UAN (User Action Notation) Tutor
by
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Project Report submitted to the Faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements of

MASTER OF INFORMATION SYSTEMS

APPROVED

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1. PROBLEM STATEMENT AND GOAL

Development strategies of user-interfaces have been changing rapidly. User-interfaces are no longer the byproducts of the traditional software development process. Interface designers are now more concerned with the usability of the product rather than its pure technical optimization. It has been recognized that higher usability can only be achieved if interfaces are designed by human factors specialists and implemented by software engineers. Clearly, there exists a need for an effective and unambiguous (i.e. non-prose) form of communication between the designers and implementers of user-interfaces.

UAN (User Action Notation) [1] is intended to serve as a design representation technique for such communication. UAN is a set of meaningful, concise, and visually onomatopoeic notations that are used to represent user tasks associated with computer interfaces. UAN differs from other interface representational techniques because of its focus on behavioral aspects of human-computer interaction design.

Although the development of UAN was motivated by the practical necessity of notational representation of user tasks (instead of prose descriptions) during the development of user interfaces, the use of UAN is not limited just to the design of computer interfaces. Some of the areas where UAN is finding practical applications are task analysis, interface usability metrics, information flow analysis, user documentation and request for proposals. This ever increasing popularity of UAN both in academics and industries naturally requires many people to learn the usage of UAN.

Notational representation of user behavior is a relatively new concept. People are often reluctant to learn new concepts because they over-estimate the complexity of such concepts. Such inhibitions and apprehensions can be overcome by designing effective learning tools based on interesting examples and hands-on facilities. The goal of this project is to develop an interactive tutor for UAN.

2. DESCRIPTION OF UAN Tutor

UAN Tutor is an interactive software package that is developed on Macintosh computers
using Hypercard to serve as a tutorial for UAN. The target users of this tutor are people who are directly or indirectly involved in the design of user interfaces or are interested in learning and using UAN in areas other than the design of user interfaces. The users of UAN Tutor are expected to have at least a working knowledge of ‘point and click’ direct manipulation interfaces (especially Macintosh-style interfaces) and a basic knowledge of "user tasks" with respect to computers. Although the main purpose of this software package is to serve as a tutor for UAN, because of its extensive functionality it can also be used as a tool for creating and maintaining user task descriptions using UAN.

Fig. 1 High Level Design Representation of UAN Tutor

A high level representation of UAN Tutor is shown in figure 1. It includes a tutor
system which first introduces the basics of UAN and familiarizes the user with the notations and then slowly guides the user through a set of examples aided by animation and illustrations. Finally it provides some quiz questions to test the familiarity attained.

In addition to the tutor system UAN Tutor also provides on-line help, a UAN dictionary, and a task library. On-line help provides help on two different areas: the UAN itself and the use of this tutor. UAN dictionary lists all the UAN notations and provides facilities for searching. The task library stores several UAN task descriptions which the user can study or use as desired. UAN Tutor also provides a multiple window based work space to create task descriptions and scenarios. It also supports the exchange of text files with other applications. Similarly, scenario graphics associated with tasks can be exported to or imported from Mac Paint files. A full scale example (Calendar Management System) of the use of UAN in the development of a specific user interface is also included in the tutor.

3. FUNCTIONALITY OF UAN Tutor

UAN Tutor supports the following user tasks:

3.1 Create Task Descriptions Using UAN

3.1.1 Create New Task Descriptions
The user creates a new task on the workspace in the current window. Each workspace provides a separate space for graphical work and UAN descriptions. Up to three task descriptions can be created at one time in three different windows. This multiple window facility allows the user to view more than one task description at the same time.

Such task descriptions can be saved or printed. Users can access other on-line facilities like the UAN dictionary or task library while creating task descriptions. In fact, users can even copy relevant information from the reference facilities and paste them into the current work space.

3.1.2 Save Task Descriptions
Task descriptions and associated scenarios can be saved. The name under which the task description and scenario are to be saved is supplied by the user. The system saves the task description with the exact name supplied while the scenario graphic is saved with an extension of "scn".
example, if the user wishes to save a task description with the name "mytask," the task description will be saved as "mytask" but the associated scenario graphic is saved on the file "mytask.scn" (this separation will be useful if the user wants to do graphical work on Mac Paint and import it to UAN Tutor).

