Anyone looking at magazine advertisements, product packages, or even museum exhibits lately might notice that many of them have begun including a small square with an odd design inside.

These squares are 2D barcodes, which have symbols that represent data running horizontally and vertically. The 2D tags contain much more information and can perform many more functions than traditional one-dimensional universal product codes. UPCs consist of a series of thin and thick vertical lines and have been common on items such as product packaging since the mid-1970s.

2D barcodes typically store data such as a product’s lot number and expiration date, and a URL for the manufacturer’s website. They could also take a user to an advertiser’s website. Someone looking at a movie poster could use a 2D barcode to go to an online trailer for the film.

Smartphone users photograph or scan a 2D barcode on an advertisement or product and text, e-mail, or send it via a format such as short message service. Users then connect either to a URL that takes them directly to a webpage with the desired information or to a clearinghouse that routes them to the barcode sponsor’s server, which then sends them to the target webpage.

The 2D-barcode industry is still young with different levels of adoption by companies, demographic groups, and markets, said Microsoft Tag general manager Aaron Getz.

For example, the technology is widely embraced in Japan but still emerging in the US, noted Michael J. Liard, a research director with ABI Research, a market analysis firm.

The barcodes are most widely used for marketing, such as to enable customers to get coupons, obtain store or product information, or participate in promotional contests, according to Michael Becker, the Mobile Marketing Association’s North America managing director.


A coalition of grocers and technology companies eventually standardized UPC technology, which began enabling product price scanning in 1974.

Denso Wave created 2D barcodes in 1994 for use in tracking vehicle parts through the manufacturing process. However, the tags have only recently begun widespread use in consumer settings.

2D barcodes use spaces, colors, and symbols—such as squares, dots, and triangles—to store information like letters, numbers, and punctuation, noted Ed Jordan, CEO of barcode vendor JAGTAG.

Direct-encoded symbologies provide the desired information, such as a URL, without users having to go to a server first. The barcode reader directly translates the symbols into the information.

Indirect symbologies store a short alphanumeric string that a reader decodes. The system then looks up the string’s meaning in a database and returns the appropriate response.

There are about 20 types of 2D barcodes. Some have specialized applications, such as within the healthcare industry to identify stored blood types.

The tags generally contain symbols enclosed in a square or rectangle. The systems have various ways of making sure barcode readers can decode information in the correct order. For example, JAGTAGs do this via the four marked corners of its barcodes.

According to Mike Wehrs, CEO and president of barcode-system-
provider Scanbuy, three nonproprietary 2D-barcode physical formats are most frequently used in the newly popular consumer applications. They differ in size, data capacity, and symbol type and configuration. Some have different capabilities such as error correction, which lets systems read the code even if the surface on which it appears has been damaged.

Quick Response encoding, a direct-encoded symbology that Denso Wave developed, is typically an inch square. A QR symbol can store a code with a maximum of 7,089 alphanumeric characters. The approach is commonly used in Japan, in applications such as manufacturing, logistics, and sales. There are several QR standards.

The direct-encoded Data Matrix barcodes vary in size from 2 millimeters to 14 inches square—the latter used on billboards—and can store up to 2,335 alphanumeric characters. Data Matrix barcodes are often used to track electronic and other types of components through the manufacturing process.

EZcode barcodes, an indirect approach that ETH Zurich developed, are a quarter-inch square, small enough to be attractive for use on product packaging and advertisements in publications. A scanner reads the barcode and uploads the code index to a server. The system consults a database and determines what the code means.

Numerous proprietary formats also exist including Microsoft Tags—released in May 2010—which use triangles and sometimes dots to represent data. The five-line color barcode is at least 0.75 inches square. The black-and-white versions are at least 0.875 inches square. Users can also create custom tags.

Users read the barcodes via a smartphone application. When decoded, the information points to a Microsoft server, which stores the represented information.

JAGTAGs are at least 0.75 inches square. Users photograph them with their smartphones and upload the image to a JAGTAG server. Decoders translate the tags, consult a database to determine what they mean, and send the desired information back to the user via multimedia messaging service.

Users typically utilize JAGTAGs to connect to websites to access many types of information such as weekly shopping coupons, sports highlights, and movie trailers.

According to Jordan, few phones have preinstalled barcode-scanning applications, which has slowed tag adoption. In the US, he noted, a minority of mobile-phone users even have smartphones. Moreover, the many types of 2D barcodes, the resulting market fragmentation, and the lack of widespread standardization are confusing to potential users, said Liard.

The lack of an established business model may also be holding back the market. Companies are still experimenting with various models, noted Jordan.

Nonetheless, said John Puterbaugh, founder and CEO of mobile-computing-services vendor Nellymoser, his company has studied the market and found that companies are interested in 2D barcodes.

