Template-based Approach to Mobile Reminders
By: Stephanie Rosenthal
Advisor: Anind Dey

Abstract

Busy parents often do not write down short-term reminders for one-time events, like returning videos or bringing snacks to a soccer game, because it takes too much time compared to relying on their own memory. These types of events are the most often forgotten because people accumulate so many of these small reminders. Parents want a way to quickly make reminders to perform some task at a particular time, location or while performing an activity, while minimizing the cost of entering them. Our research focuses on using cell phones as location- and activity-aware devices to collect information about what people are doing. Then we use nearest neighbor algorithms to predict and auto-complete reminders for parents. Although the events and locations may differ on a family-to-family basis, within a family, members have evolved a consistent system for reminding each other. We collect data from each family and then train the model for each individually.

Introduction

Today, dual income families make up a large part of the US population. In dual income families, each family member must be more responsible for his or her own schedule and remember to bring everything they need for their activities. Mom and Dad have conflicting work schedules. Kids have many extracurricular activities to keep them busy until their parents get home, but parents often have to either leave work early to drive their kids to these activities or schedule carpools. Furthermore, because parents don't see their children between school in the morning and activities, it is more important to remember everything that the kids will need for the whole day. When someone fails to remember a child's activity or to bring something the child needs, it is a major family breakdown. The parents must leave work to bring the child their missing items or the child must bear the ridicule from peers for forgetting the items. The parents are inconvenienced and feel guilty that they didn't remember.

Previous Research
Since the method we use for prediction are common for many tasks today, we focus on previous research on reminders and smart homes in general.

Reminders
Previous research on digital reminders has focused on the triggers for and social factors in sharing them. Dey and Abowd's CybreMinder system uses context to invoke reminders. They argue that digital reminders need not only a description but also a contextual trigger to be useful. People often need reminders only when certain conditions are true like doing the laundry when getting home from

work. The trigger could be a physical location, but also other situations like weather, people, etc. When designing the data collection for this research, we included triggers for event/activity the person could be participating in or preparing for when they want the reminder, as well as the typical location, date, and time the reminder should be delivered.

Häkkilä and Mäntyjärvi discussed the user experience concerns with mobile location-based reminders. They say that location specific reminders are good and useful, but may not be enough in real life like Dey and Abowd suggest. When people generate location reminders themselves they typically receive them more favorably and rank them more important compared to reminders generated by someone else. It is unclear however whether reminders generated by family members would have the same effect as friends or strangers.

Smart Homes
The smart home is the general framework around which reminders would be generated. The system would have information about the family's activities and locations throughout the day and could use that context to help the family remember where they should be and what they need to bring. It could also potentially predict where breakdowns would occur and notify parents so they could take action before it happens. Today's smart home research is often focused on outfitting homes with sensor networks to learn routines. The neural network house by Mozer at the University of Colorado is an adaptive home with a sensor network. He uses neural networks as the basic learning mechanism to find and learn routines. MIT's House_n follows the similar sensor network pattern.

Grinter and Edwards argue however that ubiquitous computing technology that will help make homes smart will probably enter the home in a piecemeal fashion as they have already started to do. They identify seven challenges to the technology that way instead of the large-scale sensor networks that current research focuses on. It is important for any new technology to be compatible with previous technology that is already in the home in order for it to be adopted, however with companies trying to gain market share it may be difficult to ensure everything works together. We aim to build our technology on ubiquitous devices so we can analyze its appropriateness as well as parents' willingness to adopt it today. Cell phones are widely adopted technology today that people carry around with them all the time and have many sensors in them already. Instead of making and planting new sensors around homes, cars, and workplaces, we plan to use cell phones as the platform for sensing the current context as well as reminding the user because of the ubiquity of them.

Carnegie Mellon Smart Home Project Goals

At Carnegie Mellon, the Smart Home Project aims to alleviate some of the

problem points in the inhabitants' lives. The previous research has shown that a good, easy-to-use calendar and reminder system would greatly help everyone remember what they need for the day and to avoid the breakdowns. The system would have many requirements in order to meet the needs of dual-income families - some of which are basic principles of a smart home and some have become more apparent needs through ethnographies and previous research. The system should:

1) be adaptable for each family's needs (family shouldn't be tied down to one way of calendaring, each family has a different way of handling/viewing schedules)
2) allow for changes at any time and from anywhere (web, phone, home, work, etc)
3) have easy, intuitive and multiple inputs (typing text, handwriting, voice, pictures, etc)
4) tailor reminders to different family members or to the timeliness of the task (more intense reminder as deadline comes closer, etc)
5) present reminders at a time when the person is willing to hear/see it and does not become annoying (doesn't interrupt a person if the reminder is not that important, etc)

If the family is comfortable with the system and it is easy for them to input events and reminders in an intuitive way, it is more likely that they will use the system and that it can help them. However, through later ethnographies with dual-income families, it has been found that parents don't often write reminders because it takes too much time and hassle. Instead, they develop routines around remembering in certain places and at certain times for activities. Breakdowns occur when the routines get interrupted or when activities don't follow routines. For example, if a snow or sick day interrupts the normal week, all events on that day must be shifted to accommodate taking care of the children. A parent may forget a meeting they didn't write down or an extracurricular activity for their child that may be still taking place despite the day off of school. Another example is a sports team where parents are only in charge of something like bringing snacks once or twice in a season. Not only do parents have to remember the normal routines for the week, they must add in time to buy and prepare the snacks before the game.

