# Supporting Collaboration through Passing Informal Notes to Peripheral Displays

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**ABSTRACT**
DropNotes is a note-passing system for informal sharing of information within a small group or for posting notes to oneself. Its goal is to improve collaboration by increasing awareness through peripheral displays. DropNotes typically appear on peripheral displays placed in the work environment, such as a door panel, a peripheral display near the phone, a group board in a break room or a PDA. The design of DropNotes focuses both on making note creation easy and on minimizing interruptions. As such, DropNotes supports informal information sharing and peripheral awareness rather than messaging.

**Keywords**
Peripheral display, awareness, messaging.

**INTRODUCTION**
Fred needs to get a hold of a customer service person at company X, but their line is busy and he doesn't want to just leave a voice mail. To remind himself of the phone call, he drags the phone number from company X's home page onto the DropDock for his peripheral display. The DropDock is a graphical component on his main computer screen that creates a new note when information is dragged onto it. A self-note with the phone number appears on a peripheral display next to the telephone. Each few minutes Fred notices the note reminding him to call. When he eventually gets through, he taps the note on the display to close it.

Susan takes a coffee break while writing her CHI short paper. She would like to chat with Chris about the paper on peripheral displays he is working on, but his door is closed, indicating he doesn't want to be disturbed. Susan drops a note "Coffee break! Join me?" on Chris' dock with an expiration of 15 minutes. Chris sees the note appear on the display in his office. There is no need to take action to acknowledge or dismiss the note, as it will go away by itself after a while. Chris finishes the paragraph he is working on and decides to join Susan for a cup.

**DROPNOTES**
DropNotes allows people to send short messages to themselves or to colleagues, that are displayed on peripheral displays in the work environment. Notes have the appearance of sticky notes, whose background color indicates type: self-notes are yellow, personal notes from others are green and public notes sent to a group are blue. Notes are meant to be short, informal and relatively short-lived. Notes typically contain phone numbers, email addresses, a name, or simply a few words as reminder to get milk on the way home. Alternatively, notes can contain an image.

When displayed on a peripheral display, notes typically appear in a desktop-like space. This allows users to arrange notes at will. On devices with smaller screen sizes, such as a PDA, several notes might be collected into one longer document or only the latest note might be shown.

Notes are displayed in a way that makes users aware of newly arriving notes, but otherwise minimizes interruptions of ongoing work. We do not use using blinking, or even subtle animations on new notes because movement in the visual periphery can be highly distracting, see [1, 2]. Users will notice the arrival of a new note, but it is at their discretion whether to act on the note. Most commonly, it is not necessary to interact with a new note: simply seeing the note is sufficient to perceive the information, making DropNotes a no-interaction-required interface.

We think the ephemeral nature of most notes is an essential aspect of our system. Everybody has probably received emails informing about "cookies in the coffee room" hours after the fact. DropNotes automatically appear on the display, guaranteeing timely delivery of a message. Many people check e-mail only a few times throughout the day and typically would miss such notifications. Similarly, users can assign an expiration time to DropNotes. Expired notes are automatically removed from the display.

**DropDocks**
In order to support a fluid interaction with the system, we use the concept of the DropDock. Docks are small regions at the very edge of a user's display space, labeled with a destination. When the user moves the mouse pointer over a dock, it expands to show a sketch of the peripheral display addressed by the dock (see figure.)

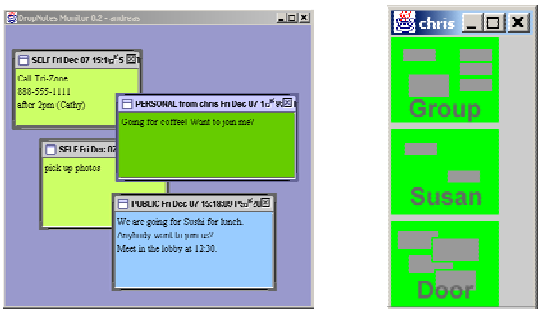


Figure: The arrangement of notes on a display (left) is reflected on the associated DropDock (right).

DropDocks were inspired by the use of "flaps" in the Morphic interface of the Squeak system (www.squeak.org). Flaps are relatively small components sitting at the periphery of the workspace. When moving the mouse cursor over a flap it expands to reveal a palette of (typically) tools or shortcuts to projects. Docks, like flaps, conserve screen real estate when not immediately needed.

Clicking a DropDock opens a dialog to create a new note. Alternatively, shift-clicking the dock creates a new note containing the contents of the system clipboard. The third method to create notes gives DropDocks their name: Dragging text or an image from another application onto a dock creates a new note containing the dropped information. The drop location inside the dock determines the approximate location where the note will appear on the peripheral display. Depending on security settings, the DropDock shows the location of notes already on the targeted display. This allows senders to place notes in a free space or to informally prioritize notes by placing them at the bottom or top of the display, for example.

DropDocks maintain a history of notes sent through them. This allows senders to withdraw a note, or change its expiration date. However, it is not possible to access notes posted by other people. Thus, this model departs from the e-mail and postal mail model where it is not possible to withdraw messages once they are sent.

### Addressing notes

DropDocks are located at the border of the user's main display according to his or her personal preferences and needs. This allows docks to maintain a loose spatial relationship to the note destination. For example, this author's peripheral display is running on the laptop left of the main workstation, near the telephone. Another display is outside the office door (to the right). Accordingly, there are two separate docks.

Users owning several peripheral displays use one DropDock per display, unless several displays are meant to show identical information. Additionally, there is one dock for every person a user would like to send notes to. Users determine which one of their displays shows incoming notes from other people. Accordingly, a DropDock can be associated with a group of users or displays. Notes sent to these docks are shown as blue public notes.

### Acknowledging receipt of a note

Even with very informal notes it is sometimes useful or even necessary to receive confirmation that a message has been seen. Notes of this kind contain an "OK" button. Clicking or tapping this button informs the sender that the note was seen. Similarly, we consider adding a note variant containing "Yes", "No" and "Don't know yet" buttons.

From there it would be an easy step to extend the idea to a general "reply" button. However, this would turn DropNotes into an instant messaging tool. We believe that existing instant messenger systems do a good job for messaging of this kind. Passing notes back and forth through a reply function does not fit our design goals. For this reason we do not plan to incorporate a reply button.

### Architecture

DropNotes is implemented in Java. Both DropDocks and the displays communicate through a system called Dspaces, developed at our lab. Dspaces is a tuple-space like Linda or IBM's T-spaces system [3].

Peripheral displays run a Java-swing based client, which displays incoming notes as internal frames on a JDesktop. Every addressable display or group of displays 'owns' a space on the Dspaces server and registers for change notifications on this space. New notes dropped into that space thus trigger an event received by all registered displays. The displays then show the newly created note. Similarly, when notes are closed or moved, update events are sent to the associated DropDock, which then reflects the change in arrangements in its visual appearance.

## SUMMARY

DropNotes supports both informal information sharing with other people in a group as well as posting informal reminders to oneself. The key idea of the system is to make creation of notes as simple and easy as possible and not to require interaction with the notes. Users do not have to actively check for new notes and typically they do not need to acknowledge or dismiss notes, making DropNotes a no-interaction-required system for information sharing at the visual periphery of a user's workspace.

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