3.1.3 Edit Task Descriptions
The user edits an existing task description by opening the task in the active window. Whenever the user opens a particular task its associated scenario is also automatically displayed. Once the task is opened all further operations are similar to those in 3.1.1.

3.1.4 Print Task Descriptions
The user can print the task descriptions currently displayed in the active window. The scenario and the associated task descriptions are printed on different pages.

3.2 Change Workspace
The user can open three different workspace windows at the same time. The position of the windows (but not the size) can be changed as desired by the user. Navigation among windows is based on the conventional Macintosh method of clicking on a desired window to make it active. However, the window switching function is also provided in the pull-down menu to make the navigation easier in case windows are not visible due to overlapping.

3.3 Use Tutor System
This is the most important of all the functionalities provided by the system. The tutor system is divided into the following three parts:

3.3.1 Getting Started
This function introduces the user to the tutor system and then lists the recommended steps to be followed while using the tutor.

3.3.2 Self-Guided Tour of Examples
This function enables the user to explore several examples of UAN descriptions. Such examples are explained and supported by animation
wherever possible.

3.3.3 Time for Quiz
This function provides several quiz questions and their answers to test the familiarity attained by the user.

3.4 Use On-Line Reference
This system supports the following on-line references:

3.4.1 UAN Dictionary
UAN dictionary contains all the standard UAN notations and their brief descriptions. All standard operations like searching and browsing through the dictionary are supported.

3.4.2 Task Library
Users can create and maintain their own library of frequently used task descriptions. This library can be referenced while the user is creating task descriptions, thus making it possible to copy library tasks into the current working area.

3.5 See Examples
A practical application (Calendar Management System) of UAN descriptions in the development of a specific user interface is included as an example.

3.6 Use Help System
The system supports an on-line help system. Help is provided in the following areas:

3.6.1 All About UAN
This area provides all relevant information about UAN. For example, in addition to the basic introduction to UAN there is also information regarding the evolution of UAN and current status of research at home and abroad.

3.6.2 How To Use This System
This area includes all necessary information required for use of UAN Tutor.

4. DEVELOPMENT OF UAN Tutor
The development of UAN Tutor consisted of the following phases followed by formative
evaluation and iterative design.

4.1 System Analysis
In this phase of the development an assessment of the needs and goals, functional requirements, and definition/description of target user classes was made. A full account of system analysis is presented in Appendix A.

4.2 System Design
In this phase of the development basic design principles and guidelines relevant to UAN Tutor were identified and an effort was made to fully address the users identified during the system analysis. A detailed documentation on system design is presented in Appendix B.

4.3 Prototyping of Interface
A prototype of the interface was developed with Hypercard on the Macintosh. This prototype was based on the design guidelines as decided during the system design phase. A representative sample of UAN Tutor screens is presented in Appendix C.

5. FORMATIVE EVALUATION OF UAN Tutor

The formative evaluation (evaluation of interface as it is being developed, early in the life cycle) of the UAN Tutor user-interface involved empirical testing with three users. The evaluation is based on two benchmark tasks and one questionnaire. A prototype of UAN Tutor was used for the evaluation. Pilot testing was conducted to iron out any procedural testing problems.

5.1. Benchmark Tasks and Questionnaire

5.1.1 Navigation Task
This task, presented in Appendix D, was intended to test the usability attribute of ease of navigation through the interface. The complete task is composed of several sub tasks chosen to represent navigation which covered a wide range of the interface. Total time to complete the task was the measurement method chosen for this attribute.

5.1.2 Task Performance Tasks
This task, presented in Appendix D, is also composed of several sub tasks that represent actual tasks a user may perform when using the tutor.
Performance accuracy was measured by the number of errors committed while completing the task.

5.1.3 Questionnaire

Both qualitative and quantitative questions were designed to evaluate the user feedback. The questionnaire used in the evaluation is presented in Appendix D.