Thus, it is not necessarily correct that a system would be widely used by families if it has easy natural input and output. Instead, it might be possible that learning the family routine around reminders and auto-generating those for the family would be better than requiring parents to generate them. The goal of this research is to analyze the effectiveness of automatically generating reminders based on the family routines. Instead of parents and children forgetting to write down events and to-do lists, the system would use context about where the person is in their routine (or deviating from their routine) to predict what they might write down to remind themselves. Can we learn the routines enough to predict what parents should be remembering at specific times? Is it enough to

just remind a family of their routine instead of automatically generating the reminders?

Problem statement

In order to investigate the effectiveness of automatic reminders, we focus on both the HCI and AI aspects of the actual predictions. In HCI, the primary questions include gathering reminder data, digitally presenting the reminders, and representing the predicted data to the family. In AI, our goal is learning the family reminder routines and predicting new reminders based on family context. Because reminders about family are needed at work, home, and in the car, the output platform we use is a cell phone because of its ubiquity today and despite the constrained input and output. We propose a template-based approach much like MadLibs games to accommodate a large but not infinite reminder set and the highly constrained input environment. The templates, in addition to narrowing the field of possibilities for reminder generation, narrow the possible reminder formats for the new system to auto-generate.

Method for User research/Data collection

The demographic for the research is dual-income families with kids in the age range of 5 to 15, so that we capture the change in responsibility for kids over time and also ensure that the children are still dependent on their parents to get to and from events and school. Dual-income families (as opposed to single-income families) require extra coordination to get their children to extracurricular activities because often the activities start after school when parents are still at work. With single-income families, the non-working parent is more flexible in being available to get their children to activities. Also, when teens start driving at around 16, they become less dependent on their parents and parents do not have to coordinate to get them to activities.

Surveys
To first understand how families typically balance extracurricular activities, chores, homework, etc for their kids, We designed a survey for parents to fill out about their children's activities and routines around those activities. The questionnaire included 60 open-ended questions about extracurricular activities their children participate in, who is in charge of getting them to and from events, what the children and parents respectively must remember to bring to school and other events, what the parents implement for family calendars and/or routines, and what kind of routines are built around chores and homework and how the parents remind them to do it (see Appendix 1 for survey). Additionally, we asked questions about what kinds of activities are hard for the parents to remember and which are easy and why.

We distributed surveys at a local cyber café that hosts activities for middle school girls each Monday night. Seven families filled out the surveys, and the data was

collected and analyzed to narrow the focus for the rest of the research. In particular, parents expressed that they often forget things for their kids, but somehow everything worked out in the end.   They said that by middle school, they had given their kids the responsibility of remembering to do their homework and remember books, but parents were still largely responsible for preparing the items needed for extracurricular activities. Parents all agreed that routine events variations like bringing snack to a sporting event once per season and activities that change often were both much harder to remember than very routine events because there was much more to remember about time and place each week.

Interviews
Following the results of the survey, we narrowed our focus to reminders about regular events with an activity that comes up every so often for it. It was important that we both talk to parents about how they generate reminders and have parents actually record their reminders and other surrounding information for me. The interview was designed so that the whole family could answer. Questions focused on how the family notifies each other of changes in plans, where the plans are recorded and who can see them, and what other information such as item placement do they require in order to remember everything about the activities they participates in (see Appendix 2 for interview questions). Additionally, we asked about breakdowns in the current reminder systems, the use of electronic devices and discussed with the family the idea of a "smart home" and pros and cons of such a system.

The interview typically lasted about 90 minutes and we asked questions to the whole family including children. In total, we interviewed three families due to time constraints. The families had varying degrees of calendar and reminder systems. One family used locations in the house to place important items to remember, while another used PDAs and e-mail to communicate. Parents focused in the interviews on how to teach their children responsibility for their own activities while maintaining control and ensuring their kids do not forget things.   At the same time, they expressed concern about how dispersed their information was between e-mail, paper, at work, car, and home and how they needed reminders in the same places. Because of the need for reminders on the go and the ability to already gather time and place data on it, we chose cellular phones as the platform for where reminders would be generated and displayed. After the initial interview was over, the parents were asked to spend a week filling out workbooks about the reminders they make for themselves.

