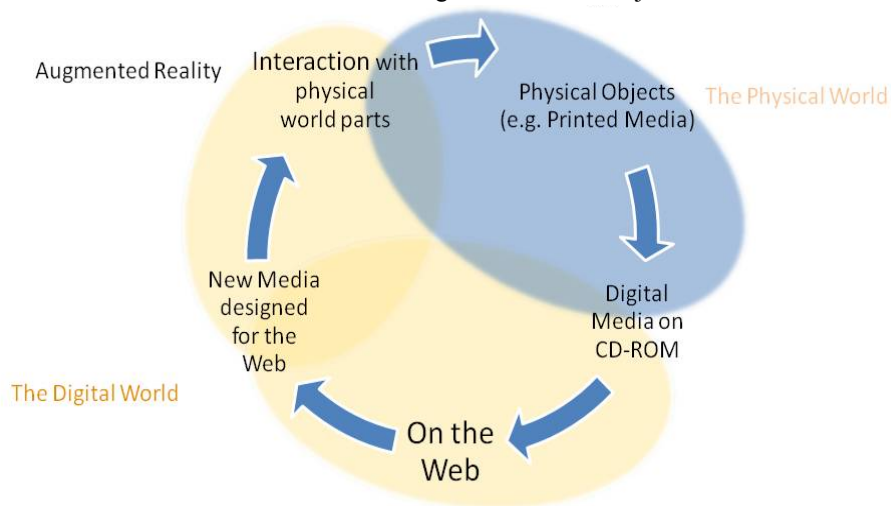


Figure 1 AR continues what the Internet began

Source: PEREY Research & Consulting

sometimes can be interactively explored, in the place of a browser opening a URL to a static Web page. The digital file associated with an AR fiducial on a business card could, for example, be a photo of the person whose name is on the business card.

The fiducial system is widely used for product packaging, advertisements and marketing.

In some use cases, using mobile cameras on smartphones and natural feature recognition software with image databases, existing content can “extended” with AR, and without the need to “insert” or add any special code or markers.

A recent example of how compelling the results can be is the WordLens application for iPhone, published in December 2010 by Quest Visual [3] The first release of this mobile AR translation application recognizes large, brightly lit words in Spanish and overlays the translated text in English on the user’s screen and the reverse (English to Spanish). It is not designed for reading books and doesn’t work in all situations or have support for all languages, but it uses true visual feature recognition-based AR to solve a very real problem experienced by many people. Currently WordLens is a “stand alone” application, which does not require network access to work.

Creating an application that relies on visual recognition involves:

1. “training” of software algorithms to recognize key features within the original content or marker,
2. creating new, digital content which in some way adds value or “goes with” the existing or new materials, usually with 3D software and interactivity, and
3. connecting the results of #1, above, the features associated with the “legacy” media (or the made-for-digital page) and the results of #2, with one another.

When the user has access to the publisher-prepared software and databases, visual detection systems need to extract the relevant features from the real world and track these in real time. While tracking, the application must extract from a local database or receive from a remote database, the associated digital content. Finally, the user’s device needs to display the digital object in a fashion that is “registered” with the target.

IV. OBSTACLES TO GROWTH

The steps enumerated above place heavy burdens on several ecosystem segments:

- the source of the text content, could be a storyteller or a copywriter,
- the publisher and printer of the finished work,
- the distributors of digital and print content, and
- the end users who are not sure what is an “active” AR zone and what is not and what tool they should use to experience the supplementary content, if it even exists.

Some of these challenges are addressable with education but many will require technology solutions. For

example, the accuracy and speed of visual recognition systems are getting better but these still do not match the human eye and brain for many applications. Increasing the number and types of visual sensors, and combining geo-position with visual sensing information (cameras) help to alleviate obstacles such as variation due to shadow/lighting effects.

To recognize images on deformed surfaces, such as an image that is across the fold of a map or the seam of a book, requires extra processing. To address these real world challenges, visual recognition continues to receive significant investment from commercial companies as well as from research institutes and government agencies.

Creating complex, 3D complementary materials can be time consuming and costly, reducing, in some cases, the financial viability of an AR project. When the purpose of the complementary material is to drive sales of a new product, in a print advertising, for example, the cost of the 3D content development may be offset by increased revenues from product sales. When margins for a printed material are low, publishers are reluctant to invest in 3D design.

Further, in order to gracefully add the AR version of existing and future content to a publisher’s readily available (merchandisable) assets, there must be digital content that is stored and managed in a Content Management System (CMS). The CMS should store both the digital objects and the features of the indexed print content. When accessed with AR-capable devices interacting with the printed media—made-for-digital or pre-existing—a user has the complete AR (combined print+digital) experience.

A number of barriers in this phase of the production and delivery of good AR with print could be reduced with standards.

Currently, AR content management systems are separate and distinct from print and Web content management systems. Existing AR platforms require that the indexed print media images (files) be “ingested” into the AR content publishing system. Changes in the media files need to be propagated to all the users and this does not scale well if the data is stored locally to the user.

Due to the unique requirements of different end user devices (e.g., desktop, smartphones, tablets, etc), entirely different versions of the digital objects may have to be available. But why should they be stored in different (separate) databases? Why isn’t device detection a part of a complete system? With automatic mobile device detection, the correct version of a file would be provided to a user’s device every time.