5.2 Subjects

A total of three subjects, all with prior knowledge of UAN and computer experience, were used as the evaluators of the system. Since the purpose of this evaluation is to evaluate the usability of the interface not the learnability for UAN, all subjects with prior knowledge of UAN were selected to balance the influence of UAN knowledge on the subject’s performance during evaluation. (Equally valid selection would have been all subjects without prior knowledge of UAN)

5.3 Usability Specifications

The usability of an interface is determined by many factors such as ease of learning, speed of performance, error rate, user satisfaction, and retention over time. While established guidelines provide some direction for the design process, the final effectiveness of an interface design can be determined only through user testing. The usability specifications, presented in a tabular form in Appendix D, were used for formative evaluation of the interface.

5.4 The Evaluation Procedure

The following procedure was used to constitute the testing cycle for each subject. Several data collection methods were employed to compensate for the inability of a single method to generate complete information.

1. Subject read and signed the informed consent form (Appendix D).
2. Subject demographics were then taken (Appendix D).
3. A written overview (Appendix D) of the system was read by the subject before the experiment began.
4. Two benchmark tasks were given, on paper, to the subject.
5. The experimenter collected the specified data during these trial
runs. He also recorded critical incidents (anything or user behavior which reveals good or bad points of design) that deviated from the expected pattern of behavior.

6. Upon completion of the benchmark tasks, the subject was requested to fill out the questionnaire provided (Appendix D).

7. After the subject completed the benchmark tasks, an open-ended discussion was pursued to extract information that was unobtainable from the above methods.

5.5 The User Performance Table
The actual user performance table is presented in Appendix D.

5.6. User Performance Results
A comparison between the usability specification and the performance table (Appendix D) shows that the achieved results were not very far from the target. The planned level time to complete task set 1 was 5 minutes while the actual average time taken by users is 7 minutes. Similarly, the average number of errors made by subjects during the completion of task set 2 was higher than the planned level. This is expected to improve because the problems that caused the subjects to make errors (mostly lack of sufficient feedback or ambiguous wordings and some programming errors left undetected during pilot testing) have now been corrected. A score of 4 on a scale of 1 to 5 on the last measurement attribute ‘Overall Reaction of the User’ is very encouraging.

5.7. Weaknesses and Strengths of the Design of UAN Tutor
Many interesting observations were made during critical incident taking. It was noted that there are aspects of an interface that are absolutely undetectable until user testing is performed. For example, some of the subjects misinterpreted the screen labels as buttons while others tried to move some screen partitions believing them to be movable windows.

A summary of results from the post-testing questionnaire, verbal protocol, and critical incident taking are presented below. Following are some of the features
liked by the subjects:
  * ease of navigation
  * consistent interface
  * animated examples
  * on-line help
  * task library

Following are some of the features disliked by the subjects:
  * system too slow (a limitation of the prototyping tool)
  * the “graying out” of unavailable buttons was not obvious to some users
    (There is no support for ‘graying out’ buttons in Hypercard. I ‘blackened’
    the unavailable buttons by setting their hilight property to true which caused
    confusion)
  * some users got confused and took a dedicated screen area to be a window
  * lack of information provided on the use of workspace (For example, subjects did not know that they had to choose browse tool before writing on
    the UAN description area)

5.8 Cost / Importance Analysis and Iterative Designs
Cost and impact are broken into low and high (a representative table is presented in
Appendix D). The items with high cost and low importance were not corrected. For
example, the speed of the system can be improved by writing external routines in a
low level language like C but the cost involved would be much more than the
benefit achieved by speeding up the tutor. The correction of the speed problem
incurs high cost but produces low importance. Hence the speed problem is not
corrected. On the other hand, low cost and high impact items were taken care of
during iterative design. For example, unavailable buttons were removed rather than
“graying out” (the “graying out” of disabled buttons was found from user tests to
be confusing and the best alternative was to remove disabled buttons altogether).
This change in design does not require much resources but may be very confusing
if left unattended.

The current design of UAN Tutor is significantly different from its original
design. The degree of change in design is reflected in the fact that several design
features included in the benchmark tasks are no longer included in the design. For
example, the name of the menu “File” has been changed to “Task”. Similarly, the layout of several screens are now completely different from the original layout. This shows the power of empirical testing during the development of user-interfaces.

6. CONCLUSION AND FUTURE WORK

Interface designing is a never-ending process in the sense that there is always room for improvement. The design of UAN Tutor is no exception. Moreover, only one set of user test has been conducted so far. Further user testing is imperative.

