REDESIGN AND RETROSPECTIVE

An Analysis of the Palm User Interface

Introduction to HCI
Fall 2004

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EXECUTIVE SUMMARY

Executive Summary

We have spent the semester analyzing and redesigning the Palm interface. This paper presents our findings, including the interaction problems we discovered, our suggested redesigns for the Palm, and a retrospective account on our process.

Who We Are

The members of our team come from varied backgrounds, including engineering, computer science, information systems, and psychology. Our five member team includes three females and two males; and most of us have had prior experience either in professional work or academic research. All of us are computer users and are familiar with current technology. We feel that our diverse background allowed us to give a more thorough analysis of the task because we were able to approach it from multiple schools of thought; at the same time, our unified knowledge on technology aided us in focusing in on the task at hand and communicating in a similar language.

Methodology

We used Contextual Inquiry and Design to analyze the task of scheduling. This allowed us to fully understand user's intents, motivations, and needs.

We also used Heuristic Evaluation, Cognitive Walkthrough, and Think-Aloud to discover usability problems in the Palm interface. We used affinity diagramming to organized our problems and define our redesign themes.

Most of our redesigns are inspired from the Usability Aspect Reports generated; however, some are inspired from user's needs that were uncovered in the CI & CD.

Results

Most of the problems identified from our methodologies rested in the DateBook application.

We specifically found the event creation, edit, and deletion process to be tedious and undirected. The features that the user needed were not prominently displayed or intuitively labeled. We also found that the system responses did not match user expectations, which became very frustrating for the users.

Redesign

As mentioned before, the problems identified were rooted in the DateBook application; thus, our redesigns focus on the event creation work flow in the DateBook application. We also felt that certain Palm-wide changes were necessary, so we included them as well.

We identified a main theme in our redesigns: giving the user what they want, when they want it. This involves giving frequently used features more visibility, labeling options in terms that the user understands, and creating a match between the user's mental model of how the system performs and how it actually performs (no unexpected system responses).

The redesigns suggested in this paper all adhere to our greater theme. Though these redesigns are application specific, we feel that they are good examples of what can be done across the whole Palm interface to create a better user experience.

REDESIGN

Redesign Overview
User Scenario

REDESIGN OVERVIEW

Our group had a very empirical approach to our redesign, which means that all of our redesigns are derived from the data collected using the methodologies described previously.

Our CI data indicated that one of the primary functionalities of the Palm is as a scheduling device (using the DateBook application). Though this is from the study of one individual's work, we feel that it is indeed the main tool used by many and thus warranted the focus of our redesign. Furthermore, since the think-aloud and cognitive walkthrough techniques both concentrated on the DateBook application, we had a strong data foundation on the DateBook.

Using the UARs we created and affinity diagramming, we created a thematic focus of our redesign: to give the users what they want, when they want it. The Palm should be a Swiss army knife of sorts. Our sub-goals for the theme involve giving more frequently used application more visibility, giving the user exit methods, efficiently using screen space, labeling in a language the user understands, and providing system responses that match user expectations.

Because most of our data is about the DateBook application, the specific changes we are suggesting focus on that. However, we feel that our theme is crucial throughout the whole Palm interface, and we hope that this paper provides an inspirational foundation needed to create Palm-wide redesigns.

In the following pages, our redesigns are highlighted in the form of a user scenario. The redesigns are documented in more detail in Appendix A.

User Scenario

Kathy Baker, a project manager, needs to exit the Welcome application in order to change an event time, and add a lunch appointment in the Palm. The design changes will be discussed while Kathy tries to complete her tasks.

Scenario

Kathy Baker is a Project Manager, who has her secretary keep track of her schedule. Kathy is familiar with computers as she uses specialized programs to manage her projects.

Kathy, a novice palm user, was recently promoted to Senior Project Manager. To celebrate her promotion, she got herself a new Palm, which arrived early this morning (Tuesday). She had given it to her assistant to transfer her current appointments into the Palm.

Currently, Kathy is playing around with her new Palm. She is in the middle of the Welcome Application when she gets a phone call from her colleague John.

John: "Hey Kathy! It's John!"
Kathy: "Oh hey John!! Haven't talked to you in a while!"
John: "I just heard about your recent promotion; let's get together for lunch to celebrate!"
Kathy: "Sure! I'd love to."
John: "How about this Thursday at 12:30pm?"
Kathy: "Sounds good to me!"
John: "I will stop by your office then."
Kathy: "Perfect! See you then."

Kathy decides to enter the new lunch meeting into her Palm; but in order to do so, she has to exit the Welcome Application first.

STEP 1

Exit Welcome Application

Kathy is currently in the Welcome Application (Figure 1). Kathy notices that there is a button labeled "Exit" on the bottom of the screen. Kathy presses on the "Exit" button which brings Kathy to the main application screen (Figure 2).

Figure 1

Figure 2

DESIGN CHANGE

Design Idea 9: Give users the control to exit the Welcome application

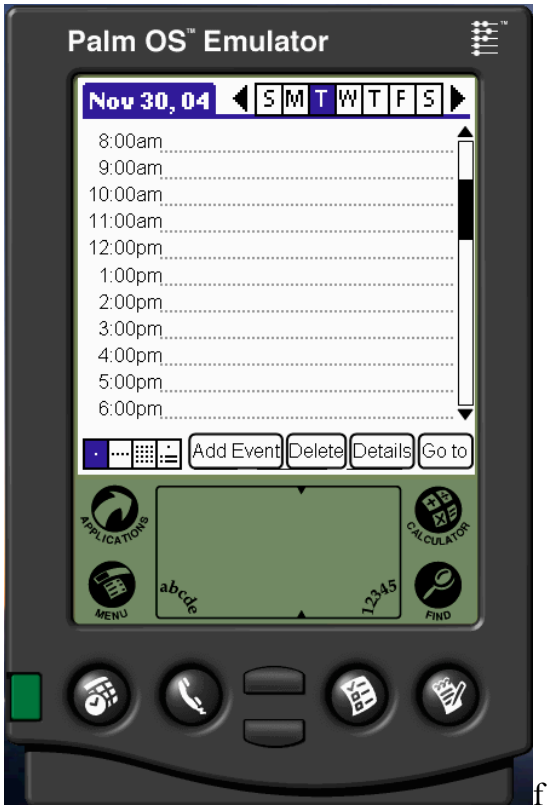
During the Think Aloud, we found the user had great difficulty exiting the Welcome Application. The user got very frustrated while he tried to exit the Application because there was no label on the screen indicating the functionality of an Exit button, so the user kept on taping on the Application icon and hoping to get back to the main application screen. In order to avoid this problem, we suggest adding an "Exit" button on every page of the Welcome application so that the user could click on that button whenever he/she wants to exit the application. The label "Exit" is a real world concept, so users shouldn't have any trouble understanding the functionality of the button.

STEP 2

Enter DateBook Application

Kathy sees the DateBook Application as one of the icons and decides that is the place she will have to go in order to add the new event. Kathy taps on the DateBook icon (Figure 1) and enters the DateBook Application (Figure 2).

Figure 1



f

Figure 2

STEP 3

Navigates to Thursday

Kathy has the DateBook Application interface in front of her. She notices today's date is showing on the top of the screen and the day she wants to add the new event for is Thursday. Kathy clicks on the "T" after "W" in the Day bar on the top of the screen (Figure 1). She assumes that the "T" comes after "W" means "Thursday" because "W" means "Wednesday" from her real world experience. A new interface appears and indicates that's for Thursday because it has Thursday's date on the top left corner of the screen (Figure 2).

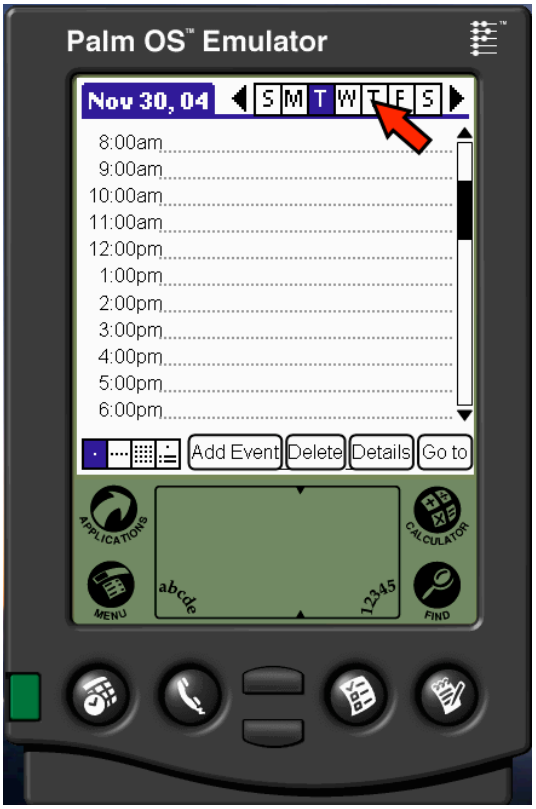


Figure 1

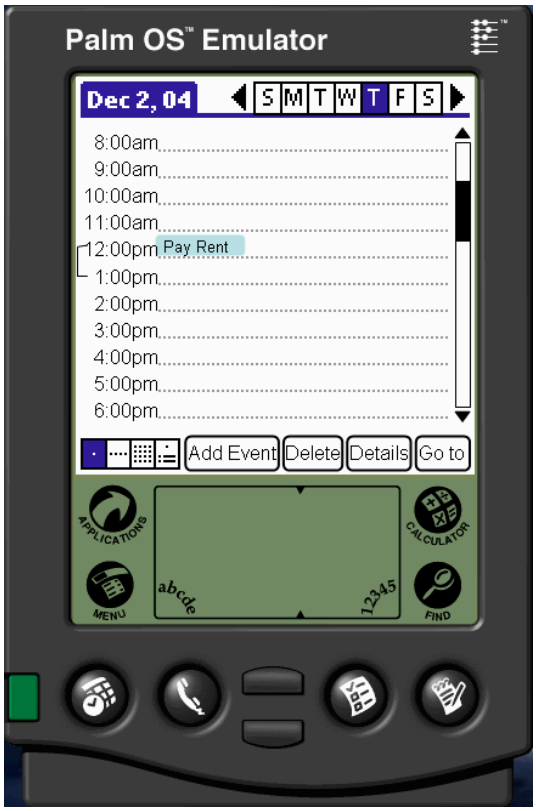


Figure 2

STEP 4

Deletes conflicting event

Kathy wants to input the event into the 12:30pm time slot; however, she notices she already has an event entered for 12:00pm on that day. Kathy was supposed to drop off the monthly rent for her apartment to the leasing office during her lunch break, but now she decides to do that after work so that she could make to the lunch meeting. Kathy notices the "Delete" button at the bottom of the screen. Kathy taps on the 12:00pm time slot (Figure 1) then clicks the "Delete" button to delete the event (Figure 2).

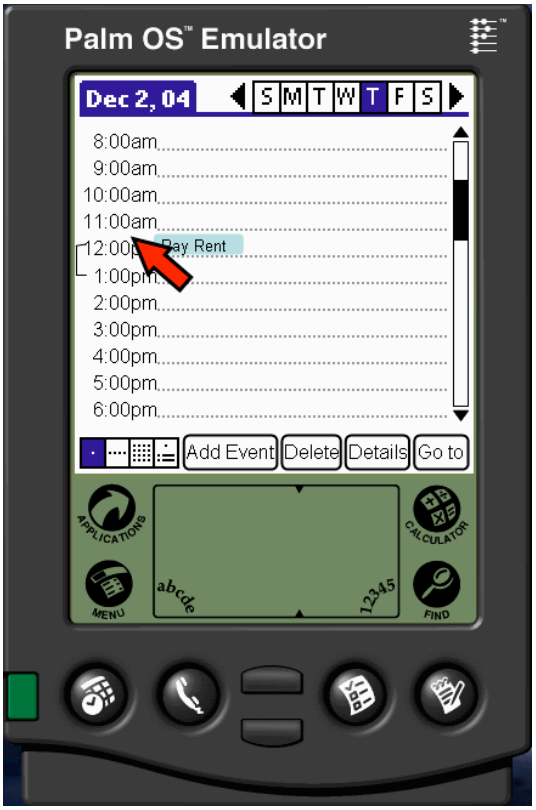


Figure 1

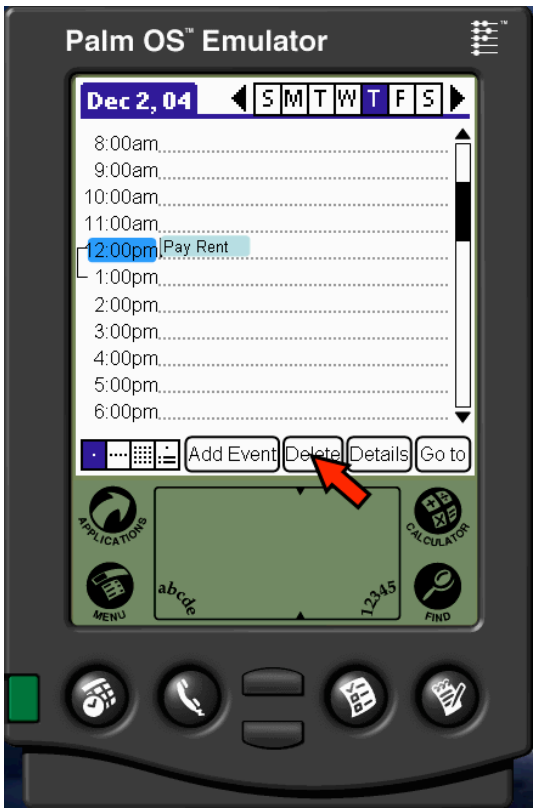


Figure 2

DESIGN CHANGE

Design Idea 3: Give users quick access to event manipulation functions in the DateBook

Not having a "Delete" button really limits users' performance. Users won't have enough control and freedom over their action. Therefore, it violates the "user control and freedom" heuristic. By adding the "Delete" button to the main DateBook interface fixes this problem.

STEP 5

Confirm deletion

After Kathy presses the "Delete" button a confirmation dialog box appears. It asks Kathy to verify her action. Kathy taps on "Ok" to delete her event (Figure 1). Kathy is then brought back to the main DateBook Screen (Figure 2).

DESIGN CHANGE

Design Idea 3: Give users quick access to event manipulation functions in the DateBook

Only having the "Delete" button is not enough because the user might click on the "Delete" button by accident. Therefore, the confirmation dialog is an error prevention method, which prevents the user from deleting events accidentally.

