LINC: A Ubiquitous Digital Family Calendar

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ABSTRACT

LINC is a ubiquitous digital family calendar designed to be as easy to use as a paper calendar and available wherever it might be needed: home, work or on the go. In our demo, we will highlight the ubiquity and simplicity of family calendaring using LINC. The main LINC client was prototyped as an information appliance using a Tablet PC. The mobility of the tablet and the ability to install LINC on any desktop PC turns the family calendar into a ubiquitous information source within the home. By using ink as the primary input method, LINC allows users to enter exactly what they want for an event as well as draw pictures and symbols. LINC Mobile provides access to the family calendar on a Windows Smartphone, while LINC Web makes the calendar available in the Internet Explorer web browser. These two interfaces facilitate calendar browsing while at work or mobile.

Keywords

Calendars, families, home, coordination

INTRODUCTION

Many families make use of paper calendars to coordinate their activities because they are easy to use, and can be always available in a central location in the home such as the kitchen [1]. However, a disadvantage of paper calendars is that the events on the calendar are not available to family members outside the home when they are at work, in meetings, or scheduling the next dentist appointment.

While many current digital calendars exist, they are typically either designed for use at work (e,g Microsoft OutlookTM) or by a single person (e.g. Google CalendarTM, TrumbaTM). Even the calendars that specifically address families (e.g. OurFamilyWizardTM) are designed for use on a desktop computer rather than in a way that matches how families typically use paper calendars. When building the LINC digital calendar system we wanted to give families an experience similar to using a paper calendar, but with the added advantage that their calendar information would be ubiquitously available both inside and outside the home. Four of our main design principles focused on making family calendaring and coordination a ubiquitous activity:

1) **Simple Awareness Appliance**: LINC needs to be easily accessible in a central location (e.g., kitchen) and always running so families can walk up and use it without opening an application.

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2) **Simple and Flexible:** The LINC appliance may be placed in any home location which means there may not always be a keyboard and mouse available (and if there is, they are likely cumbersome to use, e.g., mouse interaction on a kitchen counter). LINC needs to support flexible and simple input through pen-based interaction.

3) **Ubiquitous Access within the Home**: LINC needs to be accessible from multiple locations within the home to enable family coordination where it naturally takes place. The main LINC appliance needs to be easily moved and the LINC client able to run on multiple desktop PCs which may be spread throughout the home.

4) Ubiquitous Access outside the Home: LINC needs to be accessible from locations outside of the home where the LINC client cannot easily be installed. For example, work computers with restricted access or while the user is mobile.

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We designed and built LINC in an iterative process starting with paper prototypes and then a medium fidelity prototype described in [2]. To meet our first design goal, we prototyped the main LINC client as an inkable application running as an information appliance, which we simulated using Tablet PCs. Figure 1 shows LINC's main screen for the Jones family.

Our second design goal was met through simple and flexible pen-based interaction. Imagine Beth phones Joan to see if her family is free for dinner on Friday June 16th. While on the phone, Joan glances at her LINC calendar and sees that her family is available. She grabs the stylus and hand-writes "Dinner. Beth 7pm" on the sticky note on the top of the 'New Events' pad (Figure 1, top left). She taps on the tool bar at the top of the note (with her stylus) and then drags the note over to Friday where it shrinks to fit. If Beth calls back later to say a conflict has developed, Joan can easily drag the dinner sticky note to another day using the stylus. Joan can also double tap on the note to open an Options dialog, where she can set explicit times for an event, create reminders, or create copies of notes when events recur. LINC also includes a day view where days are broken into loose time buckets of 'Morning', 'Afternoon', 'Evening' and 'Any Time'.

EINC: The Inkable Family Calendar!							
New Events	Month	Day		June 2006			Today
* / / A 🛪	Sun	Mon	Tue	Wed	Thu		
Dinner Beth 7pm	May 28 5 M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	29 Memorial Day 4:۰۵ ^{Smith} e	30 Sito Taum Sociar	31 12:30 School Hauf Day 7:00 PTA	1 Sito Dewn Socker	2 School fieldtrip	3 IDam spinksos
	28 29 30 31	DidtoLA					
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Messages	11	12	13	14	15	16	17 Socen at DHS
Rent - Clocko h	Grandpois Birkday R 🖽	4:00 play prachie 10 am Dawr dentist	4:00 play plackie	4:00 play packa Success at WAS 4pm	4:00 play plackie S110 Down Socar Bowling 7 pri-	4:00 play plackie	Diane with Susan 7pm
nu present ≈ 20. A ×	18 Hike & Breathn	19 6:30 Book club 4:00 play plache	20 Non-third annual of the section Non iste meeting	21 4:00 pray stacka Socian at home ypm	4:00 play placha. S110 Down Socar	23 WillSchool Yung 7pm Jory of 5	24 Sara's party (spin 'XXX School May 77m Joey at 3
Nom- cull Sue	25 Find play 2:00	26 Red Janes's cat Dad late meeting	27 Joey school party 3:10 parts sector Mom late meeting	28 7:80 PTA	29 Siso Dewn Socar Bauling 7 Pm	30 Nom breakfast meet	Jul 1 S M T W T F S 1 3 4 5 6 7 9 10 an spin (4 2005 5 10 1 1 1 9 40 4 2 23 24 25 26 27 28 29
Buy Dividiy Online: synchronized at 2:49 PM Options Manual Update	2	3 Jory CPP Morn business trip	4 Independence Day BBQ at Lake, 5 pm	Jour CPP	S:10 Down Socar	Tourshigt 7pm	8 10 cm swimtesons



Figure 1. Jones Family Calendar in Month View (Default)

Figure 2. LINC Mobile and LINC Web

UBIQUITOUS CALENDAR ACCESS

To meet our third and fourth design goals, we extended LINC to be ubiquitously accessible. LINC can be installed on multiple computers. For example, Joan Jones has installed the LINC client on the computer in her office. Since her work computer is not a tablet, she adds events by choosing the 'A' icon in the sticky note toolbar and typing text with her keyboard. (An example is the 'Mom late meeting' on June 6th in Figure 1.) Calendar events are synchronized through a remote server at a designated time interval (default is 20 minutes). We use a simple scheme to synchronize event changes, where the most recent change is always used. This synchronization feature lets multiple LINC clients run autonomously from any location provided that an Internet connection is available during synchronization.

To allow people to access their LINC calendar when installing a LINC client is not practical, we built LINC Mobile and LINC Web. LINC Mobile runs on Windows Smartphones and displays a screen shot of any month the user requests from the server (Figure 2, top). Users can then pan and zoom to look at events. LINC Web works in a similar fashion, allowing people to bring up screen shots of days or months from their calendar (Figure 2 bottom, shown at reduced scale).

LINC Mobile and LINC web are our first steps at providing access to the family calendar from any computer or mobile location. They function as real world design probes so that we can better understand how often family members access the family calendar using them. Future versions will allow people to add or update calendar events from the web or phone.

CONCLUDING REMARKS

The LINC system provides a robust prototype that we can deploy in homes to explore whether or not it meets the coordination needs of families. A recent field study [3] showed the importance of calendar ubiquity: families greatly valued the portability of the LINC appliance within their home and took advantage of LINC's ubiquity to access their calendar from many locations. Evolving LINC and continuing to deploy it in homes will help us understand the challenges of building ubiquitous applications that meet users' needs.

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