In the future, the publishing of AR content must be sufficiently flexible to represent and manipulate objects/support interactivity while, at the same time, offer customized experiences for the different end user platforms. And, publishing platforms should have AR and feature content stored on the device and, also be distributed across the client and server/host for optimal performance, lowest cost to the end user and without loss of publisher control.

V. CONTENT MANAGEMENT SYSTEM STANDARDS

This section of the position paper is pasted “as is” from the Content Management Junction Web site [4]. The

freshness or accuracy of this information is not known but could be determined through direct communications with engineers designing content management systems.

“The development of content management systems seems to follow the same trajectory as relational databases. The initial step is the consolidation of multiple vendors into a few major players. The next step is the introduction of interface standards. These steps are sure to open up vertically integrated vendor solutions into separate content repository and content application layers. The introduction of various Content management standards enable users to easily mix and match the best of breed content applications and to integrate multiple content repositories.

The World Wide Web Distributed Authoring and Distribution standard (WebDAV) is one of the most important Content management standards. WebDAV Content management standard provides a standard infrastructure for asynchronous collaborative authoring across the internet. In addition, the WebDAV Content Management Standard provides a standard interface between a range of authoring tools and WEB content. The interface supports version management and locking and management of metadata such as author and the last date the content was modified. In effect WebDAV supports universal collaboration over the Internet.

Content management standards are rapidly emerging. The Content management standards enable portlets to be used by any compliant portal server. Portlets are used by portals, as pluggable user interface components to provide a presentation layer to information systems. Organisations can use standardized portlets to access compliant web services, provide services for any number of portals and share portlet code. Web Services for Remote Portlets (WSRP) standard 1.0 is a Content management standard that provides interoperability between .Net and Java-based portal elements, which enables organisations to share a hosted portlet.

Java Specification Request (JSR) 168 is a specification defines a set of application programming interfaces (APIs) for portlets and addresses standardization for preferences, user information, portlet requests and responses, deployment packaging, and security. The JSR 168 Content management standard enables interoperability among portlets and portals. Both the JSR 168 and the WSRP Content management standards are widely supported by the major players of the content management industry. Most of the leading vendors have started to release products that support these standards. As a result, these standards will play a key role in opening up portals to the resources of a growing community of portlet developers.

Content application developers are forced to adapt to a wide range of proprietary APIs to work with multiple content repositories, due to the consolidation amongst content vendors. The JSR 170 is a Content management standard that allows developers to use the same API to access all the content repositories. JSR 170 also has a strong industry support with Apache, IBM, SAP, BEA Systems and Oracle all serving as members of the expert group. Other leading industry participants include, Documentum, Filenet, Vignette, and Venetica.

The common interface provide by the JSR 170 Content management standard supports read/wirte access to repository content and metadata, facilities to create versions of any content and retrieve these versions, monitoring and notification of content events such as changes made to a document, and full-text search and filtering of content. In addition, the common interface of the JSR 170 Content management standard provides a unified, extensible, access control mechanism, standardized access to the locking and concurrency features of a repository, and a standard mechanism to soft/hard link items and properties in a repository and provide a mechanism to create relationships in the repository. The JSR 170 Content management standard is mainly designed for the J2EE environment. The usefulness of the JRS 170 Content management standard enables it to be extended to non-Java environments as a web service. “

[end of content]

VI. CALL TO ACTION

In order to overcome challenges such as those described above, the existing ePublishing DRM/CMS system providers for the print and publishing industry (e.g., Adobe, Mark Logic, North Plains Systems, Innodata Isogen, Connotate, and Aptara) and the AR platform providers (Total Immersion, metaio, AR Toolworks among others) need to collaborate to simplify the integration of their systems and reduce the barriers to entry for content publishers.

This collaboration will require investments on the part of the:

- AR technology providers,
- those companies providing solutions to publishers and printers, and
- content providers/publishers themselves.

Investments will take the form of:

- developing open APIs which support the integration of content from visual recognition into an existing publisher’s CMS, and/or the reverse,
- tools and workflows which simplify and accelerate the production of 3D objects of suitable interest (with interactivity) and conforming to the needs of a variety of end user devices,
- testing new technologies with existing content as well as with new made-for-digital print materials, and
- educating the marketplace of readers and consumers of information about the new experiences available to them.

VII. CONCLUSION

We believe that while significant challenges will need to be overcome, there is great potential for AR to be distributed as a companion product by printers and publishers, and the channels which market and sell printed media today. We look forward to receiving feedback to this paper from all those interested in the topic and to supporting the interchange between the communities of print and AR technology companies.

ABOUT AUTHOR

Christine Perey has been working in the domain of rich media communications for 20 years, initially in the area of dynamic media technologies on personal computers; she founded, was the editor and publisher of the QuickTime Forum, a publication for QuickTime developers 1991-1993. When enterprise and wide area networks emerged as a means of distributing rich media created and consumed on personal computing devices, she expanded to provide a variety of services to the companies in the rich media communications industry, and accelerated adoption of videoconferencing and streaming media.

Since 2006, Perey studies and assists companies to better understand their opportunities in the domains of Mobile Social Networking and Augmented Reality. Perey is an active leader of new industry initiatives, organizing thought-leadership meetings and think tanks about mobile AR topics.

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