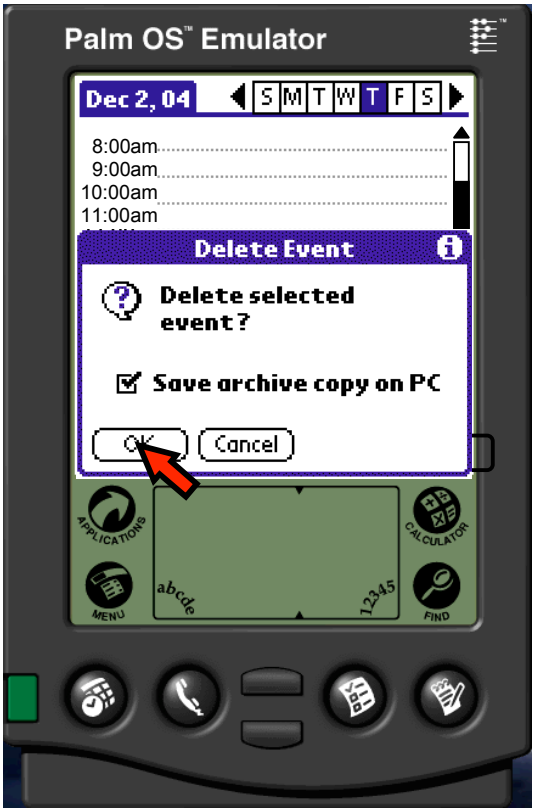


Figure 1

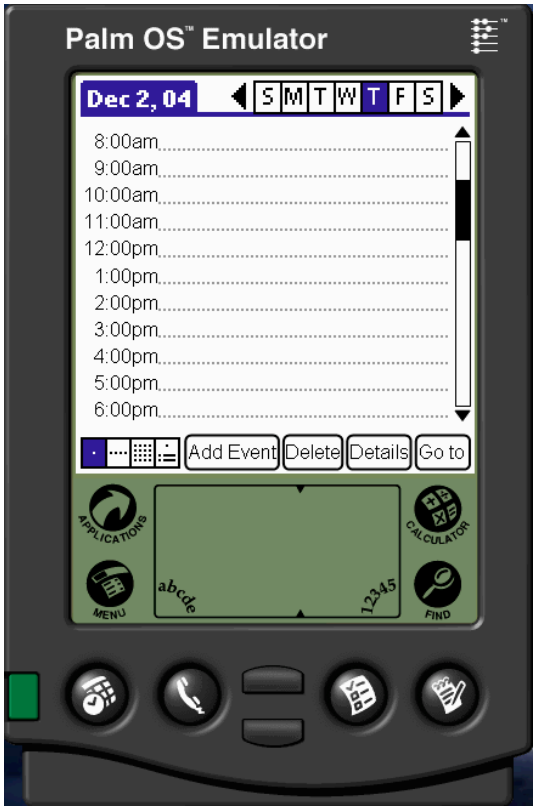


Figure 2

STEP 6

Taps on "Menu"

Kathy decides to set this rent-paying event as a monthly recurring event. However, Kathy is not sure how to set up a recurring event. Therefore, she decides to tap on the "Menu" icon to look for information on this functionality (Figure 1). She then sees a menu listing the options available (Figure 2).

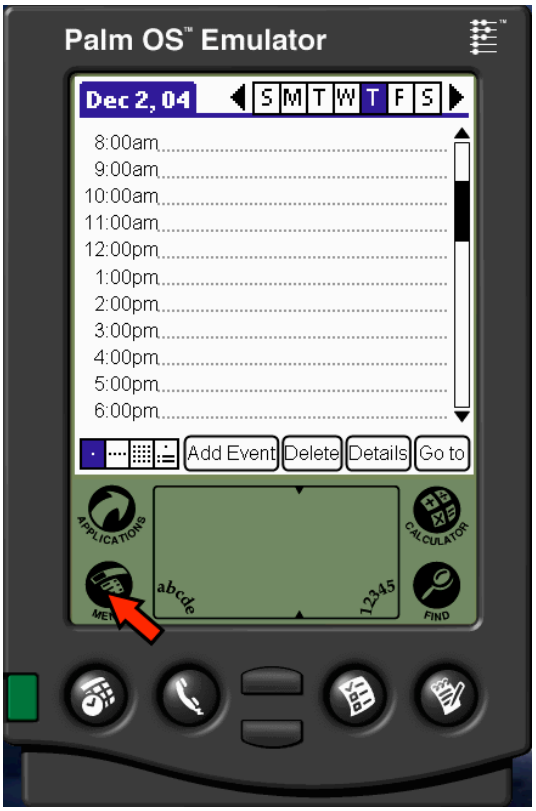


Figure 1

Figure 2

STEP 7

Select Help

Kathy can not find any thing on Recurring event. Therefore, she decides to tap on the "Help" button to look for more information (Figure 1). This produces a new screen that lists Help options specific to the DateBook (Figure 2).

Figure 1

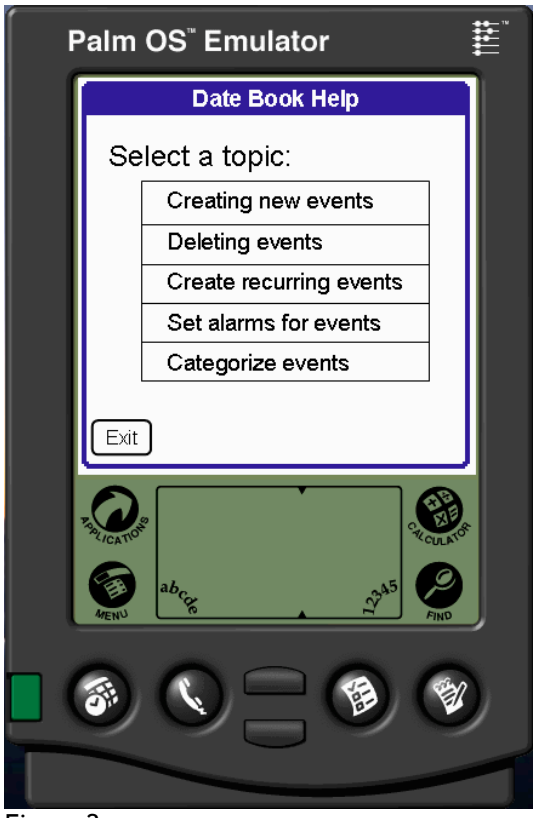


Figure 2

DESIGN CHANGE

Design Idea 10: Give user access to Help all the time

Not having Help at all times violates the help and documentation heuristic. The Think Aloud also indicates that the user may have been more successful in the task if there was Help and Documentation assisted him in his task. Having a Help button helps to provide quick and effective instructions for lost or confused users.

STEP 8

Select "Creating Recurring Event" option

Kathy finds "Creating Recurring Event" as one of the options under the "Help" bottom. Kathy selects the "Creating Recurring Event" option (Figure 1) and a message dialog appears with instructions on how to create recurring events (Figure 2). Kathy read through the instruction.

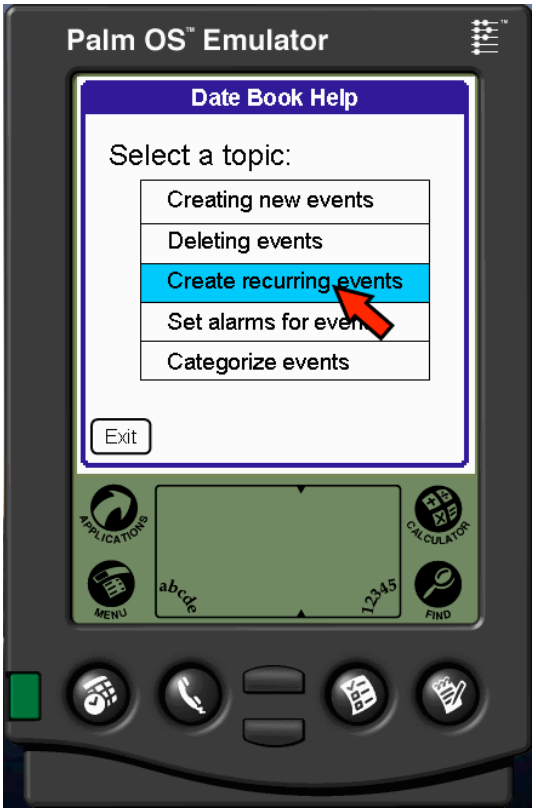


Figure 1

Figure 2

STEP 9

Clicks "Exit"

Kathy clicks on the "Exit" button at the bottom of the message dialog to exit the "Help" screen and back to the main DateBook screen.

Figure 1

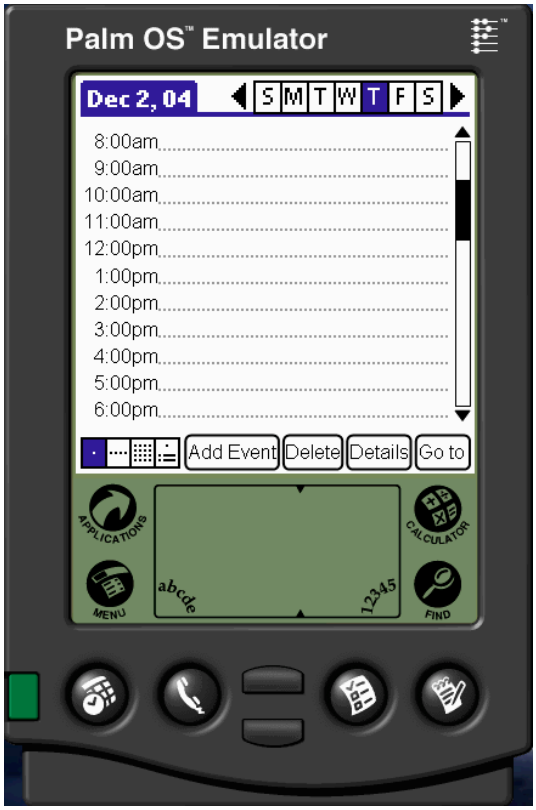


Figure 2

STEP 10

Scroll to 7:00pm

Kathy wants to move the rent-paying event after work, 7:00pm. She can not find the 7:00pm time slot when she first navigates the main interface because the time slot stops at 6:00pm. At this time, Kathy notices the scroll bar. She taps on the downward pointing arrow at the bottom of the scroll bar (Figure 1). The 7:00pm time slot appears (Figure 2).

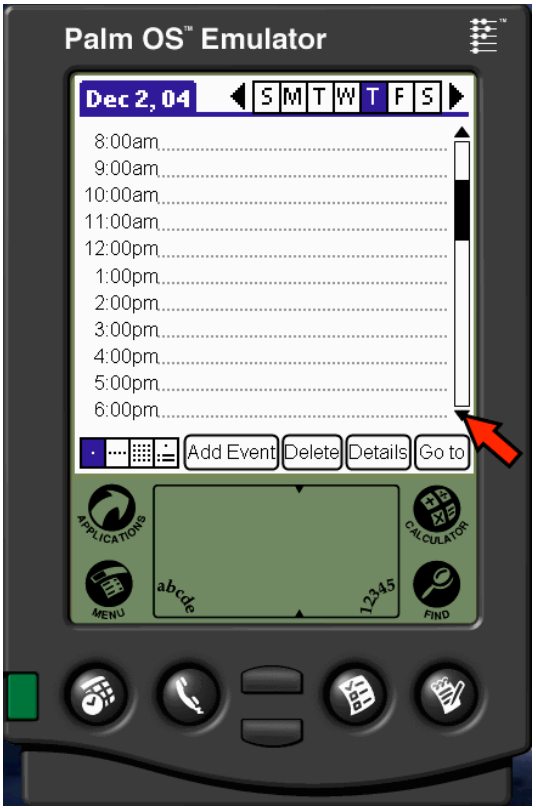


Figure 1

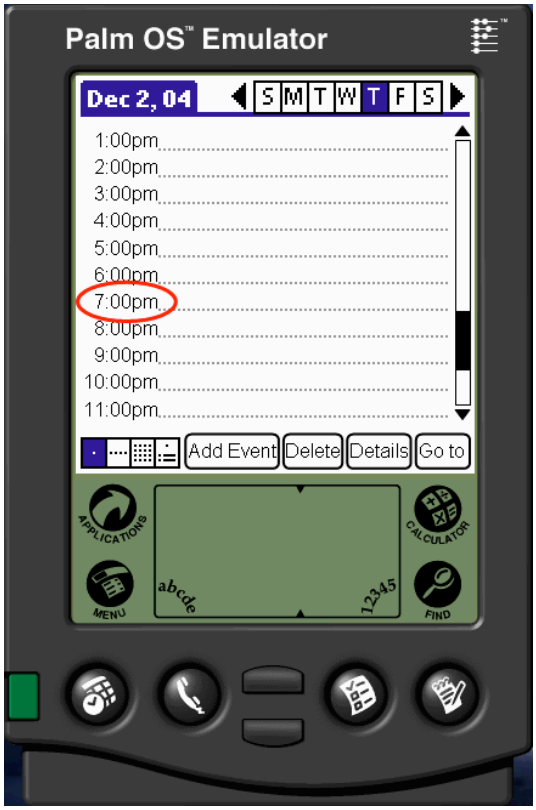


Figure 2

DESIGN CHANGE

Design Idea 2: Give users quick access to all hours of the day in the DateBook

With the original system, the user can only see the time period of 8:00am to 6:00pm. Nothing on the screen shows the user how to get to the time slots outside of the 8am to 6pm time frame. Scrollbar solves this problem. Scrollbar is a very common tool that almost everyone who had experience with computing devices would know how it works. Once users see the it, they will know that in order to get to the time slots other than the time slots appears on screen right now, they will have to either scroll up or down

STEP 11

Click on 7:00pm time slot

Kathy clicks on the 7:00pm time slot (Figure 1) and the Set Time screen appears (Figure 2).

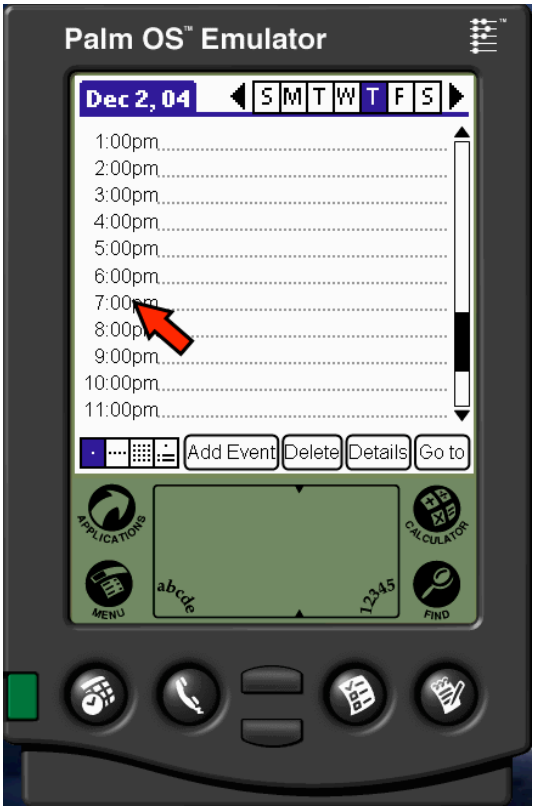


Figure 1

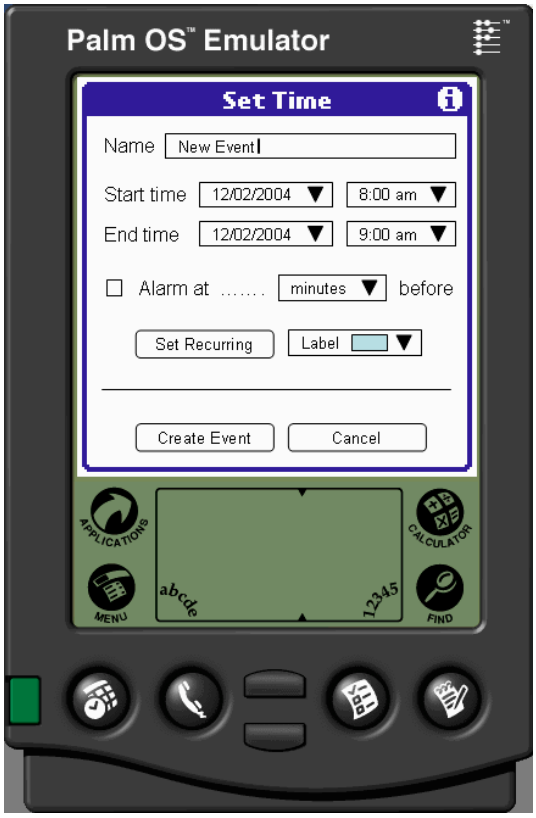


Figure 2

STEP 12

Enter event name

Kathy sees the text field for the name of the events (in the Set Time screen) with a default name, which is “New Event”. Kathy enters “Pay rent” in the text field (Figure 1).

