



New Products

Editors: Maria Ebling ■ IBM T.J. Watson Research Center ■ ebling@us.ibm.com
Ramón Cáceres ■ AT&T Labs ■ ramon@research.att.com

Bar Codes Everywhere You Look

EDITORS' INTRO

In this column, we focus on this issue's theme: labeling the world. We look at some labeling technologies, especially 2D bar codes, and talk about their adoption around the world. We also look at a popular application of 1D bar codes—price comparisons. Special thanks to Tim Kindberg and Nina Bhatti for their advice regarding this column, though all errors and omissions are ours.

Beginning in 2010, Ramón assumes the role of associate editor in chief and, alas, steps down as Maria's partner in crime in this column. Thanks to Ramón for his brief stint in this role.

Please continue to send pointers to upcoming products with exciting possibilities, your feedback on existing products, and your personal experiences with them (your name will be included with your review). Email us at pvcproducts@computer.org.

—Maria Ebling and Ramón Cáceres

BAR CODE BASICS

Labeling our world requires, well, labels. Today, this typically amounts to what's commonly called a *bar code*. This term is synonymous with the Universal Product Code (UPC) and European Article Number (EAN) codes found on nearly every manufactured good and familiar to most consumers through their nearly ubiquitous use at grocery store checkouts. Depending on the exact type (www.adams1.com/upccode.html), UPCs and EANs can encode several digits. These codes are fixed in length and limited to encoding numbers. UPC and EAN codes are but one type of 1D bar code. Other 1D bar codes, including the high-density Code 128, can encode alphanumeric characters, including all 128 ASCII characters. Use of Code 128 is common in the shipping industry.

There are also 2D—or matrix—bar codes. (We're not sure why these are still called *bar codes* because squares have replaced the bars.) Examples include QR (Quick Response), Data Matrix, and Aztec codes. Their main

advantage is that they can represent a large amount of data in a fixed amount of space.

QR codes (www.denso-wave.com/qrcode/qrcode-e.html) can encode any data type, including alphanumeric, Kanji, and Hiragana symbols. Their data capacity varies by data type, with numeric data having the most capacity (more than 7,000 digits) and Kanji the least (approximately 1,800 symbols). Similar to other 2D bar codes, QR codes encode information both horizontally and vertically. So, the image is more compact than a 1D bar code, requiring approximately 10 percent of the space necessary for an equivalent 1D bar code.

QR codes became an ISO international standard (ISO/IEC 18004) nearly a decade ago. They're in widespread use in Asia, particularly in Japan, where they often appear on billboards (see Figure 1), at bus stops, on LCD advertising, and even on food wrappers. They're also common in Europe, although not as routinely visible. If people in these countries snap a photo of the QR code using their mobile phone's camera, the



Figure 1. Quick Response (QR) code. Users take a picture of the code with their mobile phone; the phone's software then decodes the image and directs the phone's Web browser to the URL stored in the code. (Courtesy of Nicolas Raoul; used with permission.)

phone's software can decode the image and direct a Web browser to a URL stored in the QR code. The resulting Web page might contain information such as nutrition facts or event dates and times, or it might play a music video or let the user purchase tickets. Other uses include encoding a text message, a phone number, or a business card. Some proponents argue that the code should contain only an identifier, which is then looked up at a resolution service, but we like the independence enabled by decoding the image locally.

QR codes are now spreading to the US. Google recently launched *Favorite Places* (www.google.com/help/maps/favoriteplaces/gallery), wherein businesses post a sticker (see Figure 2) in their window identifying the store



Figure 2. Google Favorite Places. Businesses display a sticker containing a QR code that passersby can scan to access more information, such as customer reviews.

as a favorite, as measured by Google Maps' search results. The sticker contains a QR code that passersby can use to access more information, such as customer reviews, ratings, maps, and contact information, as well as a link to the business's Web site and potentially even coupons.

QR code adoption in the US has been much slower than in other parts of the world, reportedly for a wide variety of reasons including privacy concerns and associated legalese, patent portfolios, and the cost of accessing the information via a phone without a data plan. In our opinion, the main barrier is that users must download and install an application that makes sense of the visual code.

