

A graphic language for touch-based interactions

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Abstract

This project explores the visual link between information and physical things, specifically around the emerging use of mobile phones to interact with digitally augmented objects and spaces.

General Terms

Design, Experimentation, Human Factors.

Keywords

Interaction design, mobile technology, embodied interaction, visual design, interface design, rfid, nfc.

1. Introduction

As mobile phones are increasingly able to read and write to Radio Frequency Identification (RFID) transponders embedded in the physical world, how do we represent an object that has digital function, information or history beyond its physical form? What are the visual clues for this interaction? Here we are interested in the visual link between digital information and physical things in the early days of ubiquitous computing where consistency and standardisation will be beneficial for early user-adoption.

Digital information, history, functionality and services embedded within everyday objects is one model of ubiquitous computing in which every object is a node within an 'internet of things'. A variant of RFID called Near Field Communication (NFC) allows people to interact with physical spaces and objects by the action of touching a mobile phone to an RFID tag. This is perhaps the first sign of mobile phone being central to the early adoption of the internet of things, where otherwise 'dumb' or 'silent' objects right at the very edges of the network are enabled through the action of touch.

Unlike Semacode or other 2D barcode systems, RFID is most likely a hidden chip embedded under the surface of an object. This is both an advantage and a disadvantage; giving us the opportunity to hide possible interactions

without visually degrading the surface, but also reducing the user's ability to know the range of possible interactions with everyday objects. Clearly we shouldn't rely on the kind of 'mystery meat' navigation that has become the scourge of the web-design world, where we have to roll-over or touch everything to find out its meaning.

This work doesn't attempt to be a definitive system for indicating touch-based interactions. It proposes directions that may be useful towards standardisation and consistency, but is mainly an exploratory process to find out how digital/physical interactions might work. It has been inspired by a lack of research in visibility issues in ubiquitous computing and 'locative media'. It attempts to uncover interesting design and interaction opportunities while the technology is still largely out of the hands of everyday users.

2. Background

Existing iconography for interactions with objects like push buttons on pedestrian crossings, contactless cards, signage and instructional diagrams offer great inspiration for the patterns of a new graphic language.



figure 1. Felica-based consumer electronics from Sony, showing Felica icon that indicates touch interaction.

There is a growing collection of existing iconography in contactless payment systems, with a number of interesting graphic treatments (see figure 2).

'Felica' is Sony's implementation of NFC, and is being integrated into a growing number of mobile phones and mobile consumer electronics. Sony has used a clean and distinctive icon that shows an RFID card being placed with a finger (see figure 1). Although this is a great, instructional icon for this kind of action, it's use is limited to cards, and it doesn't indicate the right kind of action using a mobile phone.



figure 2. Existing iconography for touch-based interactions. These interactions are mainly ticketing, payment or interactions with functions in public space.

There are also instances of touch-based interactions being represented by characters, colours and iconography that are abstracted from the action itself.

Suica is the dominant form of contactless payment in Japan, and the Suica Penguin is perhaps the best known icon, that is used consistently with a strong colour schemes of green and black (see figure 3).



figure 3. Suica penguin advertising RFID-based payment services at a convenience store in Japan.

In terms of visual branding this strong character has contributed to the widespread acceptance of RFID technology in Japan. Although this is a great example of a way of 'humanising technology' through association, the iconography is tied into an existing brand and is unlikely to be adopted as a more generic iconography for digitally augmented objects.



figure 4. Icon for RFID-based passports (left).
figure 5. Icon for AIM Global EPC RFID tags (right).

Two more generic examples are officially mandated icons for RFID iconography. Figure 4 shows an icon mandated by the International Civil Aviation Organisation (ICAO) and is designed to visually represent RFIDs embedded in passports, it is being used on current passports issued in the US.

Figure 5 is proposed by the Association of Automatic Identification and Mobility (AIM Global) and is designed to be affixed on readers and transponders in the supply chain, to help logistics workers to identify RFID enabled labels. Two-character codes are used to identify the frequency, the defining agency for the data, and the data on the tag.

Both of these icons are copyrighted and tightly controlled for use only in restricted cases. In both cases the purpose of the icons is for specialist identification, this is particularly troubling in the case of the RFID passport that gives very little indication of either the content or the electronic nature of the object.

3. Graphic development

Sketching revealed five initial directions: circles, wireless, card-based, mobile-based and arrows (See figure 6 and 7). The icons range from being generic (abstracted circles or arrows to indicate function) to specific (mobile phones or cards touching tags).



