[DEMO] Insight: Webized mobile AR and real-life use cases

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[DEMO] Insight: Webized Mobile AR and Real-life Use Cases

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ABSTRACT

This demonstration shows a novel approach for Webizing mobile augmented reality, which uses HTML as its content structure, and its real-life use cases. Insight is a mobile AR Web browser that executes HTML5-based AR applications. By extending physical objects and places with a uniform resource identifier (URI), we could build objects of interest for mobile AR application as document object model (DOM) elements and control their behavior and user interactions through DOM events in standard HTML documents. A new CSS media type is defined to augment virtual objects to the physical objects. In this model, we introduce the concept of PLACE, which is the model of a physical space in which the user can be located. With this approach, mobile AR applications can be seamlessly developed as common HTML documents under the current Web eco-system. The advantages of the webized mobile AR, which is able to utilize all kind of Web resources without reworking, and its high productivity due to the seamless development of AR contents in HTML documents are shown with real-life use cases in various domains, such as shopping, entertainment, education, and manufacturing.

Keywords: authoring environment, content structure, mobile AR, real life, Web architecture, World Wide Web

Index Terms:H.5.1 [Information Interfaces and Presentation]: Multimedia Information Systems—Artificial, augmented, and virtual realities;

1 INTRODUCTION

AR content should deal with the physical world as well as the virtual world. To achieve a unified representation for these heterogeneous environments, Ahn, et al. [1] proposed a content structure for AR in terms of the webizing methodology [2]. This demonstration mainly focuses on the advantage of the webized mobile AR: 1) all kind of Web resources can be used as augmented information without reworking, and 2) the seamless development environment of AR contents in HTML documents results in high productivity in various application domains, such as shopping, entertainment, education, and manufacturing. We show these capabilities with real-life use cases of the webized mobile AR.

2 WEBIZING METHODOLOGY FOR AR CONTENT

2.1 Webized AR information model

HTML is widely used to represent information in the modern Internet system. The main reasons for this are the simplicity of its content structure, the modularity of the system, and the decentralization of information sources. From an architectural perspective, the Web has the potential to relate the virtual world to the physical world. In the Web information model, a resource is a primitive that a hyperlink can reach, and the hyperlink is targeted by a URI. As the concept of resource has evolved, a resource can be anything in the real world, including physical entities, such as objects and places. The webized AR information model embraces the content structure of AR and the common Web.

2.2 AR content in HTML

HTML also has the potential to be a container for AR content with physical resources. A hyperlink enables an HTML document to embrace physical resources. Physical resources can be directly embedded in an HTML document. The linked resources are immediately acquired when the document is rendered.

Figure 1 demonstrates how webized AR content is represented while the extended use of the resource model for the physical environment conforms to the current Web architecture. The method of referencing physical resources differs from a generic HTML document because a physical resource does not belong to an HTML element. To avoid conflict over the current web standard, we do not add a new HTML element or attribute to deal with physical resources. Instead, we utilize CSS, the separated presentation logic of HTML, to reference physical resources. It conveys the context from the physical environment to the application by the addition of a style sheet without modification of the document content. Consequently, it enables reuse of numerous HTML contents in the Web content eco-system.

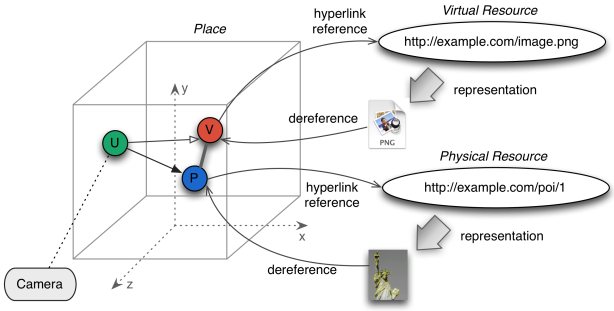

Figure 1: Webized AR information model

2.3 Insight AR Web Browser

Webized mobile AR provides clean separation between the AR Web browser, which handles tracking and rendering, and content, which handles the representation of augmented data. Using Insight's content structure composed of HTML5, CSS3, and JavaScript, which is the same as common web pages, application logic can be implemented in a JavaScript library form. Thus, the AR content and accompanying application logic is easily reusable.

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3 Real Life Use Cases

This demo presents several augmented reality Web applications (ARWebApps) in HTML5 using the Insight Web browser. Tablets are used as mobile AR Web browsers (Insight), rendering the HTML5-based AR contents on their display panels and interacting with the users. A computer is used for a content management system (CMS), which is hosted in a local Web server, and it shows how the Web applications and their resources are organized.

Visitors can play with the ARWebApps developed for real-life use cases in various domains as they would play with typical AR applications. The applications are classified into two principal parts. First, the demo shows the revolutionary capability of the proposed method to utilize all kind of Web resources without any reworking; the demo includes information search applications in the shopping and manufacturing domains. The variety of applications demonstrates the productivity of webized AR content authoring. Visitors experience that ARWebApps are completely portable due to the clean separation between the application logic dealing with physical objects and the runtime environment.