In the interviews, we found a strong sense of parents wanting to teach their children responsibility. They repeatedly said that they would not want their children dependent on a reminder system but instead learn to juggle busy schedules on their own. However, parents feel that the cost of them forgetting something for their kids is often worse than dependence on a reminder system. Additionally, they describe their use of the system as a backup to their own memory instead of complete dependence.
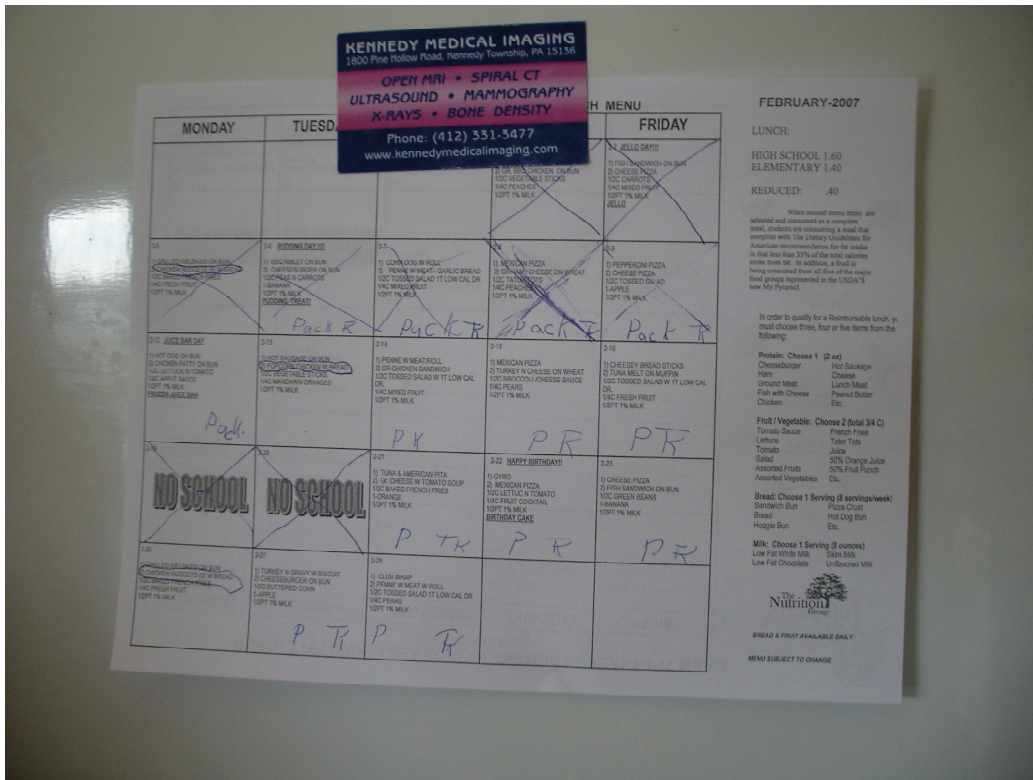
Figure 1: Lunch calendar for daughters. The writing on the days shows which ones the daughters want to bring or buy lunch.

Figure 2: School papers are organized in this basket in a family's home. If a paper isn't here, Mom doesn't know about it.

Workbooks
Both parents were asked to write an average of five reminders per day each day for one week about their family, especially their children. They would not receive reimbursement if they did not provide at least 35 reminders for the week. They were given 60-page spiral-bound workbooks with pages like the one shown in Figure 3 as well as another packet to fill in supplemental information. Parents were briefed as to how to fill out the workbooks at the end of the interview and the example reminder was set as our meeting the following week to collect the booklets (see Appendix 2 for explanation). The cell-phone-sized workbook collected basic information about the current date and time, date and time of the event, name of event, location of the event, and the content that was written on the calendar or to-do list or reminder. The supplemental information was to be filled out once a day at night and included information about where the person was, what they were doing at the time they wrote the reminder, who it was for and who/what the reminder was about. Additionally, parents were asked to write any extra information about why they were writing the reminder.

Today: ___/___ ___:___
Date:_____Time:_____
Event:_____
Location:_____
_____
Content:_____
_____
Don't forget to fill out
the supplemental form

Figure 3: Sample page from workbook. The size of the page is a standard cellular phone size, and the picture of one here signifies the parents entering information on their phone.

After one week, we collected the workbooks from the families and took the opportunity to clarify any additional questions about what the families wrote or talked about previously. Overall, parents said they enjoyed the workbooks and the fathers who did not fill them out said it was enlightening to learn what their wives did for their children.

We ran into several problems with the workbooks. Although both parents were asked to participate, only the mothers from two out of the three families claimed they write reminders about their children. The father that did make a notebook still wrote 80% of his reminders about work and not his home life. Also, one family used placement of items like backpacks and sports bags instead of calendars to remember activities. The mother from this family had trouble translating her actions into the workbook and could not finish. She did however give us insight in a second interview about the notes she writes to herself on slips of paper about to-do lists and important phone numbers. One family lost one of their supplemental packets and split the other one leaving only 24 spaces instead of the 35 we asked for. They did fill out the workbook for all 35 entries which gave us some information about their activity. In the end we had one complete workbook with 38 reminders and two workbooks with 24 complete entries although the fathers' was comprised mostly of work reminders. Although this is not enough data to completely analyze the prediction algorithms, it could provide give strong indication that with more data the algorithms can and do work.