UAN Tutor has been developed using the prototyping tool Hypercard. It is, therefore, not portable across different platforms. This system, however, can be used as a throwaway prototype for its development in other platforms. Working on this project has been a good learning experience. One of the most important lessons learned was that the nature and capabilities of a prototyping tool have a profound influence on the design of user-interfaces. Many of the original design ideas had to be changed because of the limitations of Hypercard.

Future work on UAN Tutor needs to address the following issues:
a. At present a user can not delete tasks. A menu item “Delete Task” needs to be appended to menu ”Task”
b. An information on the use of workspace to write task descriptions and draw scenario should be displayed every time the user enters in to the workspace screen. The user should, however, be given the capability to disable this feature
c. The Task library needs to be expanded
d. A post test on the effectiveness of the UAN Tutor needs to be conducted. More than three workspaces should be provided at one time
f. Workspace windows should be made resizeable
g. Inclusion of motion video instead of animation should be tried
h. Display field for ‘STATUS’ in UAN dictionary should be removed

References


Appendix A

UAN Tutor
System Analysis

A.1 Introduction

The system analysis was the first phase of the development of UAN Tutor. In this phase of the development the major goal of UAN Tutor is defined and the primary user class is identified. Needs analysis and task analysis are also done in this phase. System functionalities to serve such needs and support required user-tasks are defined.

A.2 System Goal

The main purpose of UAN Tutor is to serve as an interactive teaching/learning tool. However, users should also be able to create, edit, and save task descriptions while designing user-interfaces.

A.3 Features

The UAN Tutor contains the following features:

*A Tutor System (Information on using the tutor, a self-guided tour of Examples, and Quiz Questions and Answers).

*A Task Descriptions Creating System (New Task, Edit Task, Save Task, Print Task).

*An example of practical use of UAN (Calendar Management System).

*An on-line reference system (UAN dictionary and task library)

*An on-line help system (to help understand UAN and use UAN Tutor)
*Provision of multiple window based workspace

A.4 User Analysis

The target users of this tutor are persons who are directly or indirectly involved in the design of user interfaces or are interested in learning and using UAN in areas other than the design of user interfaces. The users are expected to have at least working knowledge of ‘point and click’ direct manipulation interfaces (especially Macintosh style interfaces) and a basic knowledge of “user tasks” with respect to computers.

A.5 Task Analysis / Functional Requirements

The following shows the task structure of UAN Tutor.

1. Create/Edit Task descriptions
   1.1 Create New Task Descriptions
   1.2 Edit Task Descriptions

2. Save Task Descriptions

3. Print Task Descriptions

4. Use Reference
   4.1 UAN Dictionary
   4.2 UAN Library

5. See Example
   5.1 Calendar Management System (CMS)

6. User Tutor
   6.1 Get Started
   6.2 Conduct Self-Guided Tour
   6.3 Take Quiz
7. Use Help
8. Navigate
   7.1 Go to Next Window
   7.2 Go to Opening Screen
9. Quit

A.6 Conclusion
This document will be taken as the guideline for further development. This document will also be used to verify the conformance of the final product with the requirements and features as stated in this document.
B.1 Introduction

The design of UAN Tutor is intended to provide an interface with high usability but without compromising its functionality. A set of human-computer interaction (HCI) design guidelines as well as experience in behavioral design and human factors principles are followed during the design of UAN Tutor. The design addresses both the constructional and behavioral aspects of human-computer interaction. An important approach followed in the design is to leave plenty of room for future modifications in the system. In other words, the design is made very flexible.

A State transition diagram is used to represent system navigation and UAN is used to represent the user actions (the State transition diagram and a representative sample of UAN task descriptions for UAN Tutor are included on page iv and page v of this appendix respectively).

B.2 Design considerations

The global goal of the design is to provide an interface that is easy to learn and use for novice users, and an interface that is simple and powerful for experienced users. The following is a set of more specific goals:

1. Make the interface simple and intuitive.
2. Require that minimum training be expected of the users
3. Allow users to achieve continuous increases in the speed of their performance.
4. Make the functionality and actions explicit to the user.
5. Accommodate a wide user base.
6. Put the user in control of the system.
7. Design for errors.
8. Make tasks yield closure.
The following design compromises have been made in the design of the UAN Tutor.

a. Almost all functionalities are provided by using pull-down menus. Extensive use of pull-down menus puts pressure on the memory of the user. However, this design choice is made to provide maximum workspace to the user. A large workspace is required here because of the requirement of displaying scenarios along with the UAN descriptions.

b. Several pieces of distinct but related information need to be displayed at one time to make the tutor effective. This requirement made some of the screens cluttered.