Figure 1

DESIGN CHANGE

Design Idea 4: Allow users to create events in the DateBook without specifying a name

We found through Think Aloud (YS-TA-02, YW-TA-02, GIB-TA-01, DAZ-TA-06) that once the user forgets to enter an event name, he/she would lose everything associated with that event. We feel that having a text field with a default name is an easy way for the user to save or recover from forgetting to input event name. This is a critical error prevention solution. We place the event name creation text field in the Set Time screen because it’s more visible to users and harder for them to miss or forget giving event names.

STEP 13

Select end date and time

Kathy sees the dropdown menus for Start Time and End time. Since Kathy's already in the Thursday interface, she doesn't have to worry about selecting dates (one for start time, one for end time). Kathy tapped on 7:00pm so the start time is set to 7:00pm automatically. Kathy now sets the end time by clicking on the dropdown menu for time on the right side of the "End time". Kathy taps on 8:00pm (Figure 1), therefore, the end time is set to 8:00pm (Figure 2).

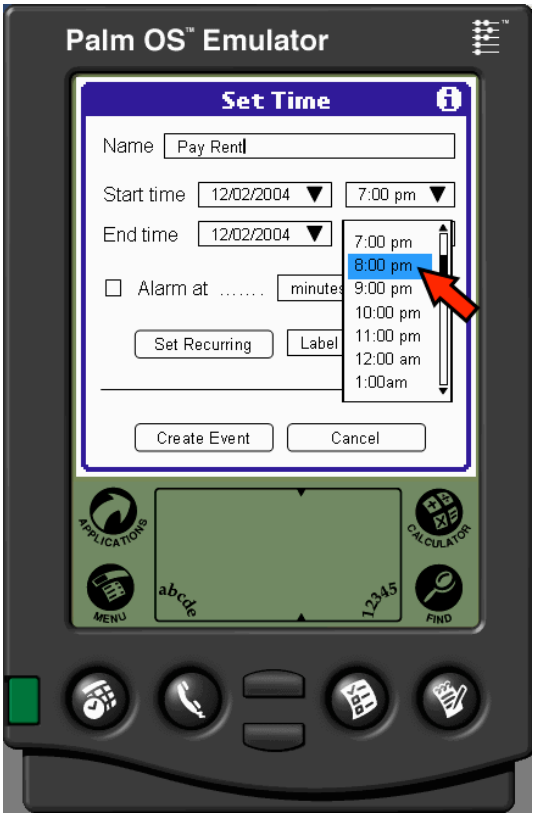


Figure 1

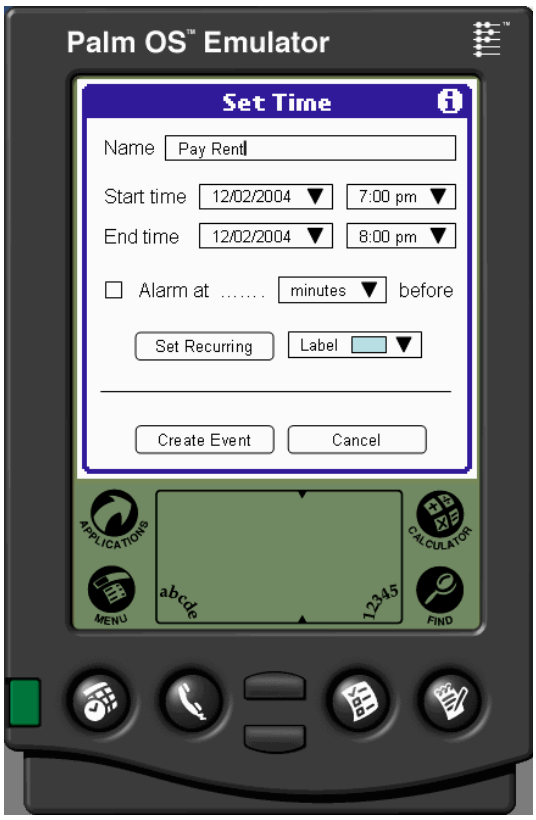


Figure 2

DESIGN CHANGE

Design Idea 5: Give users greater control over event start and end times

While doing think-aloud, we found the user has difficulty recognizing that the start and end time textboxes are editable. We change the text boxes to dropdown menus because dropdown menus are easier to notice than textboxes. It provides more efficient use by allowing the user to choose the correct time, which also prevents error more effectively.

STEP 14

Click "Set Recurring" button

Kathy wants to make the rent-paying event a recurring event. Kathy notices the button labeled "Set Recurring" (Figure 1). She clicks the button and an interface called "Set Recurrence" appears (Figure 2).

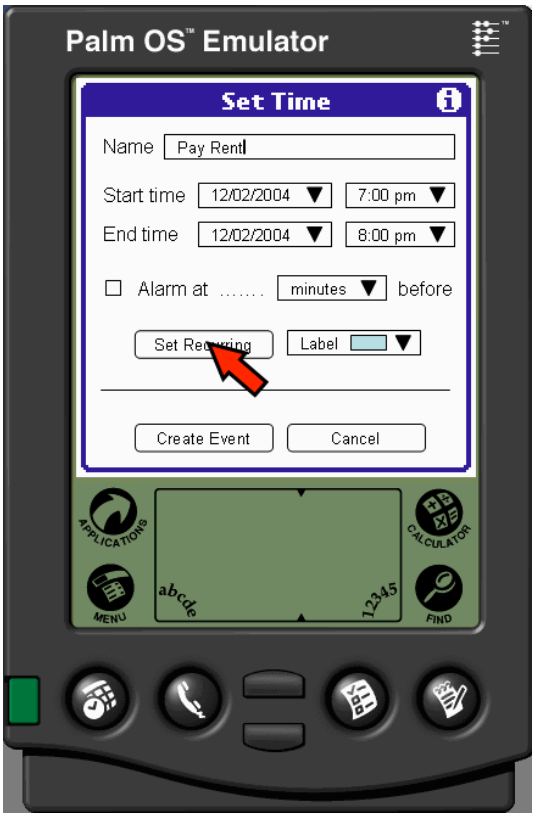


Figure 1

Figure 2

DESIGN CHANGE

Design Idea 7: Give users the ability to create recurring events

While doing CI, we found that many of the events that the user schedules are recurring events. This functionality does not exist in the original Palm DateBook. We add a recurring events button to the Set Time interface. Selecting this button will take users to another dialog where they can set the options for a recurring event.

STEP 15

Select "Monthly" radio button

Kathy realizes in order to make this event recurring every month; she needs to select the "monthly" radio button. Kathy taps on the "monthly" button (Figure 1) and the monthly options appear (Figure 2).

Figure 1

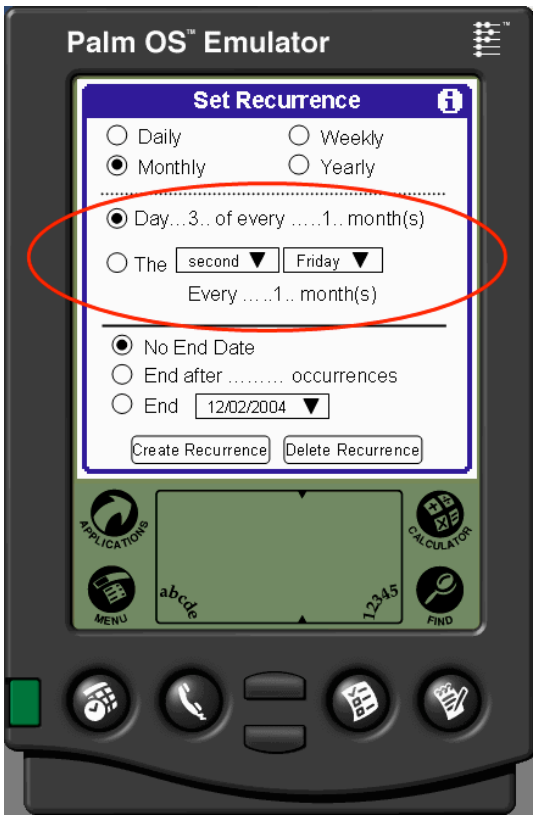


Figure 2

DESIGN CHANGE

Design Idea 7: Give users the ability to create recurring events

There are four radio buttons been presented to the user on the top of the Set Recurrence interface: Daily, Weekly, Monthly, and Yearly. These options give users more control and freedom over their action.

STEP 16

Change settings to be "first" "Thursday" of every "1" month

Kathy then selects the second option since her rent is always due the first Thursday of every month (Figure 1). She changes the settings to "first" "Thursday" of every "1" month by selecting options she wants from the three dropdown menu (Figure 2).

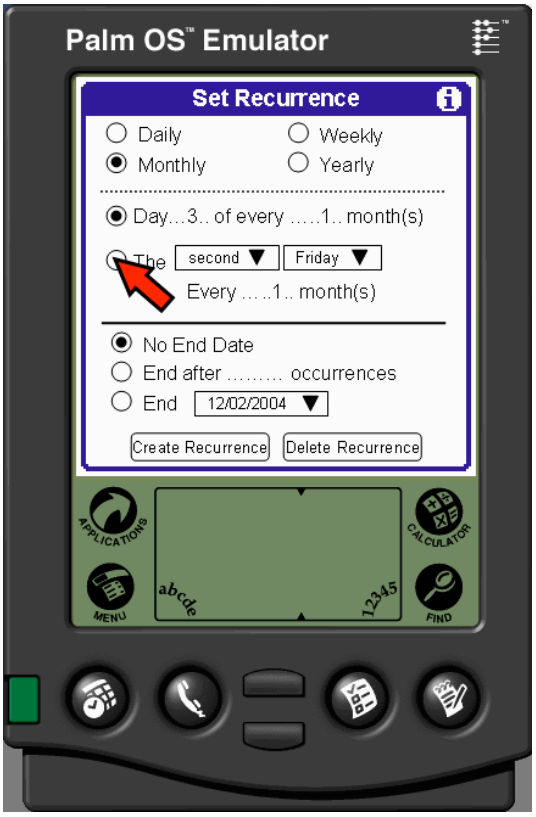


Figure 1

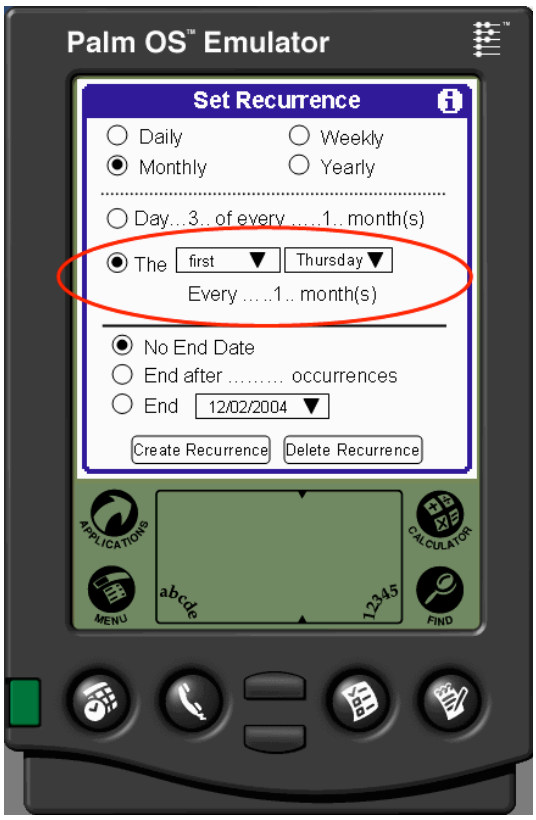


Figure 2

DESIGN CHANGE

Design Idea 7: Give users the ability to create recurring events

Being able to select how often users would like their events to occur gives users more control and freedom over their actions. The options we are representing to users in our redesign for the recurring events are commonly used in other computing devices, so we feel that they will be easily understood and quick to use.

STEP 17

Select "No End Date"

Kathy sees that the radio button "No End Date" is selected by default, so she keeps it that way (Figure 1) because she doesn't know how long she will be living at her current apartment at this point.

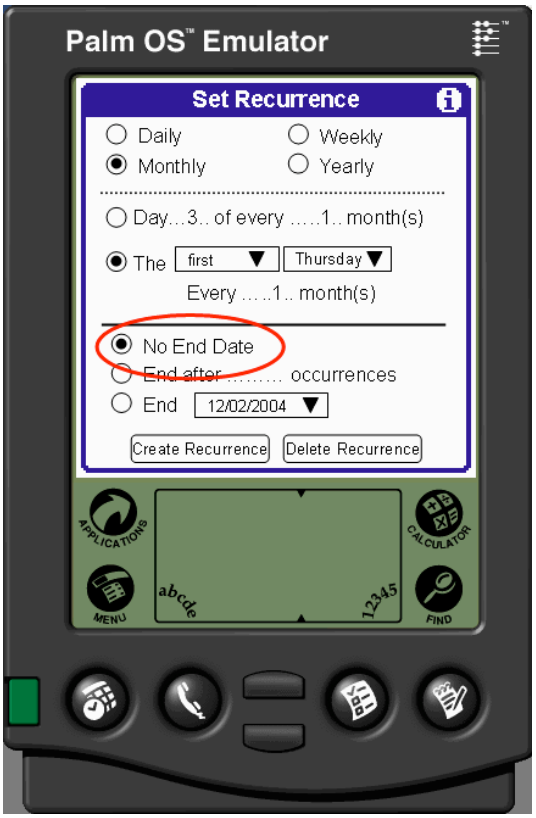


Figure 1

DESIGN CHANGE

Design Idea 7: Give users the ability to create recurring events

It is important to give the user control deciding how long the event will re-occur – a certain number of times, until a certain date, or no end date. These options give users more control and freedom over their action.

STEP 18

Click "Create Recurrence"

Kathy clicks on "Create Recurrence" button to create the recurring event (Figure 1). Kathy is then brought back to the main Set Time interface. She notices the original "Create Recurring" button is now labeled "Change Recurring" (Figure 2).

