

Object AURAs: A Mobile Retail and Product Annotation System

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ABSTRACT

In this paper, we describe a system used to link physical objects to online content implemented with commercially available pocket computers using bar code scanners, wireless networks, and web services. We describe sample applications built with the system for objects like books, music, packaged goods, and art works as well as a related web application that facilitates the creation of communities around objects scanned by the handhelds. Finally, we suggest several scenarios for uses of these kinds of devices and the possible sociological and commercial implications.

Categories and Subject Descriptors

H.4.3 [Communications Applications]: Bulletin boards, Electronic mail, Information browsers

General Terms

Documentation, Design, Economics, Experimentation, Human Factors

Keywords

Ubiquitous computing, community, retail augmentation, physical interfaces, tangible interfaces, bar codes, tags, annotation, Tour Guides, Museum Guides, handheld computers, wireless networks.

1. INTRODUCTION

Every object has a story to tell. Labels and signs tell only a part of this story and there is always an enormous amount more that cannot fit on the label. A wave of mobile systems for authoring and accessing annotations on physical objects is about to become widely available through the integration of mobile computing, wireless networking and a variety of sensors. The technical infrastructure required for linking physical objects to online content has become increasingly developed, available and affordable to a growing population as pocket computers merge with cell phones. The resulting hybrids enable a new linkage between things and information about things that dramatically expands the space for commentary and services related to the places, products, and objects that physically surround us. Retail

environments seem the most likely to change as consumers bring the power of the Internet to bear at the point of sale.

2. Description of System

Nearly every object has a wealth of information available about it from various networked resources. We created a system that links objects with machine readable tags to metadata that describes those objects. Our architecture combines a client application with remote web services tied together with wireless networks. We think of this system as a platform for the construction and deployment of “payloads” – small applications that are based around the identifying strings captured by the various hardware scanners and sensors. Each payload is tuned to accept a particular type of identifier and link it to a set of online resources and services. Each of these services provides some form of metadata that is itself then used to find related online content like the web site of the object’s manufacturer or online commerce web sites that provide reviews and offer those objects for sale.

To accomplish this we integrated widely available cellular and WiFi networked Pocket PC handhelds together with bar code scanners. Client software was created that takes a scanned identifier and passes it through various kinds of services like search engines, ecommerce sites, and directories available over the public Internet in order to retrieve useful metadata about the objects. Our first application allows users to interrogate any bar coded object and access related web content directly on the device.

We also created a closely integrated web application that allows the data created by the use of the system to be accessed from both the web browser on the mobile device as well as from the desktop; the desktop complements the mobile device by supporting different modes of engagement, like entering large amounts of text, that might be impractical on the handheld device. The web application supports the creation and access to lists of the objects users scan with their device. These lists are used to construct queries for search engines and related services that can yield useful and highly relevant results about the objects scanned. Users can annotate any object in the list and then selectively expose items and their comments for public discovery via a web blog or RSS feed. This portal could also be used to link to associated content like discussions, emails, photographs, video, and audio along with structured data like ratings and reviews.