Analysis

After all of the workbooks were collected, each question was transcribed and coded into categories that would be later used for templates in the system. We used affinity diagramming to make the categories from the answers that the families gave in their workbooks and supplemental packets. For example, meetings with specific friends and family and appointments for hair cuts and doctors were all placed in the same category for event type because they have a start and end and there was no explanation for bringing items to them. Birthdays were treated differently, because there were separate reminders for presents and cards and parties so there is a lot more involved compared to a regular meeting. The dates that the reminders were written were not coded or included in testing because we only had one week's worth of data so coding for day of the week wouldn't work nor coding for events that happen once a year like birthdays. Out of the 63 usable reminders, we had no more than 20 categories for any single question and the average is 8 categories per question (see tables below).

Today's time	Written Where	Written During
Morning	Dining room	talking
Noontime	Kitchen	Watching tv
Evening	Laundry room	Cooking
	Going to bed	Writing other notes
	My Work	Doing laundry
	Car	Walking upstairs
	Home	On the computer
	Spouse's Work	Driving
	Starbucks	Going to bed
		Cleaning
		Thinking

Table 1: Questions and categories used from the workbooks to train the prediction models.

Event	Future Date	Future Time	Location	Content	Who For
Meeting/appt	Week later	Morning	Calendar	meeting	Me
Party	Tomorrow	Noontime	Kitchen	Birthday	Kids
School	1.5 weeks	Evening	Work	Homework	Husband
Daycare	Today		Car	Laundry	Me and kids
Dinner	3 days		Dining Room	Pay daycare	Me and husband
ATM	No Time		Bed	Get lunch money	Husband and kids
Holiday	This Month			Make dinner	My brother
Pet	Next month			ATM	Whole family
Travel				Valentine's day box	
Medicine/Doctor				Make peanut butter treats	
Add to To-do list/make reminder				Call doctor	
				Change hair appt	
				Go Food shopping	
				Call pharmacy	
				Pick up prescription	
				Update calendar	
				Tax appt	
				School event	
				Update To Do List	

Table 2: Questions and categories used from the workbooks as the predictions for training and testing the models.

Preliminary data analysis shows that the categories are fairly well distributed for questions of content and event, but reminders were much more likely generated in the afternoon than morning and in some specific places rather than others.

The figures 3 and 4 below show the proportion of reminders generated in different places. Although family B does not have a specific place to generate reminders however, we see in figure 5 that reminders are more likely to be made while waiting for kids at school than any other time. Families have very different routines around reminders, but within a family we see a seemingly very consistent routine in the data for making reminders.
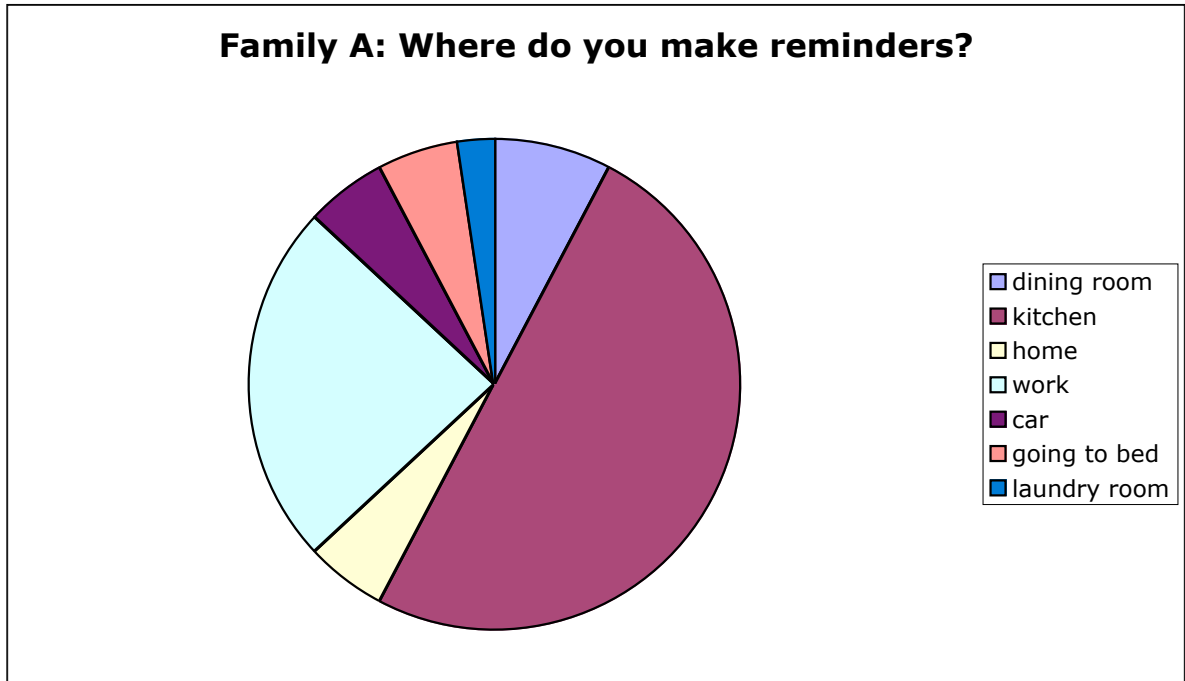

Family A: Where do you make reminders?