Figure 1

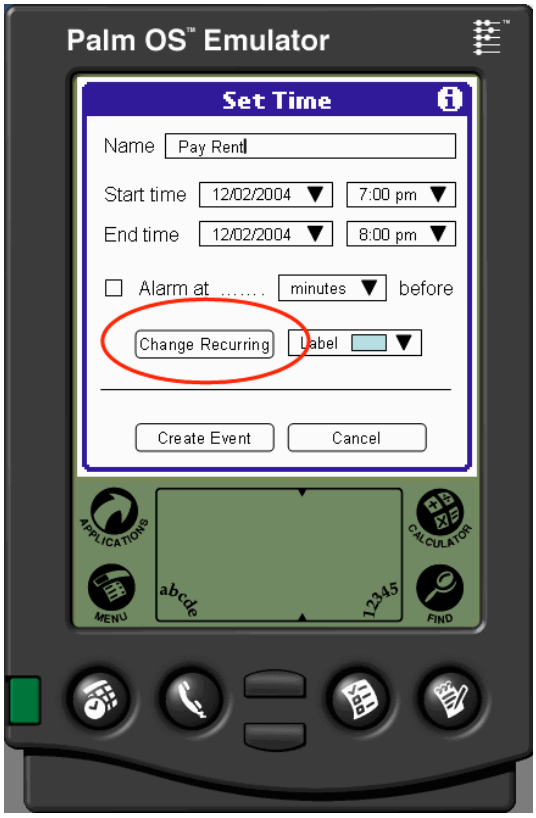


Figure 2

STEP 19

Select color label for event

Kathy notices the "label" dropdown menu next to the "Change Recurring" event button. Kathy wants to label her rent-paying event "purple" to signify that it is a personal event. Kathy taps on the "Label" menu (Figure 1) and selects color purple (Figure 2).

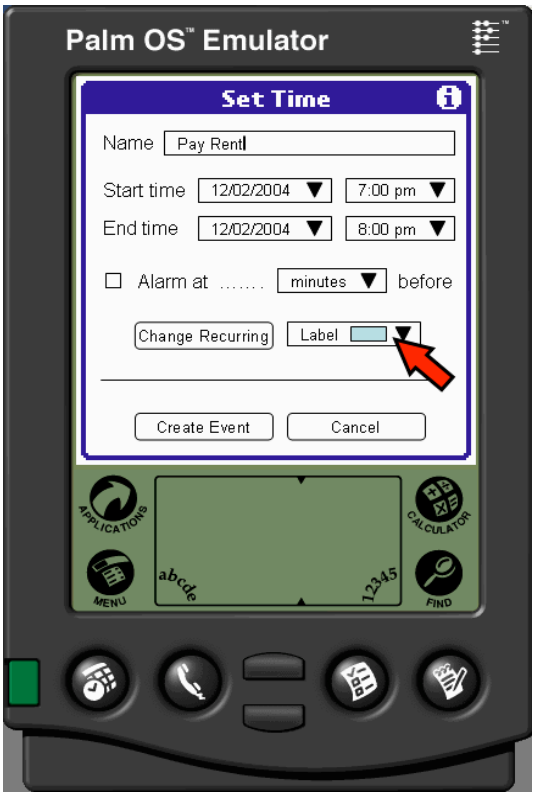


Figure 1

DESIGN CHANGE

Design Idea 8: Give users the ability to categorize events using colors

Our CI data shows that the user often categorize events by utilizing different codes on her paper calendar for different types of events. We added a dropdown menu to the event creation dialog called "Label" in our redesign. This menu will contain a palette of colors with which the user can code the event. Once coded, the event will be displayed in that color in the DateBook's calendar views. This redesign idea allows users to categorize their events without remember their own code. Using color gives them a better visual differentiation between different types of events compares to personal code. It's also an error prevention method which prevents users from confusing themselves once they forget the meaning of their code.

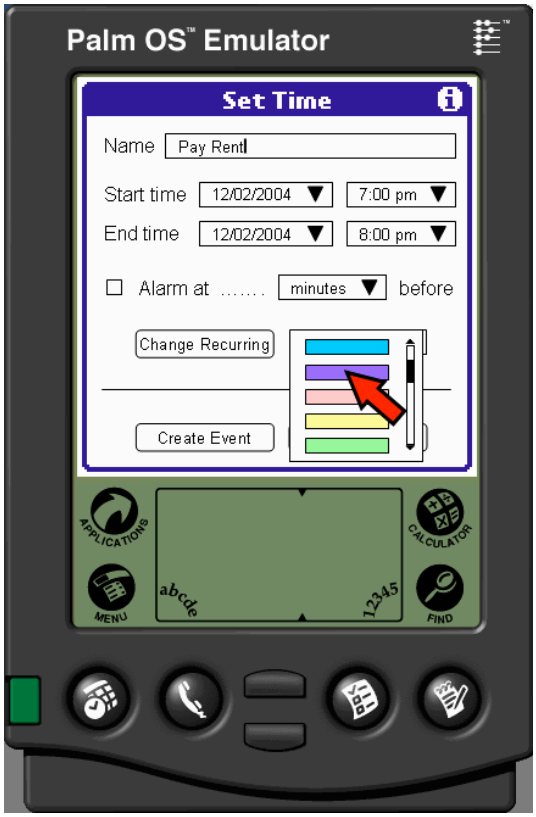


Figure 2

STEP 20

Click "Create Event"

Kathy taps "Create Event" button on the bottom of the screen to create this recurring event (Figure 1). Kathy is then brought back to the main DateBook interface (Figure 2).

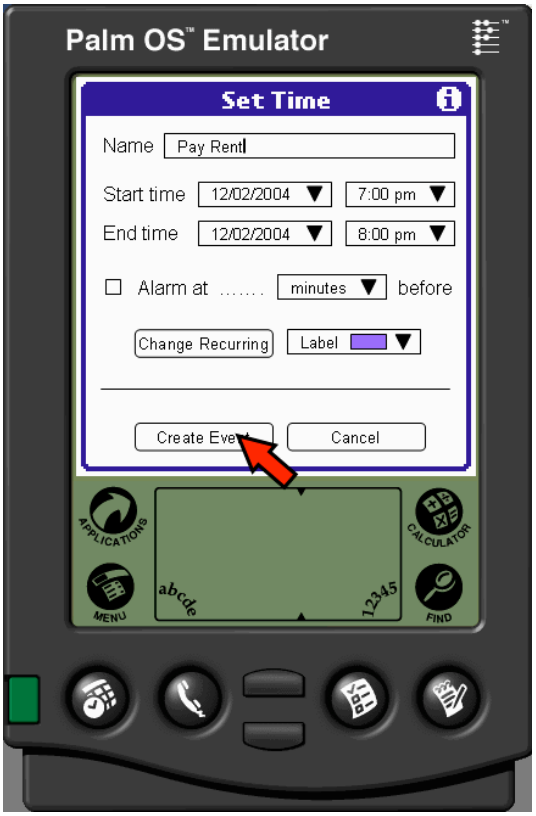


Figure 1

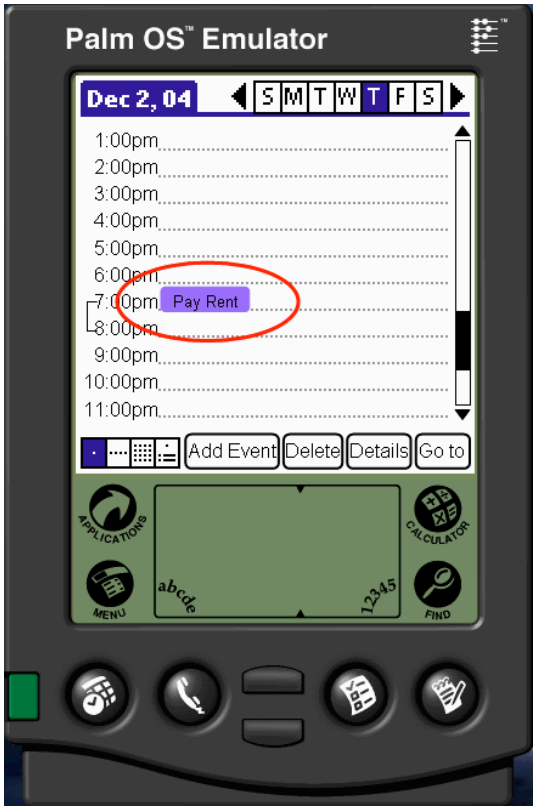


Figure 2

STEP 21

Click "Add Event"

Kathy now wants to add her lunch meeting at the 12:30pm time slot. She notices the button "Add Event" at the bottom of the screen. She taps on the "Add Event" button (Figure 1)which brings her to the Set Time interface (Figure 2).

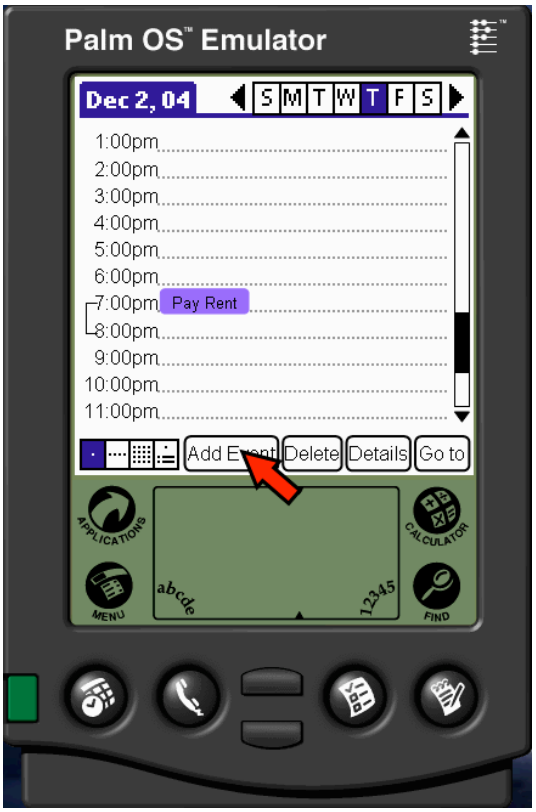


Figure 1

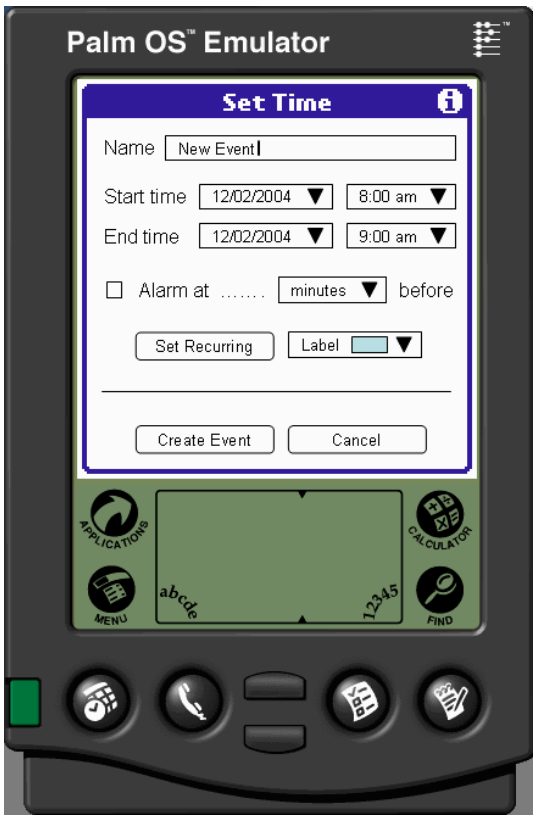


Figure 2

DESIGN CHANGE

Design Idea 1: Improve visibility of appointment creation functionality

While doing Think Aloud, we found the user tend to over looked the "New" button and have a difficult time creating a new event. Labeling the button "Add Event" instead of "New" can eliminate confusion and improve the visibility of the event creation functionality. The new label also matches the real-world conventions for calendar use.

STEP 22

Enter event name

Kathy sees the text field for the name of the events (in the Set Time interface) with a default name, which is “New Event”. Kathy enters “Lunch with John” in the text field (Figure 1).

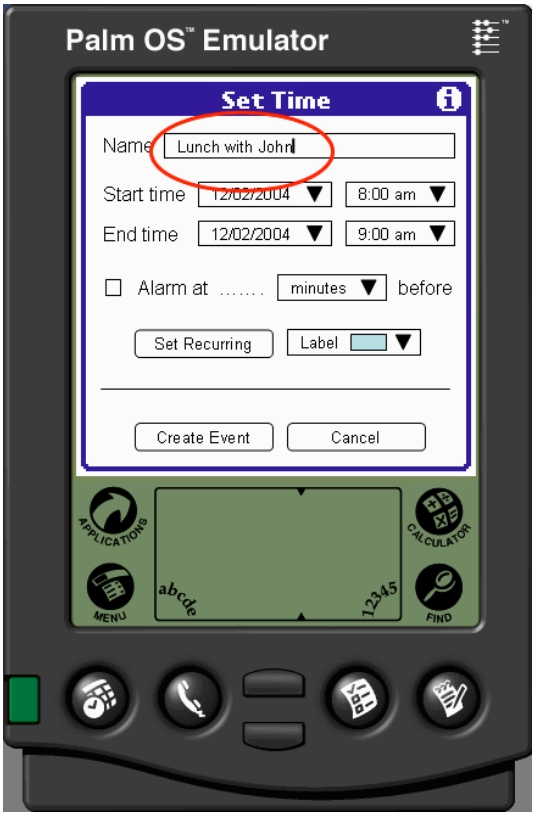


Figure 1

DESIGN CHANGE

Design Idea 4: Allow users to create events in the DateBook without specifying a name

We found through Think Aloud (YS-TA-02, YW-TA-02, GIB-TA-01, DAZ-TA-06) that once the user forgets to enter an event name, he/she would lose everything associated with that event. We feel that having a text field with a default name is an easy way for the user to save or recover from forgetting to input event name. This is a critical error prevention solution. We place the event name creation text field in the main event creation interface because it’s more visible to users and harder for them to miss and forget to give the event a name.

STEP 23

Select start and end date and time

Kathy sees the dropdown menus for Start Time and End Time. Since Kathy's already in the Thursday interface, so she doesn't have to worry about selecting dates (one for start time, one for end time). Kathy first clicks on the dropdown menu for time, on the right side of the "Start time". Kathy taps on 12:30pm. The start time is now set to 12:30pm. Kathy then clicks on the dropdown menu for time, on the right side of the "End time". Kathy taps on 2:00pm. The end time is now set to 2:00pm.