Figure 6. Initial sketches for an RFID interaction icon

Arrows might be suitable for specific functions or actions in combinations with other illustrative material. Icons with mobile phones or cards might be helpful in situations where basic usability for a wide range of users is required. Although the 'wireless' icons are often found in many current card readers, they do not successfully indicate the touch-based interactions inherent in the technology, and may be confused with WiFi or Bluetooth. The circular icons work at the highest level, and might be most suitable for generic labelling.

A simple circle was chosen for further investigation (see figure 8). This circle is surrounded by an 'aura' described by a dashed line. This communicates the near-field nature of the technology but also describes a physical object that contains something beyond its physical form. The dashed line distinguishes touch-based interactions from generic wireless interactions.

In most current NFC implementations, such as the 3220 from Nokia and many Felica phones, the RFID reader is in the bottom of the phone. This means that the area of 'activation' is obscured in many cases by the phone and hand. The circular iconography allows for a space to be marked as 'active' by the size of the circle, and we might see it used to mark areas rather than points. Usability may improve when these icons are around the same size as the phone, rather than a discrete point to touch.

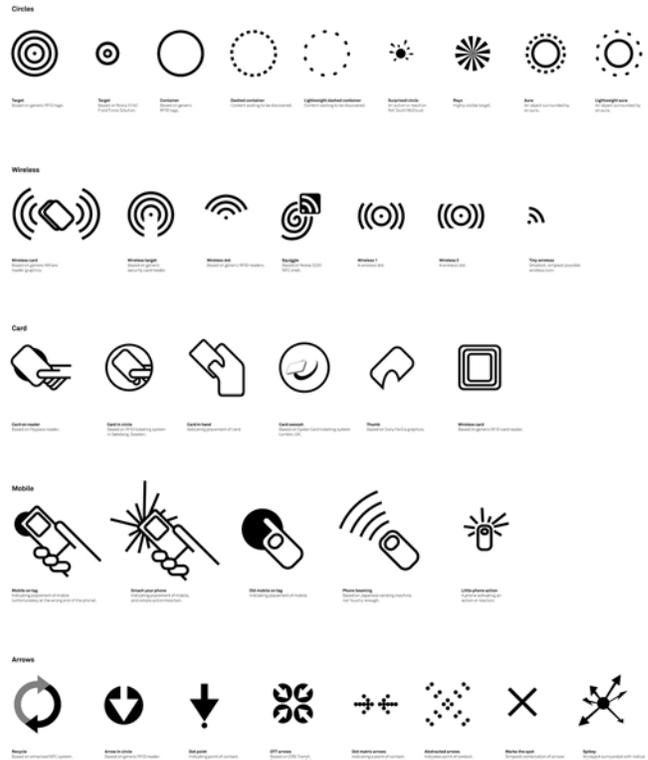


figure 7. Final selection of sketches.

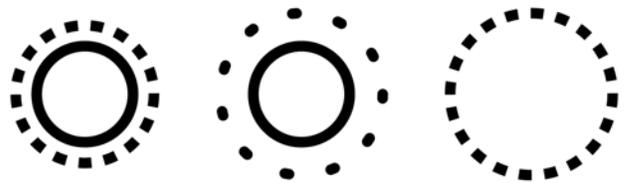


figure 8. Circular icons with dashed lines.

4.Applications

A number of applications of the iconography have been explored and these will form the basis of a new project and paper. Two examples of evidence produced by the project follow.



figure 9. The address book fridge.

Figure 9 is an exploration of the potential personal use of RFID fridge magnets, that would turn pictures and other content on the family fridge into objects that trigger phone calls or other kinds of communication.



figure 10. Wearable tags by Ulla Maaria Mutanen.

Figure 10 is an investigation of the graphic language applied to wearable crafted products, where the icon is sewed into handcrafted clothes, indicating that they contain a history of their use. This was created by Ulla-Maaria Mutanen who is particularly interested with the idea of tracking craft products and introducing new interactions and economics within consumer products.

5.Future directions

This is work in progress, and there are clear directions to look at specific applications, suitable uses and extensions. Ideally it should develop into a richer language as the applications for this type of interaction become more specific and related to the types of objects or information being used. For example it would be interesting to find a treatment that could be applied to situations as diverse as a gaming sticker offering power-ups to a bus stop offering timetable downloads.

There are also interesting questions about location and context. How large or visible should they be? Are there places that should not be 'active'? And how will this fit with the natural, centres of gravity of the mobile phone in public and private space.

The icons are available to download under a creative commons licence; users are free to use and modify them. We are very interested to see how they can be applied and extended.

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