Legend:
- dining room
- kitchen
- home
- work
- car
- going to bed
- laundry room

Figure 3: Locations where Family A respectively generated reminders out of their total number generated.

Family B: Where do you make reminders?

- kitchen
- bed
- car
- Starbucks
- school
- work
- work2
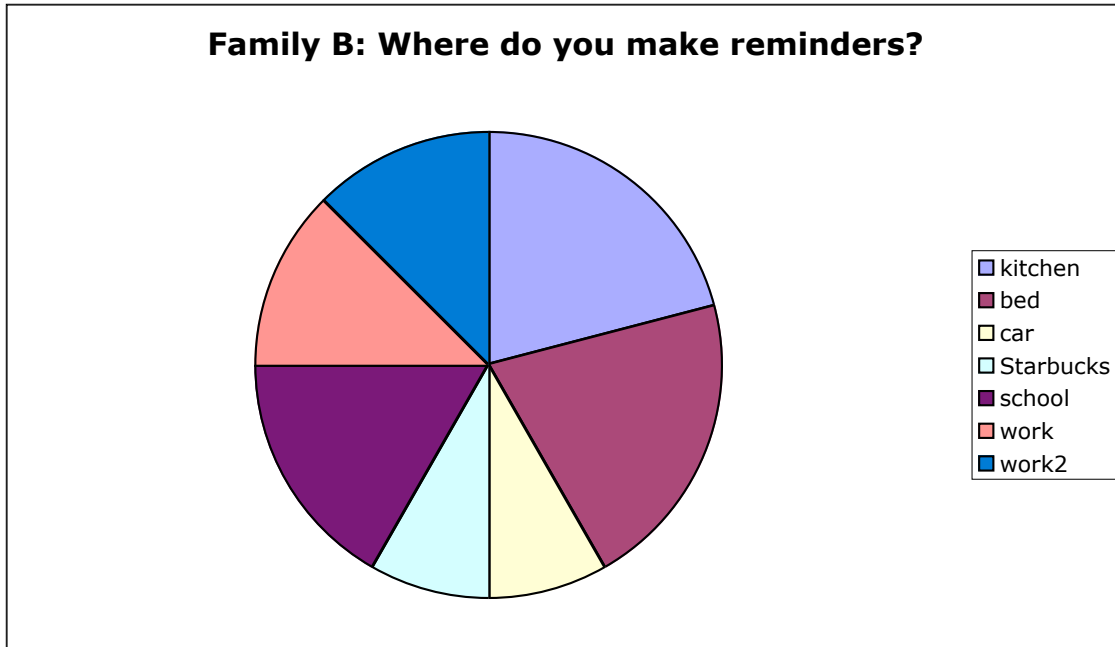
Figure 4: Locations where Family B respectively generated reminders out of their total number generated.

What are you doing?

- making lunches
- writing reminders
- making dinner
- computer
- waiting for kids
- getting coffee
- thinking at work
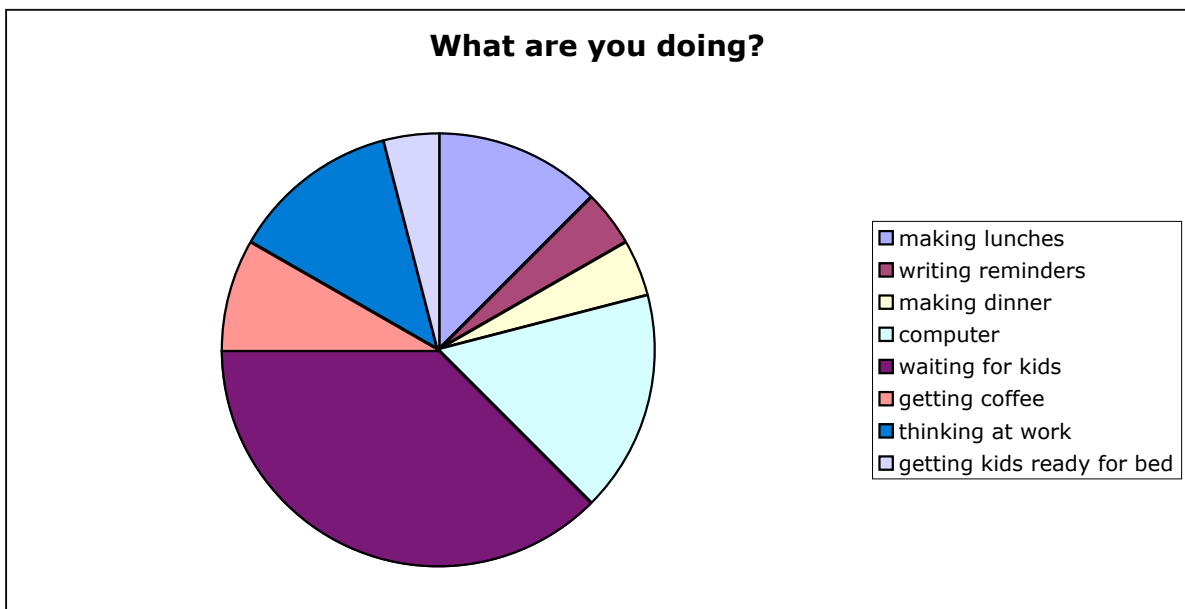- getting kids ready for bed

Figure 5: Proportion of activities family B is participating in while making reminders.