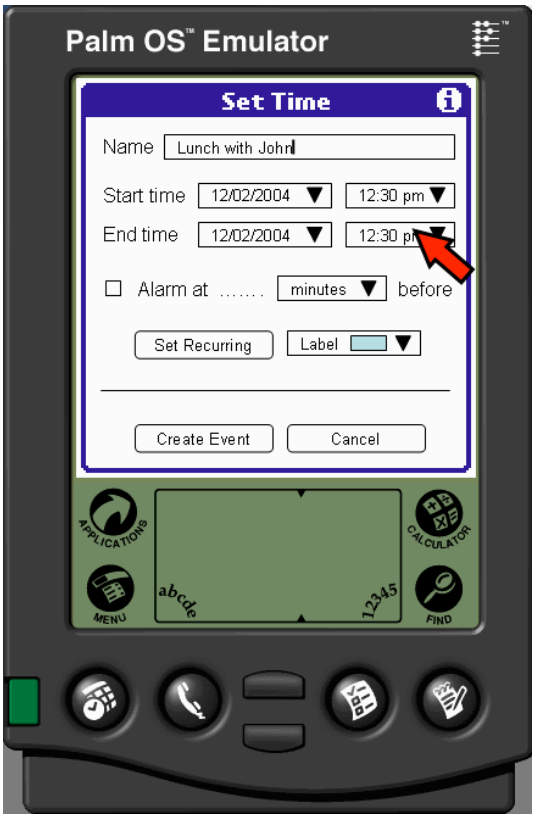


Figure 1

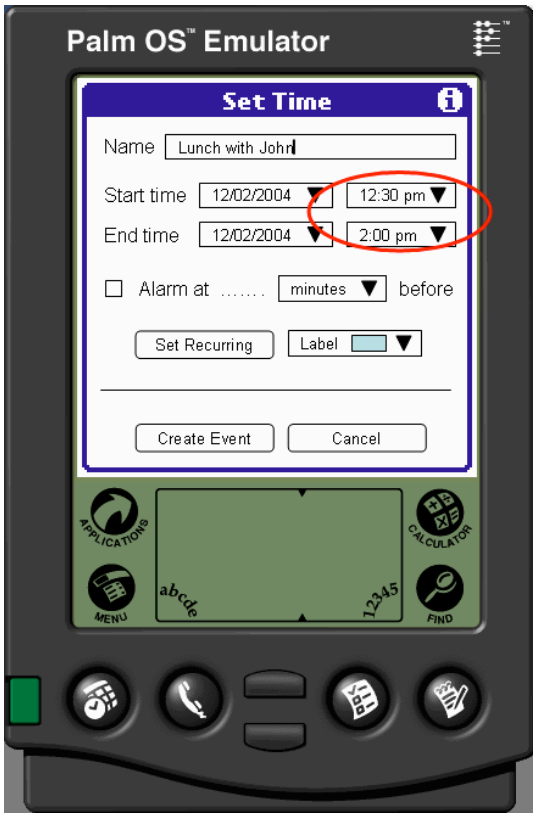


Figure 2

DESIGN CHANGE

Design Idea 5: Give users greater control over event start and end times

While doing think-aloud, we found the user has difficulty recognizing that the start and end time textboxes are editable. We change the text boxes to dropdown menus because dropdown menus are easier to notice than textboxes. It provides more efficient use by allowing the user to choose the correct time, which also prevents error more effectively.

STEP 24

Set alarm

After setting the start and end time, Kathy would like to set alarm too so that she could get a reminder on that day. Kathy checks the alarm box (Figure 1). Kathy then types "5" in the text entering field. She then selects "Minutes" from the dropdown menu (Figure 2). She now will be reminded 5 minutes before the lunch meeting.

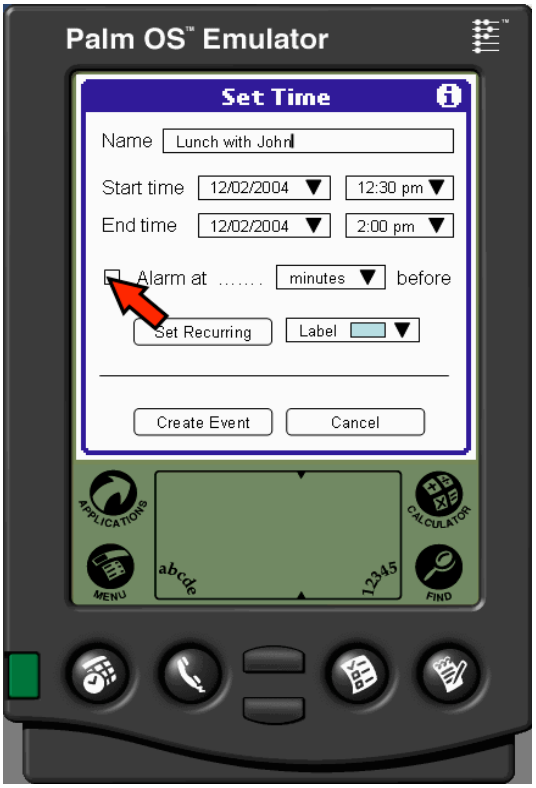


Figure 1

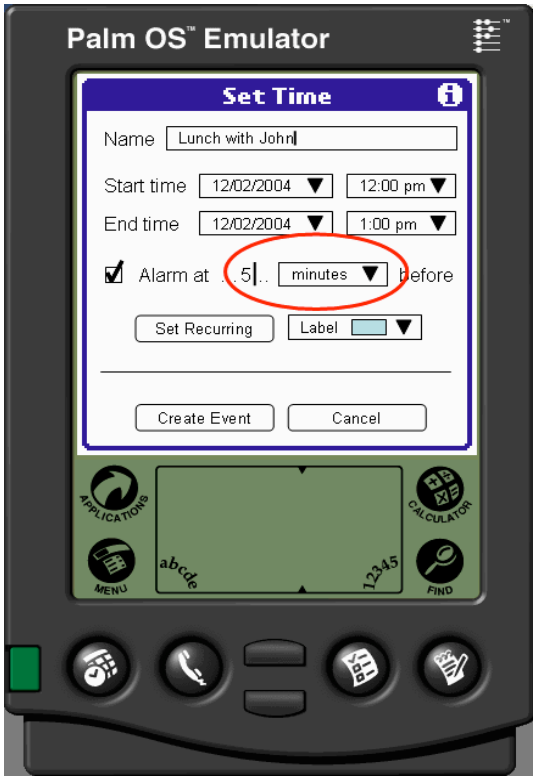


Figure 2

DESIGN CHANGE

Design Idea 6: Give users quick access to alarm functionality in the DateBook

The think-aloud study showed that the user became very frustrated when searching for the alarm system because there was no indication on how to set alarm in the Set Time interface.

By having the alarm option available in the Set Time interface, we are making a frequently used functionality readily available to the user when the user needs it. With this redesign, the user can set all the alarm options at the time of the event creation and will no longer have to search for the alarm feature.

STEP 25

Click "Create Event"

Kathy taps "Create Event" button on the bottom of the screen to create this event (Figure 1). Kathy is then brought back to the main DateBook screen where her new event appears (Figure 2). Kathy has now finished her task.

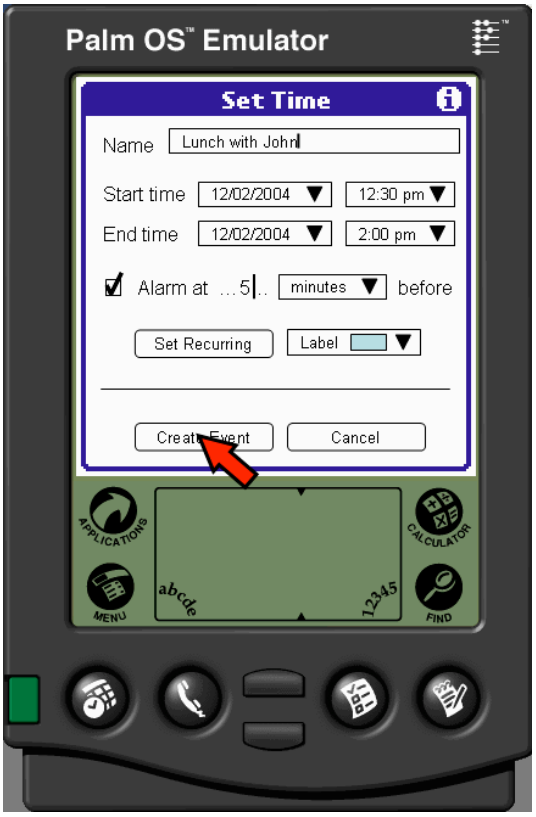


Figure 1

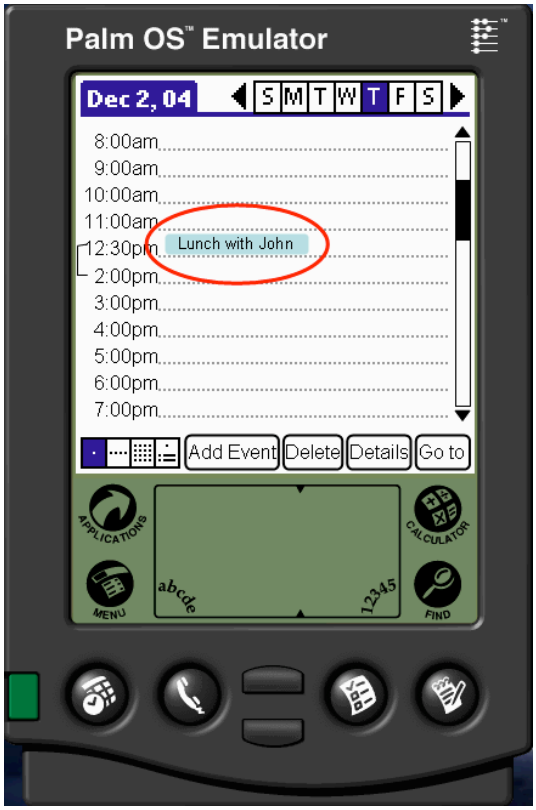


Figure 2

RETROSPECTIVE

RETROSPECTIVE

Throughout this semester, we have gone through several different methods to analyze and redesign human-computer interfaces. The first method we learned was Contextual Inquiry and Design, in which the user is observed in his/her natural environment so as to understand how the user works and what affects his/her work. The next method, Heuristic Evaluation involves a group of evaluators assessing the interface using a comprehensive list of guidelines. By applying problem solving techniques, Cognitive Walkthrough does step-by-step analysis of a task within an interface. Next, a new technique known as Design Relabeling was done, which forces the evaluators to think outside the box by applying the function of the current interface to a random object. Finally, we ended with the Think Aloud technique wherein a user is observed as he/she thinks aloud while going through specific tasks within the interface. Now that we have experienced each method, we can compare and evaluate the methods themselves.

CONTEXTUAL INQUIRY/DESIGN

Contextual Inquiry/Design is the method by which evaluators observe a user in their environment, and gather information around a focus. Unlike Think Aloud, the user and evaluator/interviewer can interact, so the interviewer can ask questions to better understand how and why the user does something. This possibility for interaction was one of the greatest advantages that we found. We feel that CI/D is a great source of empirical data to explain a user's actions and process in achieving a goal and that it is a great starting point for gathering data. Another helpful aspect of the CI/D interview is that all of the user's actions are placed in the context of their physical and cultural environment, so the physical and culture influences are integrated into the data, providing more possibilities for design/re-design ideas. This is exhibited in models that map out the workflow, sequence of work, cultural influences, physical layout, and artifact models, which are used to better understand how the user works and identify where breakdowns can occur. Although the models can be helpful, we felt that if the interview process was done well than it would be the most useful data created by CI/D therefore making the models unnecessary.

Three issues that can arise with CI/D are that it is time consuming, expensive, and can easily stray off focus. When the user strays from the focus, a large amount of off focus data is created. We found this to be most annoying when creating our models. In general the models proved to be unnecessarily time consuming, especially since we did not use the models again afterwards. We feel that the least useful of

the models was the sequence model, which if applied to the entire interview would take at least twice as long as the interview itself. While we understand the purpose and aid that could be offered by the models, we found that they are best used when applied to specific portions of the inquiry and not the inquiry as a whole.

Heuristic Evaluation

The Heuristic Evaluation method involves a group of evaluators analyzing an interface based on a group of guidelines/heuristics that are predetermined. A huge advantage of HE is that it only requires a small group of evaluators, such as the size of our groups, and yet produces an extensive list of problems and good aspects of an interface in a short amount of time. We found this to be most effective with our redesign since we could see that the majority of the group identified the more severe problems, but at the same time no small problems were overlooked. Another advantageous aspect to the small group of evaluators is that they can work individually, so the amount of group work is minimal and the time for it is well used, as opposed to the other methods. Also HE is comprehensive since it allows the evaluators to explore the entire interface, rather than orienting the analysis around a task as in TA and CW. This was particularly important in finding issues with consistency throughout the Palm interface, which was an important issue for our group although was a larger issue than we could approach in our redesigns.

One drawback of HE is that the evaluators are often the system/interface designers. Therefore our fear is that the problems found would not be representative of the issue that a novice user might encounter. We believe that HE strays from our mantra of "the user is not like me" in this way. One way that we found to counter this issue would be to follow up HE with Think Aloud. The combination of the two methods would allow for problems to be found that affect many levels of users. Also by combining the two methods, the evidence to support the change of each of the problems is stronger and more extensive.

Cognitive Walkthrough

The cognitive walkthrough method examines the cognitive processes of the user as the user attempts to accomplish a task within an interface. We found that an advantage to CW is that it does not necessitate an actual user; the evaluators mimic the cognitive process of the user through answering questions, which directly relate to the cognitive processes of the user. Given that no user is needed, the cost of the method is low and the data can be collected relatively quickly. This method allows any evaluator to apply cognitive models and theories in

evaluation of an interface. This was especially advantageous for our group, considering that we don't all have a background in psychology. Our group thinks that CW is best when used in conjunction with one or more of the methods mentioned earlier, since it requires tasks and assumptions derived from data that has already been gathered. So we suggest that CI/D be used prior since it provides the most detailed data from which to build.

While CW is flexible and can be applied to many different interfaces, our main issue was that it tests a task process only and not the interface as a whole. We found that the time spent on the method, in comparison to the other methods such as HE, did not yield the same amount of detailed data with which we could work. Also, the constant repetition of the questions for each step of the task made us feel as though the method was tedious and boring. As a result we were less interested in this method, and we believe that this caused our group to not work as hard, producing data that we were not able to use later.

Design Relabeling

Design Relabeling is a process by which evaluators use a random object and apply the functions of their current interface/product. This process demanded that we think outside the box, creating a rejuvenated energy to be applied to the redesign process. This imaginative thinking was initiated by a creative group of objects: a singing fish, a multi-tool knife, an iron, a massager, and various other things. When working with a product for an extended period of time, as is the case in many redesign projects, the design team can get stuck within a mindset, known as functional fixedness. We applied the tasks of a scheduler to an iron, enabling us to come up with new and innovative ideas for future versions of the Palm scheduler. We found this method to be the most enjoyable of the methods. Since the activity was done in class, we also got to see what the other groups came up with using their objects, giving us even more creative ideas and exhibiting the importance of parallel group design and competition. Most of the ideas that we came up with using the iron could only be used in a total redesign of the Palm, and more specifically the scheduler interface. Our redesign focuses more on aspects of the scheduler and not the interface in its entirety.

Think Aloud

Think Aloud, like CI/D, is a user-based method. In this method, the user is given a task to complete while working with an interface and is asked to speak his/her thought process aloud. The evaluators observe, but do not interact with the user

unless there is a technical problem. We believe that the data that is collected from Think Aloud is impelling and strong because the emotion of the user is observed and documented, therefore creating empirical evidence for not only the interface issues encountered during Think Aloud, but also the emotions and frustrations of the user. TA uses a similar concept to that of HE by analyzing problems by guidelines; in the case of TA, these guidelines are called criteria and are based on the users responses to the system, keeping the focus of the method as close to the designer's goals as possible.

The main issues that we found were the cost and the skill level of the users. Depending on the interface that is being tested, we would need to search for appropriate skill leveled users, which could be difficult and costly. We were frustrated by the user from our TA experience because we felt he was not a good representative of a normal or even new Palm user. He had so many problems that there were only a few that were relevant to the task and therefore usable in our redesigns. In fact, the interview had to be concluded due to his frustration. We believe that this is one of the issues with TA as a method: if a user is so frustrated with a task that they are unable to complete it or become frustrated in a different area of the system then there is less data available to the evaluators, proving TA to be not cost-effective.

CONCLUSION

Although there were methods that we liked more than others, all of the methods find different types of problems, and are therefore valuable to the evaluation process. Depending on the stage of the design process, certain methods can be more effective and useful. We feel that it would be best to start with Heuristic Evaluation when redesigning an existing system because HE efficiently identifies problem areas that can help to create a focus. Also we found that Contextual Inquiry is always a good base of information to have in combination with many of the other methods. Below, we have summarized how we feel the methods work best together and each of the method's pros and cons.