B.3 Use of design principles

B.3.1 Use of point and click graphical interface
The ever increasing popularity and effectiveness of ‘point and click’ direct manipulation interfaces have influenced the design of UAN Tutor. It is believed that a mouse used to point and click offers direct control over the interface as opposed to typing commands. Hence, the design is done in such a way that it requires minimum use of the keyboard.

B.3.2 Consistent representation
Consistency in one of the most important determinants of the usability of interfaces. So a great attention is exercised to maintain consistencies in both the syntax and the semantics.

B.3.3 Use of menus and other visible cues
Almost everything that is acted upon in this interface is visible. Menus alleviate short-term memory, so users have more memory to concentrate on the task. Consistent screens, the use of windows, and simple displays all help reduce load on user’s memory.

B.3.4 Use of human factors principles in screen design and layout
Screens were designed so that information was meaningfully grouped. They were also designed to be aesthetically pleasing. Irrelevant information is either grayed out or not displayed. Consistent spatial relationships among navigational aids, buttons,
and fields were used to keep variability at a minimum. Different contexts are made explicit by partitioning the screen and labeling these partitions appropriately. All user actions are immediately visible. Immediate feedback is provided after each user action to reassure the user that the system has received and is acting upon their input.

B.3.5 Design the interface for the range of novice to experienced users

Buttons and menus are exclusively used for navigation. This aids the novice user while providing simple navigation for the experienced user. Keyboard commands are available to speed of performance for experienced and intermediate users. Once they become more familiar with the interface, then they can exploit this powerful capability.

B.3.6 Provide for an internal locus of control

The users are always made in control of the system. Furthermore, the users are given the power to control many aspects of the system, and they don not have to perform tedious tasks the system should be doing. For example, the users are free to go to any state from any other state they want.

B.3.7 Give simple, pleasant, and informative error feedback

Errors were designed out of the system as much as possible. However, in the event of error, the user is provided with feedback that helps the user correct the error.

B.3.8 Design closure into tasks.

Users feel "relieved" knowing one step is over and the system is ready for another. This also makes more short-term memory available. A great care is taken to avoid requiring the user to remember a sequence of commands to accomplish a given task.

B.4 Behavioral representation using UAN

The behavioral aspects of the user’s actions are represented using UAN. A representative sample of these UAN descriptions is presented in page 20 of this Appendix. Macro UAN descriptions are used to create high level task descriptions.
B.5 State transition diagrams (STD’s)

The state transition diagram is presented in page 20 of this Appendix. Primary states are represented by thick circles. Navigation among the states is highly flexible. Almost all states can be reached from any other states. Transition arcs and arc labels are not shown in the transition diagram for clarity.

B.6 Conclusion

Interface engineering entails a creative design process as well as using design principles and guidelines. Any number of guidelines fall short. Therefore, many design modifications are expected to come out of user testing. Many design tradeoffs were resolved by opinion and intuition. The need for user testing is imperative.
State Transition Diagram
Legend

- Primary States
- Secondary States
- Overlapping States
  - Can Enter to State z from any state between x and y inclusive
<table>
<thead>
<tr>
<th>User Action</th>
<th>Interface Feedback</th>
<th>Interface State</th>
</tr>
</thead>
</table>

**Task: Use UAN Tutor**

(Create UAN descriptions | Use Tutor system | See Examples )

(Use Help System | Use Reference System)

**Task: Create UAN descriptions**

(Create New Task | Edit Old Task | Save Task | Print Task )

**Task: Create New Task descriptions**

(Select menu_item_New Task display (Workspace) _from Pull_down_menu_Task)

(Create UAN descriptions & Make Scenarios)