Coding Reliability

I was the only one to categorize the questions, so there may be some discrepancy in how I made the groupings. We did try to err on the side of extra categories rather than too few so that my predictions would upper bound the

error. In the future, we would like to have the categories independently verified to make the predictions more reliable.

K-Nearest Neighbor Algorithm
The prediction model we decided on is 1-nearest-neighbor, because we assumed that reminders generated under similar conditions would have similar content. Using k>1 nearest neighbor leaves the problem of averaging nominal labels, which does not seem possible. We use Euclidean distance to find the distance between two instances of reminders. The algorithm written for the nearest neighbor prediction first requires splitting the data into training cases and test cases. For this data, we used the first 10 reminders plus the even ones after that to simulate using the first to train and then adding additional training examples randomly. Then, we take the Euclidean distance between each train-test pair of instances and sort over the test reminders to find the closest training example to it. Finally, we use the one closest training example's label as the predicted label for 1-nearest neighbor. Error is calculated as the percentage of incorrect predictions compared to the actual test labels. The algorithm was implemented in the Matlab program.

Results

Data Correlations
In order to see the data more clearly and the possible correlations between different questions, graphs were generated for each family for each pair of questions asked. For example, in figure 6 below, we see that only reminders about event 5 were generated in the place with code 3. Conversely, place code 2 is the kitchen and almost every event type is written about in the kitchen. With the exception of one or two categories within each question, reminders about specific events are generated in specific places and different places from other specific events. Family A in particular wrote reminders for many different types of events all in a single place. In this case, it may not be significant to correlate place the reminder if that place is a common one, but it may be useful to weight the other places more heavily when it is not a common place to generate reminders.
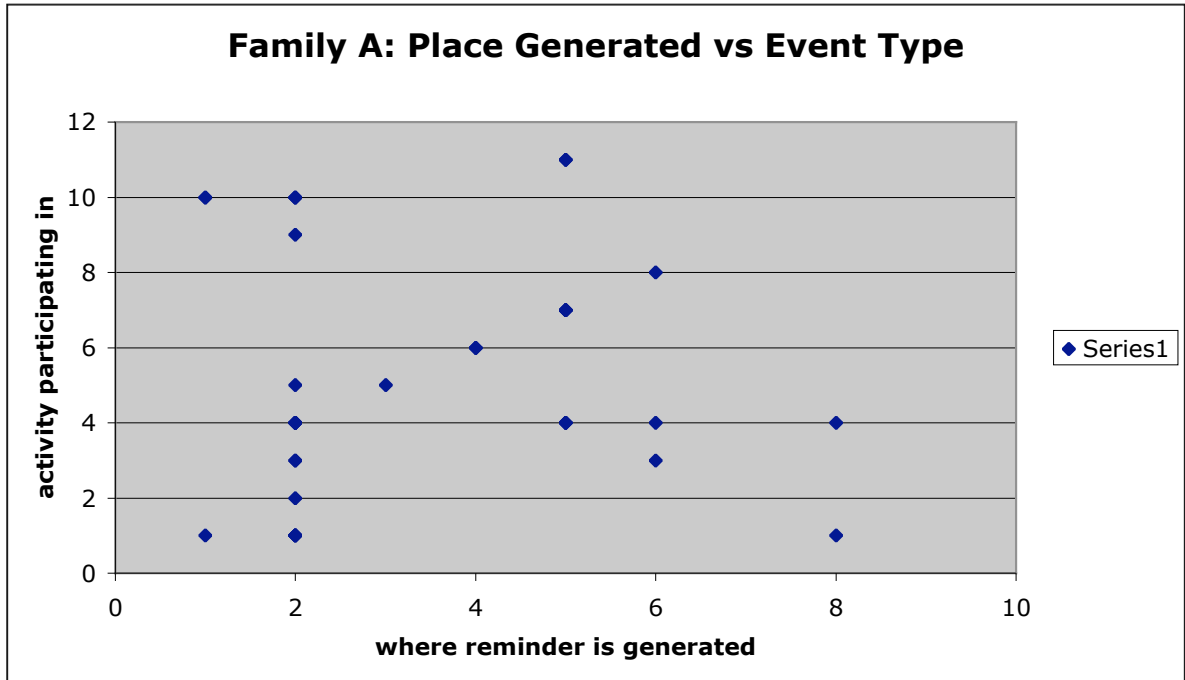
Figure 6: Graph of event times by where reminders for them are generated

Algorithm Predictions

The goal of the prediction is to predict the content of the reminder, but predicting the recipient, location, etc are also important. We ran the 1-nearest neighbor algorithm with the "current" time and place information to predict the labels for the future event reminder. Each part of the event reminder (eg. Event, Content, Recipient, etc) was learned as a separate model. As discussed before, error rate was calculated as the percent of incorrectly labeled test reminders.