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Item	Name	Email	Category	Latest Scanning Time	Is Public?	
	<ul style="list-style-type: none"> Sesame Street - The Best of Elmo UPC: 074845122939 Item Name: Sesame Street - The Best of Elmo Item Category: Video Manufacturer: Sony Wonder Release Date: 9/1/1998 12:00:00 AM Starting: Jim Henson, Frank Oz 		Video	3/24/2004 4:16:34 PM	<input type="checkbox"/>	Delete
	<ul style="list-style-type: none"> Office Depot Premium Photo Paper, Glossy, 10.25 MI, 92 Brightness, 8 1/2in. x 11in., Pack Of 100 Sheets UPC: 735854980344 Item Name: Office Depot Premium Photo Paper, Glossy, 10.25 MI, 92 Brightness, 8 1/2in. x 11in., Pack Of 100 Sheets Item Category: Office Product Manufacturer: Office Depot, Inc. OurPrice (\$): 38.66 		Office Product	3/24/2004 4:43:47 PM	<input type="checkbox"/>	Delete
	<ul style="list-style-type: none"> A Charlie Brown Christmas: The Original Sound Track Recording Of The CBS Television Special UPC: 025216843126 Item Name: A Charlie Brown Christmas: The Original Sound Track Recording Of The CBS Television Special Item Category: Music Manufacturer: Fantasy Release Date: 9/19/2000 12:00:00 AM ListPrice (\$): 15.99 OurPrice (\$): 14.99 UsedPrice (\$): 3.26 Artist: Vince Guaraldi Trio 		Music	3/24/2004 9:24:58 PM	<input type="checkbox"/>	Delete
	<ul style="list-style-type: none"> RFID Handbook: Fundamentals and Applications in Contactless Smart Cards and Identification ISBN: 0470844027 Item Name: RFID Handbook: Fundamentals and Applications in Contactless Smart Cards and Identification Item Category: Book Manufacturer: John Wiley & Sons Release Date: 5/9/2003 12:00:00 AM Authors: Klaus Finkenzeler 		Book	3/17/2004 1:13:12 PM	<input type="checkbox"/>	Delete
	<ul style="list-style-type: none"> The Complexity of Cooperation ISBN: 0691015670 Item Name: The Complexity of Cooperation Item Category: Book Manufacturer: Princeton Univ Pr Release Date: 9/24/1997 12:00:00 AM ListPrice (\$): 15.95 OurPrice (\$): 17.12 UsedPrice (\$): 17.12 		Book	3/24/2004 4:11:38 PM	<input checked="" type="checkbox"/>	Delete
	<ul style="list-style-type: none"> All Tomorrow's Parties ISBN: 0399145796 Item Name: All Tomorrow's Parties Item Category: Book Manufacturer: Putnam Pub Group Release Date: 10/21/1999 12:00:00 AM ListPrice (\$): 24.95 OurPrice (\$): 24.95 UsedPrice (\$): 1.3 		Book	3/24/2004 4:26:12 PM	<input type="checkbox"/>	Delete
	<ul style="list-style-type: none"> Encyclopedia of Community ISBN: 0761925960 Item Name: Encyclopedia of Community Item Category: Book Manufacturer: Sage Publications Release Date: 6/23/2003 12:00:00 AM ListPrice (\$): 595 OurPrice (\$): 595 UsedPrice (\$): 99.99 		Book	3/24/2004 4:44:03 PM	<input type="checkbox"/>	Delete

Figure 1. Web application displays a user's collection of scanned objects

These features change the nature of retail spaces and commercial transactions. Objects in stores become physical links to data about their price, quality, availability, competing products, and communities of users. This sets the stage for significant shifts in power between consumers, retailers, manufacturers, and online merchants.

For a consumer society, the transformation of consumption may be quite profound. The most mundane but essential element of product packages, the label faces significant change in a world of wireless devices. Food and clothing labeling, for example is often an emotionally and politically charged process. Many opponents of genetically engineered foods and pesticides, for example, have lobbied without success to require identification of those foods on their labels. Many labor-rights activists have called unsuccessfully for clothing labels that include a rating of the labor conditions of the manufacturing company or nation that produced the good. With wireless devices that can read object tags, Web services that offer particular kinds of description and warning information can be created fairly easily. Blocking such meta-annotations may be very difficult, making it possible for consumer decisions to be influenced at the point of sale by a range of viewpoints that are not now widely heard.

Our system could further impact where and what users buy. For example, widespread use of wireless handhelds may turn every bookstore on earth into a showroom for Amazon.com. Users can scan books at a brick and mortar business and then check the price on Amazon or EBay. These services do not necessarily erode physical retail establishments. Users could, for example, browse Amazon for recommended alternatives which might be found on

the shelf behind them. Feature and price comparison services could support complex purchasing decisions, particularly in environments where sales help is not highly trained. The device could confirm that the difference between the retail and the online price is minimal enough to warrant immediate purchase. Retailers might also leverage these devices to create incentives to send customers to multiple areas of the store, requesting that they scan a tag at each location, in exchange for small rewards. Visiting five areas of a book store that you might not otherwise frequent might be exchanged for the offer of a coffee or a discount on other purchases. Since controlling attention and foot traffic through retail establishments is a critical goal in retail the results might be increased sales volumes.

Shopping is a social process. This system can integrate with existing communication tools like buddy lists and cell phones to provide social support for purchasing decisions. The device can be used to send information about scanned objects to people in our decision support networks, for example, checking with a spouse to see if they think a potential gift will be appreciated by another relative. The system might also be used to accumulate wish lists by selectively publishing information scanned objects to public or semi-public audiences. Features like this are already offered in department store bridal registries and some retail stores. Our system expands the scope of this application to any object, whether displayed in a store or any other location.

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