But adoption is picking up substantially and barriers are coming down, partly because of a move toward preinstalled software. Qualcomm announced in late 2009 that Scanbuy would come preinstalled on its Brew Mobile Platform operating system (www.scanbuy.com/web/news/105-scanbuy-software-to-be-pre-integrated-on-qualcomms-new-brew-mobile-platform). Scanbuy and NeoMedia both announced that their mobile bar code applications will come preloaded on all camera-enabled Sony Ericsson devices (www.scanbuy.com/web/press-kit/102-sony-ericsson-to-pre-load-scanbuys-mobile-barcode-application and <http://neom.com/press-detail.php?id=53>). Preloading

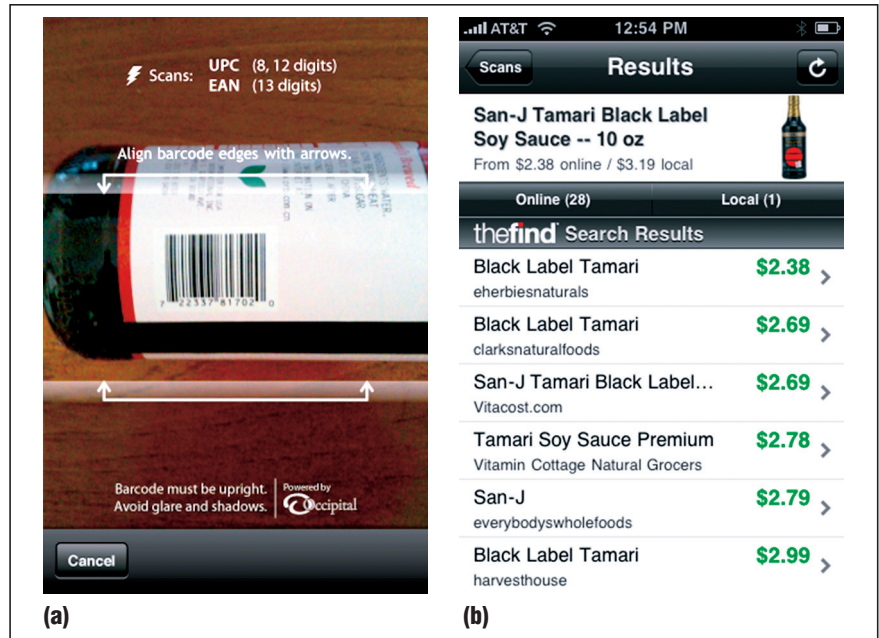


Figure 3. RedLaser. (a) A user scans a product's bar code, then (b) receives a list of various stores' prices for the product.

such software significantly lowers the entry bar.

ADVERTISING APPLICATIONS

Since mid-2009, select BMO Capital Markets advertisements in the *Wall Street Journal* have included EZcodes, a type of 2D bar code. One recent ad let readers access a Web page containing archived presentations, reports, and marketing materials. As with online advertising, companies can monitor Web site traffic generated from print ads containing 2D bar codes to measure the ad's impact.

InStyle's March issue features SpiderLink SnapTags (www.spyderlynk.com/how-snaptags-work), which function similarly to matrix bar codes such as QR codes and EZcodes. SnapTags surround a company logo or message with a circular code. When a consumer takes a photo of the tag and sends the image to the back-end system, the system decodes the image and returns a message to the consumer. This format encodes only a few bits and can't encode the message in the bar code, but we find it more visually appealing (that is, less geeky and intimidating).

PRICE-COMPARISON APPLICATIONS

An increasingly popular use of 1D bar codes is price comparisons while shopping. Again, users capture the UPC or EAN image on their mobile phone. In newer applications, the phone's software decodes the UPC or EAN label and consults online databases for the item's current prices in both online and physical stores. The shopper can use this information to decide whether to buy the item at the current store or elsewhere.

Two examples of such applications are ShopSavvy (www.biggu.com), available for the Android and iPhone platforms, and RedLaser (www.redlaser.com) for the iPhone. Figure 3a shows RedLaser guiding the user on how to line up the camera with a UPC label to scan the bar code. In Figure 3b, RedLaser identifies the scanned product and lists prices for the product at 28 online stores and one physical store. The application shows only nearby physical stores, which it finds by exploiting the phone's automatic localization function. We expect continued growth in the use of these and similar bar code applications as more of our world acquires labels. ■