**Task: Edit Task Descriptions**

(Select menu_item_Open Task
<table>
<thead>
<tr>
<th>from_Pull_down_menu_Task</th>
<th>display (dialogbox) to ask for</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Edit UAN descriptions</td>
<td>Task name to be edited Selected=Task file</td>
</tr>
<tr>
<td>Edit Scenarios)</td>
<td>Display (Task) in the current as entered by the user in window the dialogbox</td>
</tr>
</tbody>
</table>

**Task: Save Task Descriptions**

<table>
<thead>
<tr>
<th>(Select menu_item_Save Task</th>
<th>display(diaglogbox) to ask for</th>
</tr>
</thead>
<tbody>
<tr>
<td>_from_Pull-down_Menu_Task</td>
<td>filename to save the task</td>
</tr>
</tbody>
</table>

Enter filename to save the task display(filename)@x,y

**Task: Print Task Descriptions**

<table>
<thead>
<tr>
<th>(Print Setup)</th>
<th>display(dialogbox) to ask for Selected=Task file as</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Select menu_item_Open Task</td>
<td>filename to save the task entered in the dialogbox</td>
</tr>
<tr>
<td>_from_Pull-down_Menu_Task</td>
<td></td>
</tr>
</tbody>
</table>

Enter filename to load display(filename) @x,y

Select menu_item_Print Task...

| _from_Pull-down_Menu_Task | |

**Task: Change Workspace**

<table>
<thead>
<tr>
<th>(Click on the desired widnow</th>
<th>desired_window!!!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose desired window (i.e the selected window is made active: !!! denotes special type of highlighting)</td>
<td></td>
</tr>
</tbody>
</table>

**Task: Click on the desired**
<table>
<thead>
<tr>
<th>window</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image.jpg" alt="Image of windows" /></td>
<td></td>
</tr>
<tr>
<td><img src="image2.jpg" alt="Diagram of window manipulation" /></td>
<td></td>
</tr>
<tr>
<td><img src="image3.jpg" alt="Diagram of window movement" /></td>
<td></td>
</tr>
</tbody>
</table>

-\{(x,y \text{ at desired window})Mv\}^v \quad \text{desired window !!!}
Appendix C

UAN Tutor
Prototype

1. Introduction

Prototyping is one of the most important aspects of interface development. It is known that high usability can only be achieved by several iterations of design. Prototyping is the only practical way of conducting such iterations of design.

2. UAN Tutor Prototype

The development of UAN Tutor is done using Hypercard as the prototyping tool. A representative sample of screens of the prototype have been included in this Appendix.

3. Conclusion

During the development of UAN Tutor some of the limitations of Hypercard as a prototyping tool were discovered. For example the necessity of having different stacks for different windows is very awkward. Similarly, the lack of support for object grouping in Hypercard is very inconvenient. Further, a problem (bug ?) is found in Hypercard (version 2.0): We could not export graphics to overwrite an existing file (Literature on Hypercard claims that we can do so). In spite of some problems, Hypercard is very easy to learn and use, and is one of the best prototyping tools available.
The top bar on every screen displays menu items. Here are the brief descriptions of menu and menu items. Choose desired item from Pull-Down menu to proceed.

Menu: Tutor

1. **Getting Started**: Provides general advice on how to use this tutor.

2. **Self Guided Tour of UAN Examples**: Enables you to go through several examples of UAN task descriptions.

3. **Time for Quiz**: Provides you several quiz questions to test your familiarity with UAN.

Menu: Task

1. **New Task**: Displays an empty worksheet in the current window for writing task descriptions and making associated scenarios.
2. **Open Task**: Opens existing task description and associated scenario.
3. **Print Setup**: Allows users to configure Macintosh printer.
4. **Print Task**: Prints task description and associated scenario.
(Use of Task Hierarchy)

Structure charts are used to describe the relationships among various tasks. Please study the Example provided below and read the explanation provided on the window right to it.