3.1 AR Book Inspector

Once the Insight AR Web browser recognizes pre-defined target features, the target feature identifier retrieves the matching target URI through the DB and transfers the URI to the Amazon Web store connector. By using the target URI, the target's HTML page is retrieved in Amazon and is transformed into target semantic data. Using the target semantic data, view management understands the target identity (e.g., book and blue-ray disk) and filters the information that is needed for the static layout decision (Fig. 2a). Then, the real-time view management gets the static layout, tracking position data, and screen parameter values from the AR Web browser. By using these data, the AR content's layout is dynamically relocated and augmented onto the targets.

3.2 3DIY-holic

3DIY-holic is an AR-aided design and manufacturing agent platform which examines 3D point clouds captured from a depth camera, not only for recognizing existing physical products in the real world, but also for interactive visualization of how virtual CAD models are properly fitted to the products with free viewpoints. The demo shows the capability of webized mobile AR to automatically search and download a set of CAD models (Fig. 2b) suitable for physical objects from the Web and instantly use the models as augmented data (Fig. 2c).

3DIY-holic recognizes and estimates the information of physical products, such as product IDs and geometrical properties (position and orientation), using a depth camera coupled with the mobile device. Then, the system retrieves the proper set of CAD models for the products by using the previously recognized results. The selected candidates are augmented and visualized with the physical products after the simulation that defines the optimal parameters of CAD model to be fitted with the product. Finally the users choose the resulting CAD model through the user-oriented interface. With this AR-based approach, users can easily and seamlessly perform CAD/CAM related tasks without high-level expertise.

3.3 Entertainment

Real-life use cases in the entertainment domain are shown. By using the Insight AR Web browser, AR postcard makes it possible to include a greater variety of contents without limitations in the analogue postcards (Fig. 2d). Jazz AR demonstrates an example of providing enriched information for a compact disk jacket of a Jazz label and a Jazz musical explanatory book (Fig. 2e).

3.4 Education

AR Web Applications in the education domain are also demonstrated. 'Turning the earth' lets visitors know a variety of environmental issues around the world (Fig. 2f). 'Inside my body' is a teaching method that can make learning much more fun with graphical cards (Fig. 2g). 'Workbook' helps students study without the effort of making notes of wrong answers on a test (Fig. 2h). 'AR Treasure hunt game' is an interactive educational tool that encourages 3 to 5 year old children to engage in learning new English words (Fig. 2i). An AR popup book for children makes it possible to interact with augmented objects (Fig. 2j). All these examples show that the webized mobile AR methodology facilitates content supply with Web-friendly authoring environments.

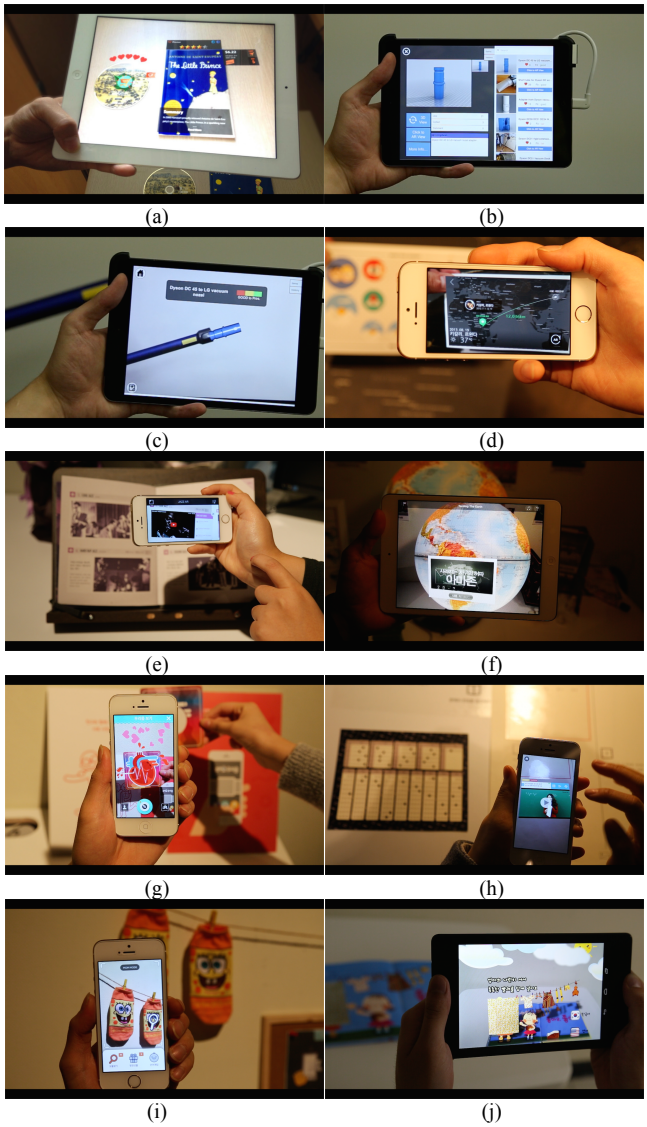

Figure 2: Examples of best practice in real-life use of the webized mobile AR

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