# DartMail: Digital Information Transfer through Physical Surrogates

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**Abstract.** DartMail realizes the concept of transferring digital information with physical surrogates. In a lightweight manner, it allows users to easily associate information with augmented physical darts, transfer that information, then retrieve the information.

One of the principle activities in group interaction is exchanging information between collaborators. People swap business cards and vacation photos, and co-authors exchange evolving versions of a paper. Computers system equivalents allow people to store and forward digital documents by email, file transfers, web links, or through shared file servers.

Yet these conventional methods of transferring information assume the exchange of either electronic or physical information. This distinction is limiting, since physical and electronic information can be linked (Ishii, 2003). For example, digital vacation photos are intimately related to a hand-written postcard: both are linked but we normally send them separately. If instead the pictures were "linked" to the postcard, the recipient could view the pictures as they read the postcard.

RFID tags allow us to easily tag a physical item, where the tag can identify electronic information associated with that item. This video illustrates our ideas through DartMail, a humorous account of how 'handles' can be quickly created, attached to a physical medium, and exchanged. Its primary interface is a physical, RFID-tagged rubber dart. Exchange is accomplished in three rapid steps.

1. Associating the RFID dart with digital data. The person passes the dart over the RFID reader to raise an on-screen dialog. The person then drags a file or textual information (such as a web link) onto it.

2. Information transfer. The person hunts down his or her colleague, and shoots the dart at that colleague.
3. Information retrieval. The receiver passes the dart over another RFID reader, automatically opening up the associated information.

DartMail is built atop two toolkits. Using Phidgets (Greenberg & Fitchett, 2001), the RFID mechanism raises an event containing the RFID tag ID whenever a tag is passed over the reader. Using the shared distributed data structure of the Collabrary (Boyle & Greenberg, 2002), the application checks to see whether anyone (anywhere) has associated information to this ID. If it has, the information is retrieved and opened in the appropriate application. If not, the person can drop items onto the raised dialog, which are copied into the shared data structure as a pointer (e.g., to files) or as content (e.g., as text or a web link).

DartMail's design is fully intended to be tongue-in-cheek. However, its underlying idea is quite serious. RFID tags can be embedded in a variety of physical form factors, e.g., business cards (for electronic resume exchanges), paper bookmarks (for web page exchange), photo frames (for photo exchange), executive summaries (for full document exchange) and so on. Thus, both digital and physical information can be transferred through the many rich ways we now exchange physical items: as a hand-delivered gift, as a mailed paper letter, as a paper document distributed to a group, and so on.

We are not the first to associate physical handles to electronic information. For example, MediaBlocks (Ullmer et al., 1998) attaches information to wooden blocks which can then be used to manipulate that information, and WebStickers (Ljungstrand et al., 1999) uses printed barcodes to associate URL's with items.

DartMail is amusing and enjoyable to use. People within our laboratory use it to transmit casual information (e.g., links to silly web pages, altered images). Additionally, DartMail often attracts the attention of others, prompting informal watercooler-like conversations, something a purely digital method would not do.

# References


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