Method	Pros/Cons	Works well with:
Contextual Inquiry & Design (CI/D)	Pros: • Contextual: physical & cultural data, real-life scenarios to design for • User's intent and goal apparent • Good observation conditions • Interaction between interviewer and user • Breakdowns visible and apparent • Thorough & detailed data Cons • Time consuming • Expensive • Doesn't test new system • No defined task • Limited to context • Excessive information • Requires trained/educated evaluators	HE, TA, CW
Heuristic Evaluation (HE)	Pros: • Inexpensive, "Discount Usability Engineering" (HE, slide 29) • Fast • Structured by Heuristics • Comprehensive – covers entire interface, no tasks • Small group of evaluators • Identifies a good range of problems • Objective, follows usability standard Cons • Testers are not users • "Pet" problems can develop • Need expert/trained evaluators • Not empirical, un-justified • Hard to apply to new technology	CI/D, TA
Method	**Pros/Cons**	**Works well with:**

Cognitive Walkthrough (CW)	Pros: • Task oriented • Focuses on user's concept of task • Detailed • No prototype required • Useful information (re word choices, system feedback) Cons • No user • No empirical data • Requires detailed interface design • Assumptions made about users • Only for one type of user • Focuses on problem solving only • Continues to analyze task process regardless of failure/success at individual steps	CI/D
Design Relabeling	Pros: • Fun • Out-of-the-Box thinking • Stimulates creative ideas • Break free from limitations of existing system/mind-sets Cons • Hard to apply to functions of system • More applicable to entire product (re)design	

Method	**Pros/Cons**	**Works well with:**

Think Aloud (TA)	Pros: • Real user • Empirical evidence based on user's actions/words/thoughts • Evidence is compelling • Designer defined criteria Cons • Must use a useful task • Time consuming • Expensive • Critical incidents/criteria difficult to define • Criteria are limiting • Need a working prototype • User can stray from task, bad data	CI/D, HE

APPENDIX A

Redesign Summary Table
Redesign Details

Redesign Idea	Current Problem	Motivating UARs	Redesign	Severity	Tradeoffs

1	Improve visibility of appointment creation functionality	Users overlook the “New” button and has difficulty creating a new event	YS-TA-01 YW-TA-01 ES-TA-01	Change label of “New” button to be “Add Event”	3	Takes up screen space
2	Give users quick access to all hours of the day in the DateBook	Users have difficulty locating the time for their event when it is before 8am or after 6pm	YS-TA-01 DAZ-TA-02 ES-HE-06 YS-HE-05	Add a scrollbar to the DateBook, that allows scrolling through all hours of the day	3.5	Must also add “am” and “pm” labels to times Takes up screen space
3	Give users quick access to event manipulation functions in the DateBook	The delete functionality is buried a level away from the user’s main interface	YS-HE-02 YW-HE-07 ES-HE-08	Add a “Delete” button to the DateBook’s main interface	3.5	Takes up screen space
4	Allow users to create events in the DateBook without specifying a name	Users’ newly created events disappear when not given a name	YS-TA-02 GIB-TA-01 DAZ-TA-06 YW-TA-02	Add text field for the name of the events(in the event creation dialog) with a default name	3.5	Users may not name any events and become confused later on when all events have the same default name. Takes up screen space
5	Give users greater control over event start and end times	Users have difficulty recognizing the start and end time textboxes as editable	YS-TA-05 GIB-TA-08 DAZ-TA-02 DAZ-TA-08 CW-1	Create start and end time variables (in the event creation dialog) with dropdown menus for date and time	3	May slow down process for skilled users as now there are dropdown menus for date and time for both start and end date
6	Give users quick access to alarm functionality in the DateBook	Users have difficulty locating the alarm functionality in the DateBook	YS-TA-03 CW-4 DAZ-TA-05	Add an alarm checkbox directly in the event creation dialog	3	Takes up screen space
	Redesign Idea	**Current Problem**	**Motivating UARs**	**Redesign**	**Severity**	**Tradeoffs**

7	Give users the ability to create recurring events	Users are unable to create recurring events	Inspired by CI	Add a “Recurring” button to the event creation dialog that links to settings for recurring events	3	Button takes up screen space Additional memory for tracking these events Added complexity with extra settings dialog
8	Give users the ability to categorize events using colors	Users are unable to categorize their events	Inspired by CI DAZ-HE-14	Add dropdown menu containing colors for categorizing events	2.5	Too many colors may confuse the user Dropdown menu takes up screen space
9	Give users the control to exit the Welcome application	Users are unable to exit the Welcome application	YS-TA-08 YS-HE-08 YS-HE-09 YW-HE-03 YW-TA-03 YW-TA-06 ES-HE-03 ES-HE-04 ES-TA-03 GIB-HE-05 GIB-HE-08 GIB-TA-09 DAZ-TA-11 DAZ-HE-06	Add “Exit” buttons to all screens in the Welcome application	3.5	Need additional memory to save previous settings if the user cancels in the middle of setup Button takes up screen space
10	Give users access to Help all the time	Users do not have access to Help	YS-HE-11 DAZ-HE-10 ES-HE-01	Add a Help option to the menu bar for all applications	3.5	Additional work creating Help interface and maintaining it through changes Requires users to read more and interact with another component Takes up screen space

PROBLEM 1

Users overlook the "New" button and have difficulty creating a new event

MOTIVATION

This primary functionality should be easy to locate in the DateBook application. However, users tend to over looked the "New" button and have a difficult time creating a new event.

Therefore, we feel that improving the visibility of the appointment creation functionality is very important. This redesign was inspired by a problem found in the think-aloud assignment.

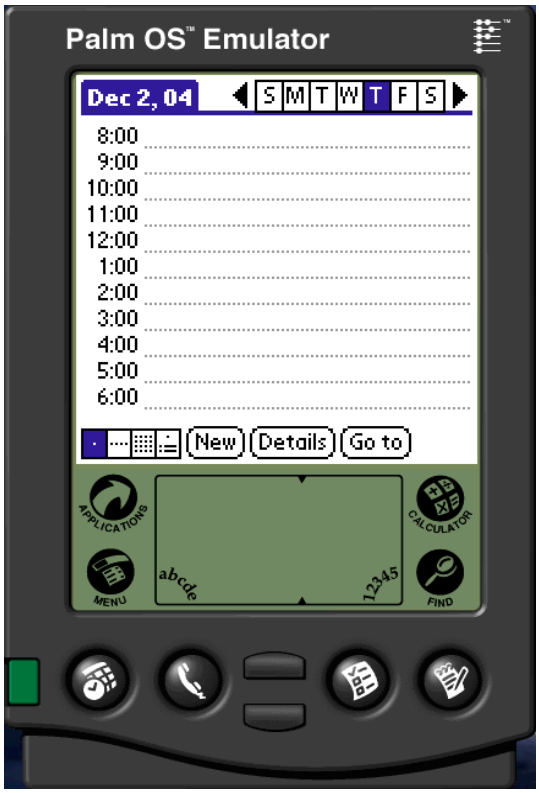


Figure 1

REDESIGN

Our solution to this problem is to make the "New" button more noticeable and easier to understand for novice users by changing the label "New" to "Add Event" (Figure 2).

We believe labeling the button this way can best describe its usage and reduce users' confusion.

JUSTIFICATION

Because creating new events is one of the main purposes of the DateBook, the "New" button could cause confusion for many novice users (see Figure 1 of old design).

Labeling the button "Add Event" instead of "New" can eliminate confusion and improve the visibility of the event creation functionality. This new label matches real-world conventions for calendar use.

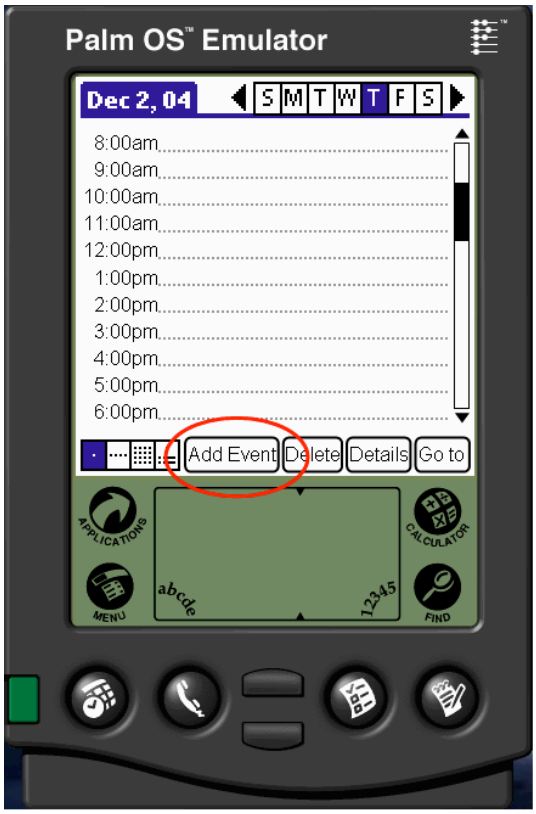


Figure 2

SEVERITY

Severity: 3

Frequency: Since creating new events is one of the main functionalities of the DateBook, many novice users might run into this problem when they first use it.

Impact: This could be a one time problem but users may become very frustrated when they run into this problem.

Persistence: Users could overcome this problem once they are familiar with the application.

Creating new events is a core function of the DateBook. It's important for first time users to have a positive experience; otherwise the user may give up using the Palm all together. This is a usability problem and it's important to get it fixed.

TRADEOFFS

The only tradeoff we see with this solution is addition screen space.

EVIDENCE

YS-TA-01

YW-TA-01

ES-TA-01

PROBLEM 2

Users have difficulty locating the time for the event when it is before 8am or after 6pm.

MOTIVATION

With the current system, the user can only see the time period of 8am to 6pm. Nothing on the screen shows the user how to get to the time slots outside of the 8am to 6pm time period.

The user from the think-aloud assignment had trouble finding the seven o'clock time slot and became very frustrated after a while. We feel that it is important to give users quick and clear access to all hours of the day in the DateBook. This redesign was inspired by the user's behavior from the think-aloud assignment.

REDESIGN

Our solution to this problem is to add a scrollbar to the DateBook that allows scrolling through all hours of the day (Figure 1).

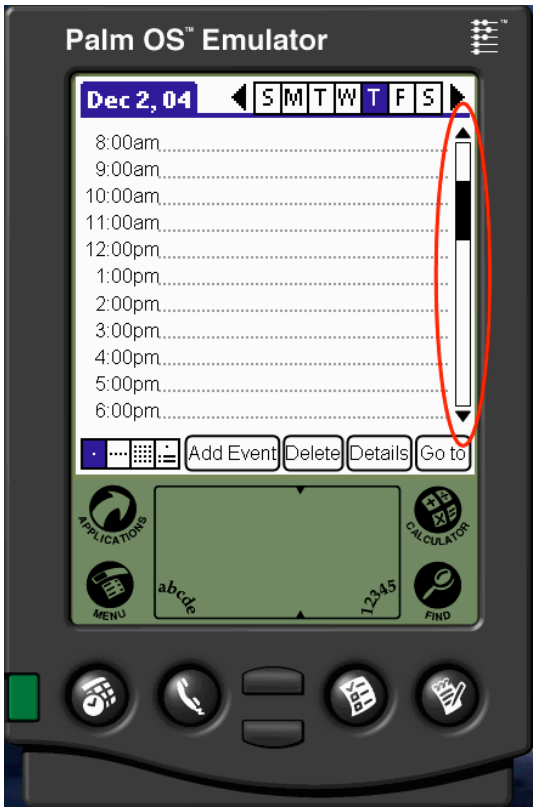


Figure 1

JUSTIFICATION

Scrollbar is a very common tool that almost everyone who has experience with computing devices would know how it works. Once users see the scrollbar, they will know that in order to get to the time slots other than the time slots between 8am and 6pm, they have to either scroll up or down (Figure 2).

By adding the scrollbar, we reduced confusion, and gave users a quick and easy access to all hours of the day.

Figure 2

SEVERITY

Severity: 3.5

Frequency: This could be a very common problem for novice users because a lot of events happen outside of the 8am to 6pm time frame. Therefore, every time when the user tries to schedule something outside of that time frame, the user would face this problem.

Impact: This problem has a big impact. Users may need to try many different options in order to find the time slots outside of the 8am to 6pm time frame, and some may become very frustrated during this process.

Persistence: Once the user familiar with this application, they would not have this problem again.

Being able to locate time slot is one of the fundamental steps for many DateBook functionalities. However, the DateBook interface does not give any indication or instruction on how to get to the time slots that are not currently listed on the screen. This is incredibly confusing and frustrating for users, and there's a good chance some of them would never figure out how to get to those time slots.

TRADEOFFS

Must also add "am" and "pm" labels to times.

Takes up screen space.

EVIDENCE

YS-TA-01

YS-HE-05

DAZ-TA-02

ES-HE-06

PROBLEM 3

The delete functionality is buried a level away from the user's main interface.

MOTIVATION

In the current system, there's no "Delete" button to delete an event on the top level screen. The user has to navigate through a sequence in order to locate the "Delete" option.

This is an important problem to be fixed, because 1) it doesn't make sense to only let users create events but not delete event and 2) some users might have to go through a lot of trouble to find the "Delete" button. We feel it is important to add a "Delete" button to the DateBook main interface in order to give users quick and easy access.

REDESIGN

Add a "Delete" button to the DateBook's main interface (Figure 1).

Pressing the "Delete" button will bring up another confirmation dialog (Figure 2).

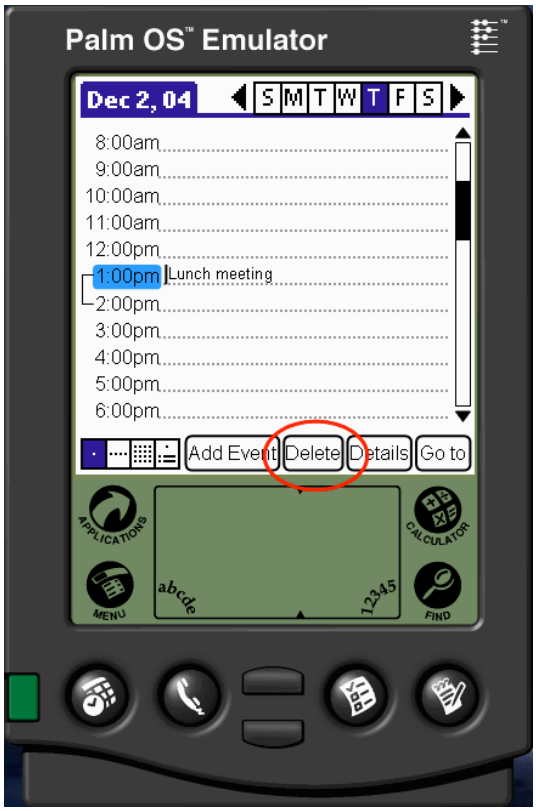


Figure 1

JUSTIFICATION

Not having a "Delete" button really limits users' performance. Users won't have enough control and freedom over their action. Therefore, it violates the "user control and freedom" heuristic. By adding the "Delete" button to the main interface fixes this problem.