As more consumers utilize smartphones and 2D barcodes, their use will increase, said Becker. And, Jordan added, companies will find new ways to employ them.
Wireless Devices Provide Users with Mobile Wi-Fi Hotspots

The personal mobile hotspot—a relatively new approach that lets users obtain ubiquitous high-speed connectivity so that they can access the Web, e-mail, or other networked services wherever they are—is starting to become increasingly popular.

Unlike some other types of devices, the mobile hotspot lets users connect even if no traditional hotspot is available.

The devices let users of smartphones, laptops, iPods, tablets, gaming devices, or any other Wi-Fi-enabled mobile device access a cellular network to which they subscribe, noted Sprint spokesperson Caroline Semerdjian.

The mobile hotspots are basically Wi-Fi routers with wireless uplinks, according to Carl Howe, analyst in the Anywhere Consumer research group with the Yankee Group, a market research firm.

Traditional Wi-Fi hotspots, on the other hand, let users access services via a fixed router that links to a network with a wired connection. Personal mobile hotspots thus give users more flexibility by wirelessly connecting to a network.

Novatel Wireless introduced the technology via its credit-card-sized MiFi Intelligent Mobile Hotspot, according to company spokesperson Charlotte Rubin.

Other vendors, such as Cradlepoint, also make personal hotspots. And some newer Android phones contain embedded hotspots.

Phones connect via Wi-Fi to the mobile hotspots, which then link to the wireless network via cellular technology. Once connected, a phone can serve as an access point for other wireless devices. They could access the network simply by linking to the phone via Wi-Fi.

The mobile hotspots use various Wi-Fi technologies. For example, Sprint’s devices use the IEEE 802.11b and 802.11g versions to communicate with the company’s code-division multiple-access (CDMA) network, noted Semerdjian.

The battery-powered hotspots work via a Wi-Fi chip containing a transmitter, receiver, and antenna. They also have one or more antennas that let them connect to one or more types of cellular networks.

The devices provide communications-related services such as encryption, security, authentication, and GPS, Semerdjian noted.

They offer connections at the same speed as whatever Wi-Fi versions they work with. IEEE 802.11n is currently the fastest version, offering theoretical maximum data rates of 600 Mbps.

Being able to utilize one portable hotspot to provide any device with wireless connectivity can be more economical for a user than subscribing to separate data plans for each device.

But, according to Howe, carriers have mixed feelings about the devices. Some providers like them because they yield new income from a nonvoice service, he explained. However, he added, others prefer to focus their efforts on telephony, which is more lucrative.

As the hotspots get faster, they could replace wired broadband connections, particularly for consumers who want to consolidate their network-access services, he said.

Selling portable mobile hotspot services via monthly subscriptions may be difficult because users may not understand the technology’s value or want yet another ongoing communications-related cost, according to Howe.

Also, if future smartphones and other machines include chips that provide mobile-hotspot capabilities, separate hotspot devices might become unnecessary.

Howe predicted the portable hotspots will be successful and will generate demand for connected radios, video players, game consoles, and other applications that would work via the devices.

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Electronic Paintbrush Captures Colors and Textures from Objects for Use in Creating Art

Researchers have developed a high-tech brush that lets users create art by picking up images, video, audio, colors, and textures from objects and painting them onto a touch-screen canvas.

Experienced artists could use the device intuitively without having to work with typical computer-based interfaces such as mice, keyboards, or controllers, noted Stefan Marti, co-inventor of I/O Brush and a principal researcher and project leader at Samsung Research and Development.

I/O Brush looks like a typical paintbrush but contains a small camera that captures images, video, and audio. It also includes optical fibers among the bristles, a ring of LED lights for illumination, and four pressure sensors that measure the force the user exerts when painting. This determines the width and angle of the resulting brush stroke.

An embedded microelectromechanical inclinometer determines how the user rotates or angles the device. The system uses this information to create the types of strokes and textures a painter might utilize.

By applying the brush to the canvas in different ways, artists can distribute, sequence, rotate, and otherwise manipulate images, video, and audio as desired.

When touching an object, the brush captures and stores thumbnail images at about 16 frames per second. Upon touching the canvas—a large plasma, LCD, or rear-projection touch screen—the device lays down the thumbnails at 10 frames per second, overlapping them when necessary to create the desired image.

The I/O Brush can distinguish between touching an object to pick up image data and touching the canvas to apply the information. Algorithms identify when the brush is touching something but not moving, indicating that it’s supposed to be acquiring images from an object; or when it is moving and thus should be placing images onto the canvas.

The resulting art pieces are touch-sensitive and interactive, and can play video thumbnails and audio related to the painting.

According to Marti, the researchers plan to create commercial consumer and professional, museum-quality I/O Brush versions. He said they have been in licensing and commercialization discussions with major software and hardware companies.

Source: MIT

Researchers have built a high-tech brush that lets artists pick up images, video, audio, colors, and textures from objects and paint them onto a touch-screen canvas.