Predicting content given that there were 20 possible labels and only 40 data points resulted in the worst error rate of 91%. Although this rate is better than chance, getting the content wrong over 90% of the time is unacceptable to deploy to users for testing. Instead, we tried classifying the event that the reminder was written about, because the event is only missing the exact action to take for the event. With 11 events, we get an average error between the families of 60% which is significantly better than the content error rate. With this rate, we have a 1 in 2 chance of correctly predicting the event purely based on location the reminder was written, time of day, and activity the family member was currently participating in. Furthermore, 50% of the errors were possible ambiguities in coding. For example, birthday events often were predicted as meetings or appointments. Birthdays are a type of meeting, so that's close. Other errors were for events that only happened once in our data set so we didn't have any nearest neighbors with correct labels. With more data or perhaps refining the coding scheme, we should be able to get a 30% error rate. The error rate for predicting the recipient was 60%, but all the errors were predicting that

the reminder was meant for a single person instead of the writer plus that person. These errors could be easily fixed in a future model. The error rates for all others were greater than 80%.

Future Work

Data Collection
In addition to problems with parents filling out the packets, the workbooks in general may not be sufficiently capturing everything that parents make reminders about so we may not have complete data. We are fairly sure that when the parents wrote or thought about many reminders at once, they also recorded them on our workbook. However, we may not have even captured all of those for family B as there are several days in the middle of the week missing from the workbook. Additionally, there are times when people only think of or write one reminder, and it is unclear whether we are capturing those. In order to capture all of the reminders generated in a day, we would need to meet with the family each evening to go over the day's activities to trigger parents to remember exactly what they were thinking all day.

Although the 1-nearest neighbor algorithm had only a 50% error rate for one week of data, having more data over multiple weeks might help understand the intricacies of the reminders that were not caught this time. To get a better sense of weekly repetitive events and reminders, it would be helpful to gather data for two or three weeks worth of data instead.

Interface
The HCI aspect of this project is yet to be completed. We have the data and the learned model but we need to implement a template-based user interface to test the model and capture the significance of the errors we are making. Implementing the interface on a cell phone would allow the data to stay on the phone and thereby stay more secure. However, designing interfaces for non-Windows-based phones is difficult and each OS requires programs to be written in a different language thus making it harder to distribute and user test. Implementing the interface in a website viewable on the phone would be easier to implement but require the user to have internet on the phone. Additionally, this implementation would require a small program on the phone to send GPS coordinates to a server so that accurate location data can be used for the learned model testing.

Updating the Algorithm
Since we could and would be gathering additional information while families are using the reminder system, it would be possible to use active and reinforcement learning to improve error rates over time. Depending on the initial error rates that we can attain with more data, implementing this extra step would decrease frustration with the system when it made errors on specific types of reminders.

Alternatively, using active learning could make the reminders less predictable and harder for the family to use.

Testing
Since we are only correct 50% of the time, the types of errors we are making may be ok and they may not. Implementing active and reinforcement learning would be one way to fix the errors over time. Too many errors early on in the adoption of the technology might turn the family away from helping it make better decisions. On the other hand, the errors may not be significant enough to warrant the extra processing time. On a cell phone especially, the extra time may reduce the battery life on it.

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APPENDIX 1

1. General information
   a. Mom's Age and Occupation

   b. Dad's Age and Occupation

   c. Kid(s)' ages and genders

   d. Current list of kids' and family activities

Pick 3 activities that will happen in October or November (routine or special events):
For each activity, please take a picture of the date the activity falls on, plus any flyers or information in your house that helps you remember the activity. Please submit these pictures to srosenth@andrew.cmu.edu and label the pictures with which activity goes to which picture.

2. Name and Date of Activity 1:
   a. How did the information about the activity first come into the house?

   b. Is the activity on the family calendar now or a separate calendar?

   c. Was the activity ever on the family calendar? When?

   d. Where is all the information surrounding the activity kept now?
      i. Phone numbers
      ii. Schedules
      iii. Appointments, events

   e. Do your kids need to remember to bring things to the activity?

   f. Do your kids need to remember to bring things *to school* for these activities?

   g. Do they remember to bring what they need? How? If not, why not?

   h. Do you have any other responsibilities as a parent for these activities? How do you remember these responsibilities?