Furthermore, the confirmation dialog is an error prevention method, so that the user does not accidentally delete events.

Figure 2

SEVERITY

Severity: 3.5
Frequency: This could be common problem because Delete is a very common functionality in the DateBook. Users delete events as often as they add them.

Impact: Users will most likely find this very difficult to overcome, as the discoverability of the work-around sequence is low.

Persistence: Users will be repeatedly bothered until they learn the sequence of navigating to the 'Delete' button. For users who never discover the 'Delete' button, they will be repeatedly bothered by bogus entries in their DateBook.

Because of the high frequency, huge impact, and high persistency, we feel this is a major problem that requires attention and needs to be fixed.

TRADEOFFS

The trade off for this solution is taking up screen space.

EVIDENCE

YS-HE-02
YW-HE-07
ES-HE-08

PROBLEM 4

Users' newly created events disappear when not given a name.

MOTIVATION

A major problem we found within the DateBook application while doing think-aloud and heuristic evaluation was that events disappear when the user does not give a name to the event he/she creates.

The user from think-aloud assignment became very confused because he couldn't find the event (as he did not give the event a name. Note: the current system does not allow the user to enter the event name in the event creation dialog (Figure 1)). We feel that is it very important for the system to behavior to match user expectations (i.e.: events do not disappear on the user).

Thus, we feel it is necessary to have a default name so that the system can save the event under that name if the user forgets to create a name for the event.

REDESIGN

Add text field for the name of the events (in the event creation dialog) with a default name (Figure 2).

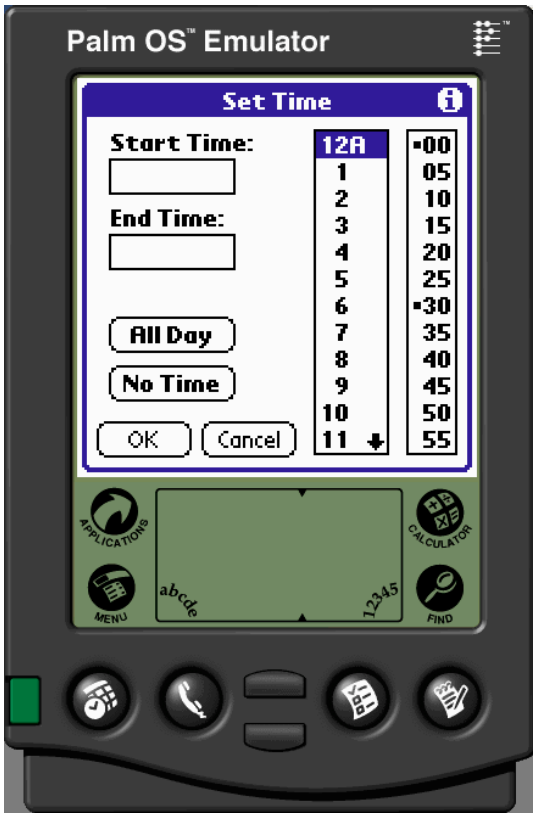


Figure 1

JUSTIFICATION

Without the default name, once the user forgets to enter an event name, he/she would lose everything associated with that event.

Having a text field with a default name is an easy way for the user to save or recover from forgetting to input event name. This is a critical error prevention solution.

Putting the text field in the event creation dialog is a logical place, as this is the main interface the user uses for event creation.

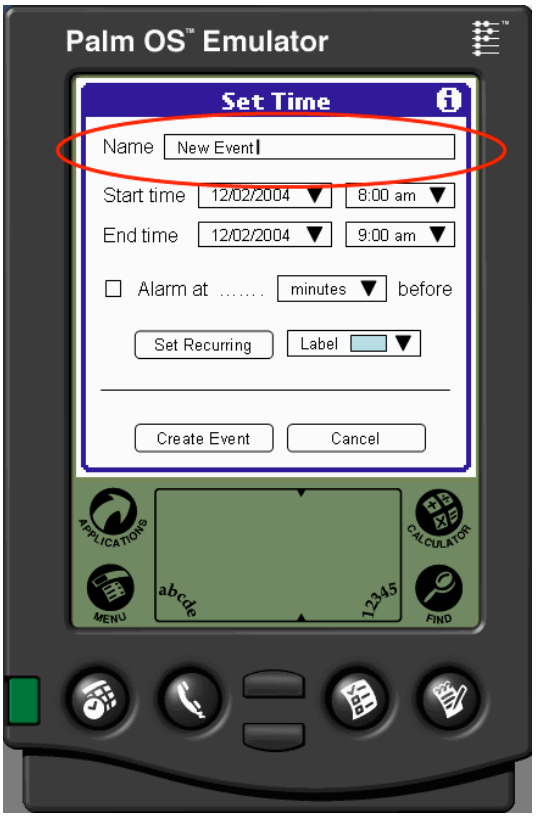


Figure 2

SEVERITY

Severity: 3.5

Frequency: Since appointment making is the primary function of the DateBook, this problem will be encountered all the time. Appointments with no names will always disappear.

Impact: The user may have a difficult time overcoming this problem as they may not be able to associate the strange behavior with "not having a name".

Persistence: The user will be able to overcome this problem once they are familiarizing with the application; however, it's a challenge for users to overcome it the first time.

Since the user is not given any feedback on the cause of such a problem. The user may never be able to find the cause (and thus the solution) to the problem. It has a high rating also because it affects a core function of the Palm.

TRADEOFFS

Users may not name any events and become confused later on when all events have the same default name.

Takes up screen space.

EVIDENCE

YS-TA-02

YW-TA-02

GIB-TA-01

DAZ-TA-06

PROBLEM 5

Users have difficulty recognizing the start and end time textboxes as editable.

MOTIVATION

A problem we found within the DateBook application while doing think-aloud was that the user has difficulty recognizing that the start and end time textboxes are editable. In think-aloud, the user was asked to create an appointment that ran from 7am – 8:15am, but instead, he created an appointment between 7am- 8am. We feel it's important to give users greater control over event start and end time.

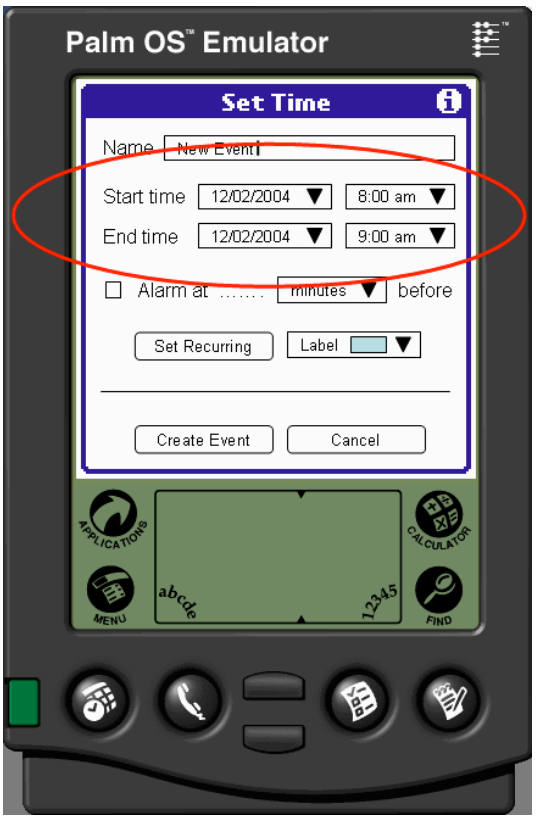


Figure 1

REDESIGN

Create start and end time variables (in the event creation dialog) with dropdown menus for date and time (Figure 1, 2, 3).

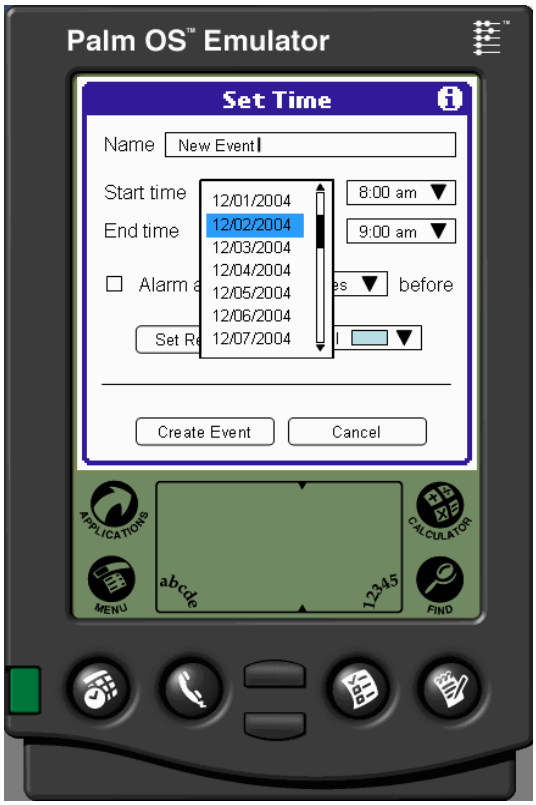


Figure 2

JUSTIFICATION

The dropdown menu is easier to notice compare to textboxes. It provides more efficient use by allowing the user to choose the correct time, which also prevents error more effectively.

Previously, a single time manipulation method was shared by both the start time slot and the end time slot. This redesign

gives time manipulation tools to both start and end time slots, so the association will be much clearer for the user.

Figure 3

SEVERITY

Severity: 3

Frequency: This could be a very common problem for novice users as they many not notice that the same time table is used for changing both the start and end times.

Impact: This has a great impact, because it affects the accuracy with which users create events. The purpose of a DateBook is lost if the user must manually write in the end time for every event (as the think-aloud study participant did).

Persistence: Once the user understands how to use the start and end time textboxes, this problem will no longer occur.

The user can overcome this problem once they understand the application better, however, it's still important to make the textboxes more visible in order to give users greater control.

TRADEOFFS

May slow down process for skilled users as now there are dropdown menus for date and time for both start and end date.

EVIDENCE

YS-TA-05

GIB-TA-08

DAZ-TA-02

DAZ-TA-08

CW-1

PROBLEM 6

Alarm functionality in DateBook is difficult to locate.

MOTIVATION

The think-aloud study showed that the user became very frustrated when searching for an alarm system. The user went off track and got tangled in other applications that were completely unrelated to the DateBook. Even when the alarm function is found (as in the cognitive walkthrough), we found the alarm settings to be ambiguous and potentially confusing.

REDESIGN

The redesign idea involves including an alarm checkbox option in the event creation dialog (Figure 1).

There will also be a dropdown menu for selecting how far in advance the alarm should sound. This dropdown menu is grayed out as inactive until the alarm is turned on by checking the alarm checkbox (Figure 2)

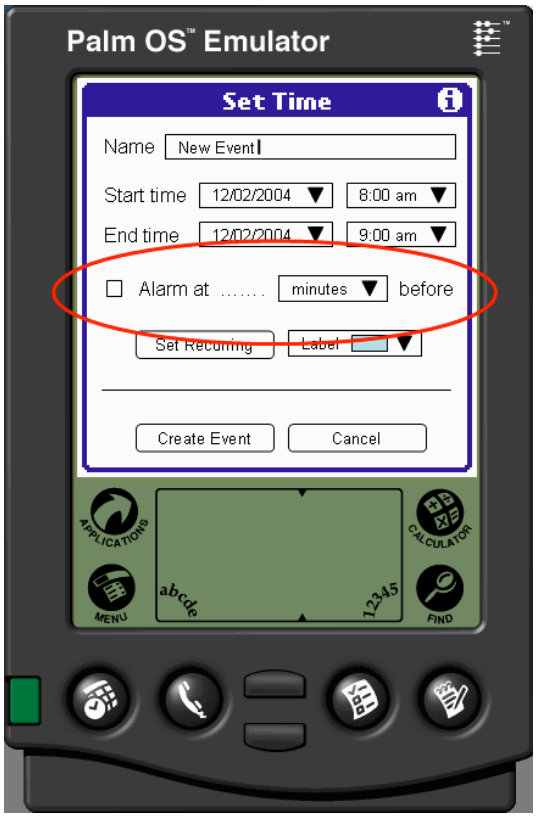


Figure 1

JUSTIFICATION

By having the alarm option available right in the event creation dialog, we are making a frequently used functionality readily available to the user when the user needs it. With this redesign, the user can set all the alarm options at the time of the event creation and will no longer have to search for the alarm feature.

SEVERITY

Severity: 3

Frequency: We feel that scheduling is a frequently used feature for Palm users and thus this problem will be encountered very often. When analyzing the CI, we noticed that users often use Sticky-Notes as reminders; thus, we infer that users will often set reminders/alarms for their events.

Impact: We believe that the user will not easily overcome this problem. From the think-aloud, we see that the user's mental model of where the alarm feature should exist is not under the "Details" button; thus, we feel that finding the path to the alarm feature may be difficult.

Persistence: If the user discovers the alarm functionality, it is simply a few steps away. On the other hand, if the user become frustrated with the alarm feature (as we saw in the think-aloud), the user may never try to set an alarm again.

Because of the high frequency of this problem as well as the potential for users to never find a solution to the problem, we gave this a severity rating of 3.

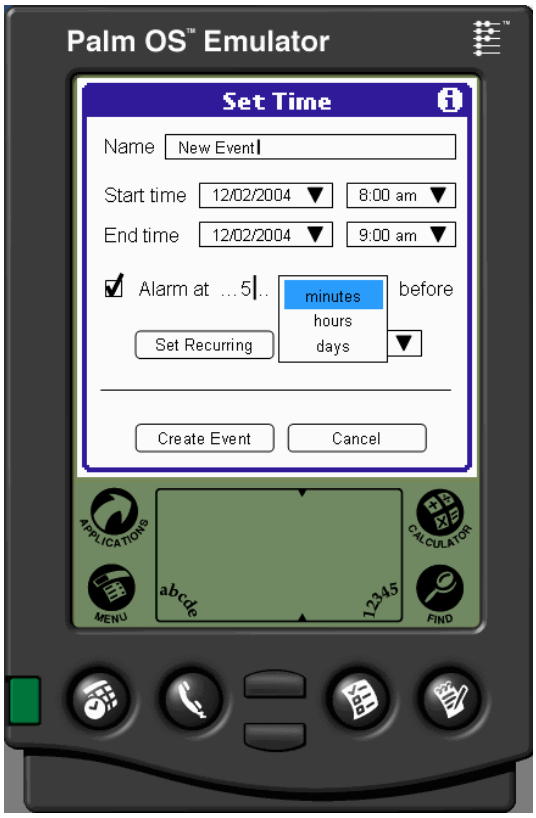


Figure 2

TRADEOFFS

The only tradeoff we see with this solution is the screen space taken up by the alarm options.

EVIDENCE

YS-TA-03

CW-4

DAZ-TA-05

PROBLEM 7

Inability to create recurring events in the DateBook

MOTIVATION

From the CI, we discover that many of the events that the user schedules are recurring events. Currently this functionality does not exist in the Palm DateBook.

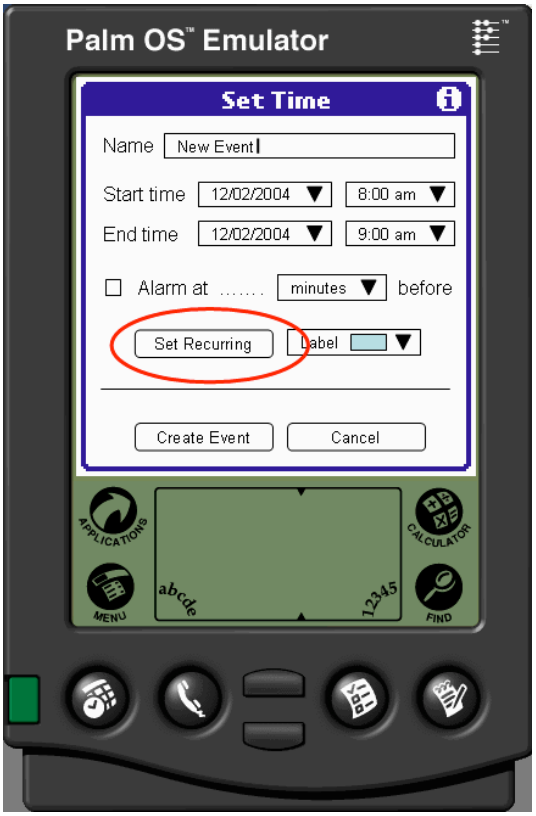


Figure 1

Figure 2

REDESIGN

The redesign idea involves adding a recurring events button to the event creation dialog. Selecting this button will take the user to another dialog where the user can set the options for a recurring event (Figure 1).

The user is given the option to set the event to recur daily (Figure 2), weekly (Figure 3), monthly (Figure 4), or yearly (Figure 5). Furthermore, if the even occurs weekly, the user has the option of selecting multiply days of the week on which the event will occur. After setting the frequency of the recurrence, the user can then decided how

long the event will re-occur – a certain number of times, or until a certain date.

The recurrence can be created/changed by pressing the “Create Recurrence” button, or removed from the even with the “Delete Recurrence” button.

After creating a recurring event, the button text changes from “Set Recurring” to “Change Recurrence” (Figure 6). This way, the user knows that the event is a recurring event and any future press of the button will change the recurrence settings.

Figure 3

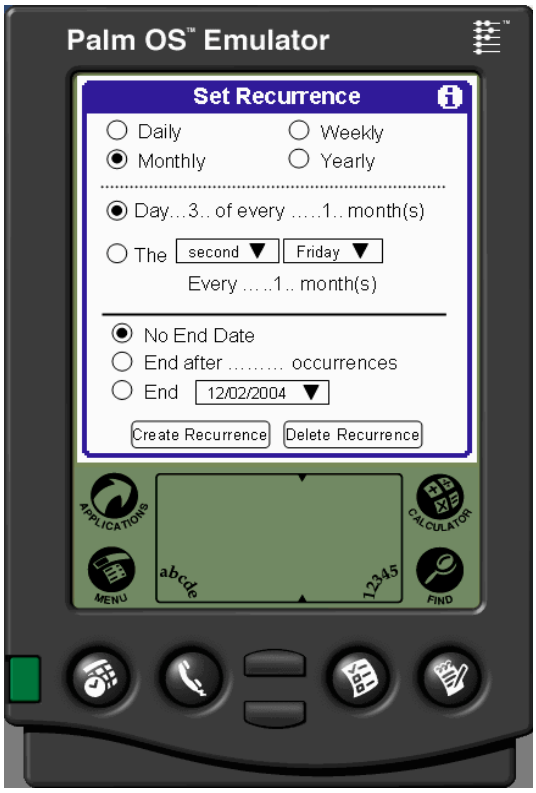


Figure 4 and 5

JUSTIFICATION

The recurring events feature will allow users to quickly schedule events that are regular to their schedule. This convenience saves the user a lot of time and frustration.

The options we have selected for the recurring events setting are common to virtual calendars such as iCal and Outlook, so we feel that they will be easily understood and quick to use. A quick cognitive walkthrough of the options also indicates that the actions are intuitive.

SEVERITY

Severity: 3
Frequency: From the CI data, we find that recurring events is a frequent occurrence for user.

Impact: The user will be able to overcome this problem by manually entering all recurring events, which is incredibly laborious and inconvenient.

Persistence: Because this feature does not exist, the problem will persist.

Because of the high frequency of this problem as well as the great convenience that would be gained from the solution, we gave it a severity of 3.

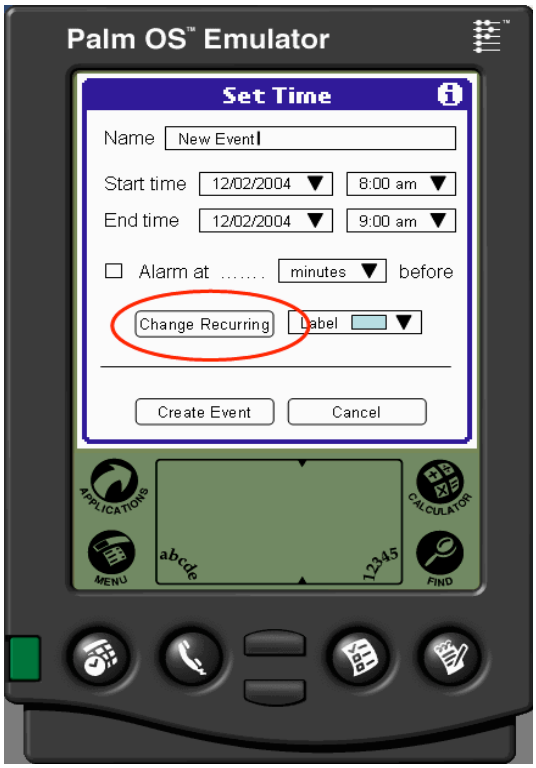


Figure 6

TRADEOFFS

A possible problem is the added complexity of the user having to learn how to use this interface.

Another tradeoff would be the additional memory for tracking recurring events.

Finally, the added button to the event creation dialog takes up additional screen space.

EVIDENCE

Inspired by CI

PROBLEM 8

Inability to categorize events in the DateBook.

MOTIVATION

The CI data shows that users often categorize their events. For example, in our data, the user utilized different codes on her paper calendar for different types of events (working from home, tentative events, etc). This feature does not exist in the Palm, and since the Palm does have a color display, we can take advantage of this with color coding.

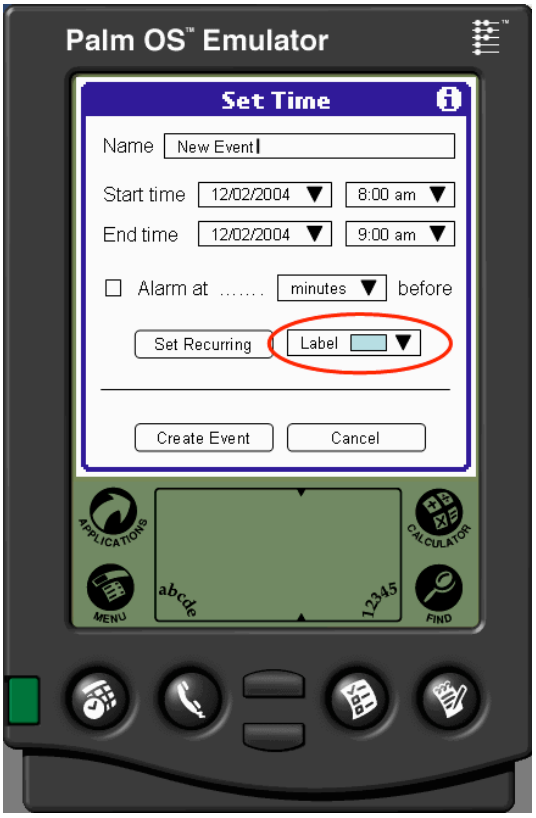


Figure 1

REDESIGN

The redesign idea involves adding a dropdown menu to the event creation dialog. This menu will contain a palette of colors with which the user can code the event (Figures 1 and 2). Once coded, the event will be displayed in that color in the DateBook's calendar views.

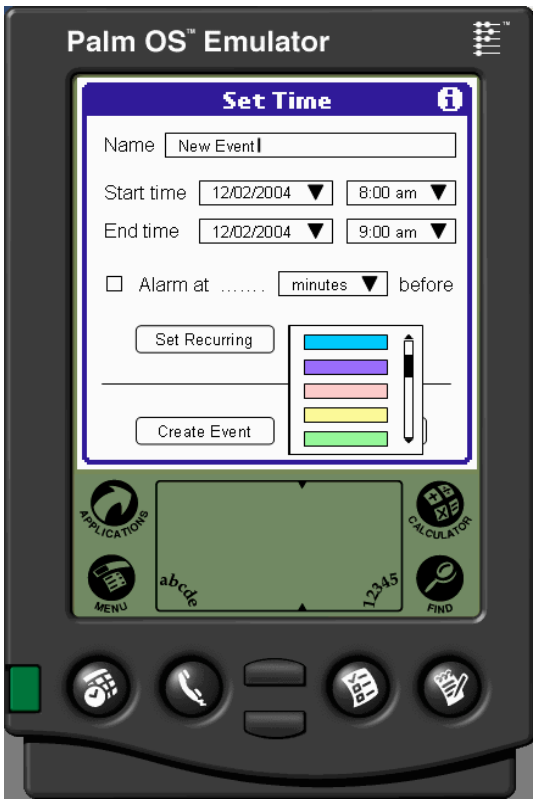


Figure 2

JUSTIFICATION

Allowing users to categorize their events will give them a visual differentiation between different types of events.

Using color as our method of categorization is inspired from the fact that the Palm does have color display. It is also a method that does not take up any more valuable screen space (as text does).

SEVERITY

Severity: 2.5
Frequency: From the CI data, we see that users often categorize their events, so we believe this to be a frequently encountered problem.

Impact: The user can find workarounds for this problem (such as using text labels). Such workarounds are not visible in the weekly and monthly views.

Persistence: Because this feature does not exist, the problem will persist.

Though this problem occurs frequently, we feel that this additional feature is not necessary. Instead we feel that it is a bonus feature that adds an extra level of polish to the Palm; thus, we gave it a severity rating of 2.5.

TRADEOFFS

Having multiple colors displayed (especially in the weekly and monthly views) may become confusing for the user on such a small screen.

The dropdown menu that is added to the event creation dialog takes up screen space.

EVIDENCE

Inspired by CI
DAZ-HE-14

PROBLEM 9

Users are unable to exit from the Welcome application.

MOTIVATION

The heuristic evaluations and think-aloud study all point to this problem. The heuristic evaluation shows that this violates the user control and freedom criteria. Once the user enters this application, the user is forced down a fixed path and cannot escape.

The think-aloud study demonstrates an actual user who gets stuck in this situation. He becomes very frustrated at the fact that he cannot exit the application.

This problem is cause for a lot of user frustration because the system does not respond to the user's actions. Instead, the user must follow a fixed path in order to exit the application.

REDESIGN

The redesign idea involves adding "Exit" buttons to every screen of the Welcome application (Figures 1 to 6).

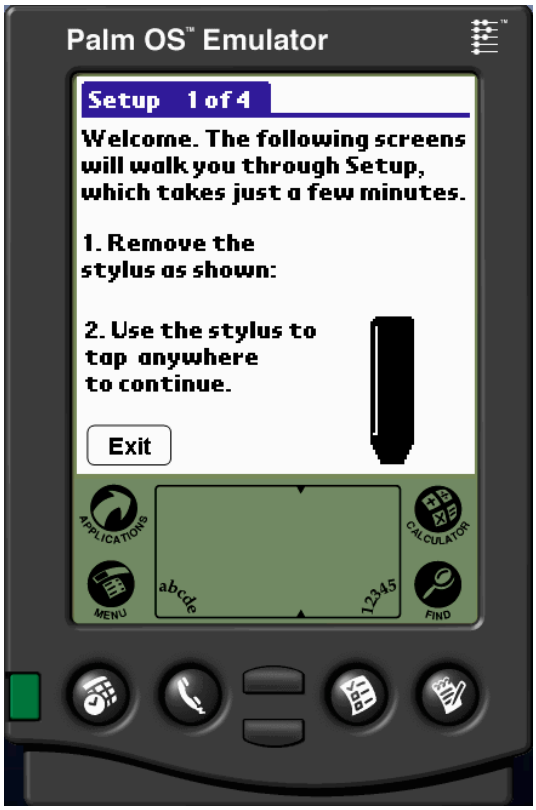


Figure 1 and 2

Figure 3 and 4

JUSTIFICATION

By adding an exit point to every screen, the user will have the option to continue (by clicking anywhere on the screen) or to exit the application (by clicking the "Exit" button). This gives the user more control over the system and reduces user frustration.

SEVERITY

Severity: 3.5

Frequency: This event will not happen that frequently as the user will not often go into the Welcome application. However, we found in the think-aloud that users who are problem-solving and looking for features, may accidentally stumble into the Welcome application.

Impact: It is impossible to overcome this issue. The user must follow the instructions on every screen and follow through with the Welcome setup process in order to exit.

Persistence: This problem will continue to occur every time the user enters the Welcome application.

Because of the high impact and persistence of the problem, as well as the extreme user frustration that occurs when this problem happens, we gave this problem a severity rating of 3.375.

Figure 5 and 6

TRADEOFFS

The addition of the "Exit" button itself will take up screen space.

The addition of the exit functionality will require extra memory because the system will have to be able to revert back to the old settings if the Welcome setup process is terminated prematurely.

EVIDENCE

YS-TA-08
YS-HE-08
YS-HE-09
YW-HE-03
YW-TA-03
YW-TA-06
ES-HE-03
ES-HE-04
ES-TA-03
GIB-HE-05
GIB-HE-08
GIB-TA-09
DAZ-TA-11
DAZ-HE-06

PROBLEM 10

User does not have access to Help and Documentation ubiquitously.

MOTIVATION

The heuristic evaluations show that this violates the help and documentation heuristic.

The think-aloud also indicates that the user may have been more successful in the task if there was Help and Documentation that aided him in his task.

We feel the help and documentation must always be available in order to have a complete user experience. Otherwise, the user will become frustrated or confused and have no resource to turn to.

REDESIGN

The redesign idea is to always include a Help option on the menu for every application (Figure 1).

Figure 1

JUSTIFICATION

By having a Help button always available, users who are lost will always have a resource to refer to. This alleviates any frustrations that the user may have.

We feel that it is important to design a system that is easy to use; however we realize that not all users will find all features understandable; thus, in the cases where a feature is not usable, we believe that we should provide help to the user for using it. Basically, if we can't make systems easy to use, we should at least make it easy to learn how to use.

SEVERITY

Severity: 3.5
Frequency: Every time the user may be stuck, the user may be looking for help. This could be very frequent, or very infrequent, depending on the user.

Impact: The user will not be able to overcome this very easily. The user may turn to other resources for help; however, these other resources are most likely more out of the way.

Persistence: Since this does not exist, the problem will persist. We certainly do not want to have the user stop using the Palm because he/she cannot figure out how to use a feature.

This problem is fundamental to the design of a system. We feel that this problem has a huge impact and persistence, thus we gave it a severity rating of 3.5.

TRADEOFFS

The biggest tradeoff with this redesign is the creation and maintenance of the Help and Documentation. The system must also have extra memory to support these new interfaces. This redesign also touches every application, so the system backend may become more complex because of this. This is expensive for the system in terms of time and money.

The actual addition of the Help option to the menu bar takes up additional screen space.

EVIDENCE

YS-HE-11
DAZ-HE-10
ES-HE-01

APPENDIX B

HE UARs
TA UARs
CW UARs