3. Name and Date of Activity 2:
   a. How did the information about the activity first come into the house?

   b. Is the activity on the family calendar now or a separate calendar?

      c. Was the activity ever on the family calendar? When?

      d. Where is all the information surrounding the activity kept now?
         i. Phone numbers
         ii. Schedules
         iii. Appointments, events

      e. Do your kids need to remember to bring things to the activity?

      f. Do your kids need to remember to bring things *to school* for these activities?

      g. Do they remember to bring what they need? How? If not, why not?

      h. Do you have any other responsibilities as a parent for these activities? How do you remember these responsibilities?

4. Name and Date of Activity 3:
      a. How did the information about the activity first come into the house?

      b. Is the activity on the family calendar now or a separate calendar?

      c. Was the activity ever on the family calendar? When?

      d. Where is all the information surrounding the activity kept now?
         i. Phone numbers
         ii. Schedules
         iii. Appointments, events

      e. Do your kids need to remember to bring things to the activity?

      f. Do your kids need to remember to bring things *to school* for these activities?

      g. Do they remember to bring what they need? How? If not, why not?

      h. Do you have any other responsibilities as a parent for these activities? How do you remember these responsibilities?

Household chores
1) General Information
      a. Mom's chores only

      b. Dad's chores only

   c. Parents shared chores

   d. Each kids chores/expectations

2) Are there schedules for chores?

3) How do you remember the chores?

4) Who does the grocery shopping? Is there a schedule/day to go shopping? Do you make lists? Do you remember the list?

5) Do you have activities that your family does together? Are they on the family calendar? How do you remember them?

School Activities
1) Is there a special time to do homework?   Do you schedule it? Where is the schedule?

2) How do you and your kids remember what homework they have?

3) Do you check their homework or help with it?

4) Is there a specific time to check homework each day? How do you remember?

5) Do you have responsibilities at your children's schools?

6) How do you receive that information from school? Is it on your family calendar? How do you remember?

7) How do your kids remember what to bring to school (lunch, books, binders)?

8) Do you make sure they have everything? How do you remember?

Classifications
- Do you think there are different categories of things you have to remember?   What are those activities?

- Do you find you have to remember different amounts of information for different types of activities?

- Please 2 give examples of activities you have to remember a lot for and activities you don't have to remember a lot for.

- Why do you need that amount of information?

Do you know any other families that would be interested in participating in the study by filling out this survey and submitting pictures of their calendar?

APPENDIX 2

Hi, my name is _____ and _____ is running the camera today. We're here to learn more about how your family's routine around your kids' school and extracurricular activities and your work. We will be using your information to build a system to help you better remember your activities while not interfering with your family time or responsibilities. Today, we would like to learn about your routine in your home. Over the next week, we'd like the parents to record some information about reminders you make for yourself and your family. Next week, we'd like to come back and collect the packets and just test your acceptance for some initial ideas we have for reminder systems.

These are consent forms and assent forms for you to fill out to allow us to film you and an agreement for you to participate in the study. We will pay for your time today at the end of the session, and the rest will come next week. Do you have any other questions?

Can you all please introduce yourself and give your age or occupation?
Please feel free to share any opinions you have about your current methods of reminders and scheduling. How has your method changed over time? Could it be better for you? How?
What activities do your kids participate in, and on what days?
What does your work schedule look like?
How do you remember all of your activities and do they come with calendars/schedules – can we see them?

Interview Plans:
Step through each day's plans/activities
- When does the schedule get reviewed?
  - What if changes occur?
  - How do the kids remember?
  - What do the kids remember?
  - What gets reviewed? When does it get reviewed?
- any calendars (old/still in use) that helped people remember,
  - colors
  - icons
  - abbreviations and how they originated
  - what each calendar is for
- any artifacts to help them remember (soccer ball, bag, etc),
  - how does the artifact help
  - placement of the object
  - why
- any artifacts to remember for the event
  - order that they are remembered
  - how they are remembered

- routine around each of them (when clothes are washed, when oranges are bought)
- placement of the object
- why

Thank you for participating in the study. I would like to go over the workbook with you before we leave. We ask that you fill out an average of 5 reminder sheets per day per person = 35 per person over the week and that you carry it around with you as much as possible as if you were receiving and writing reminders through your cell phone. If you don't fill out 35, we cannot reimburse you for your time. Each sheet asks for the current date and time, and asks for some information about what reminder you're making. Location means where you're putting the reminder (in your head, on a post-it, on the calendar, on the fridge). We also ask that you fill out some supplemental information about the reminder at the end of each day. These questions are aimed at why you made the reminder, so that we might build a system that would predict what you need to be reminded about based on your current situation. Did you just talk to your child and need to remind yourself to do something later for them? Did you see a sign that reminded you of something? Lets fill out one together about remembering to fill out the forms. Write down today's date and time. Make the reminder for yourself, and then write down in the booklet where you put it, what it said, etc. Tonight you can fill out the supplemental information that we were here and that we reminded you to make yourself a reminder, or something like that. If you have any questions for me during the week, please feel free to e-mail me or call. We will be back next week to collect the packets and ask you a few more questions about ideas we might have to make your life easier. Let's schedule a time for pick up now…

Thank you so much for your time. Here is your payment for today. We will see you next week. Don't forget to fill out the booklets.