**Example**

<table>
<thead>
<tr>
<th>Task Hierarchy Structure Chart</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="https://via.placeholder.com/150" alt="Diagram" /></td>
<td>The chart on the left shows the task structure of <strong>Task: Delete File</strong>. The user can delete the file in three alternative ways. Further the task &quot;Erase Icon&quot; can be done in two ways. The UAN for the task structure will be (only macro UANs are used): <strong>Task: Delete file</strong> Command key</td>
</tr>
</tbody>
</table>
1. Get UAN dictionary

2. Read the meaning of symbols
\sim, [X], \ast, M, v, \wedge from the

<table>
<thead>
<tr>
<th>User Actions</th>
<th>Feedback</th>
<th>Interface State</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task: Move file</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>\sim[file_icon]Mv\ast</td>
<td>file_icon-1:</td>
<td></td>
<td>When the user moves the cursor to the file icon and depresses the mouse button the icon is highlighted</td>
</tr>
<tr>
<td>\sim[x,y]* \sim[x', y']</td>
<td>outline of icon follows the cursor.</td>
<td></td>
<td>As the user moves the cursor around the screen, an outline</td>
</tr>
</tbody>
</table>

Scenario

- myfile_1
- mustack-1
- myfile-2
- letter to mum
- myfile-3
1. Study the following examples with reference to the scenario.

2. Try to figure out the meaning of UAN descriptions. It is not necessary to write it down.

Some More examples

(only user actions are given here)

1. ~[File]M(lef)tV~

2. ~[my resume]Mv
   ~[x,y]*~[x',y']
### Practice Questions

**Practice Questions**

*Click to Select Answers*

<table>
<thead>
<tr>
<th>a. What is UAN?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A programming language</td>
</tr>
<tr>
<td>2. A notation used for describing the constructional detail of interface design</td>
</tr>
<tr>
<td>3. A notation used for describing the behavioral actions of users during interface design</td>
</tr>
<tr>
<td>4. An interface standard</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>b. UAN is used only in the development of computer interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. True</td>
</tr>
<tr>
<td>2. False</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>c. The UAN notations are</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Easy to type</td>
</tr>
<tr>
<td>2. Visually onomatopoeic</td>
</tr>
<tr>
<td>3. Compatible to Standards</td>
</tr>
<tr>
<td>User Action Notation</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>Click on Tasks to Select (Tasks List)</td>
</tr>
<tr>
<td>Select_Single_File</td>
</tr>
<tr>
<td>Select_Multiple_Files</td>
</tr>
<tr>
<td>Delete_Multiple_Files</td>
</tr>
<tr>
<td>Drag_Multiple_Select</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Appendix D

Evaluation Reference

D.1 Informed Consent Form

You have been solicited as a research participant for our evaluation involving the design for a new interactive software program. Because you have certain rights, this informed consent form has been established to delineate the rights and responsibilities of the research participants and experimenters. Please read through this document before you participate. The evaluation is being run by H.R. Bhattacharai who will be glad to answer any questions you may have about the evaluation.

What is expected of you?
As a participant, you will perform pre-established tests for a prototype UAN Tutor user-interface. A complete and detailed description of tasks will be given to you, and you will use the specified software to complete the tasks. As the participant, you are the evaluator, the person who is evaluating the design of the software interface. You will not, in any way, be evaluated.

The testing procedure will take approximately 30 minutes. The testing will be held in McBryde 102, where all necessary equipment will be set up. Your participation will be a voluntary action. There are no known risks associated with this evaluation.

You will be expected to provide evaluative input by completing a questionnaire at the end of the testing session, as well as by answering questions during an informal verbal discussion with the experimenter.

Your rights as a participant
1. You have the right to withdraw from the procedure at any time for any reason.
2. At the conclusion of your participation, you have the right to see your data if you so desire. If you decide to withdraw your data, please inform the administrator of the experiment immediately. Otherwise, identification of your data might not be possible because of our efforts to ensure anonymity.
3. You are requested to refrain from discussing the evaluation with other people who might be in the candidate pool from which other participants may be drawn.
Finally, we appreciate your invaluable time and effort for participating in this evaluation. **Remember, you cannot fail any part of this session, for there are no right or wrong answers. The session is to identify problems with the software, not with you.** Your signature indicates that you have read this in its entirety, and that you consent to participate.

**Signature** ............................

### D.2 Subject Demographics

Name:________________________________________ Age:_____
Education Background:________________________________________
Prior experience using a computer with a mouse:
  _none    _occasional    _often

### D.3 System Overview and Instructions

**Overview**

The system under test is a tutorial for UAN (User Action Notation). The tutor first introduces the basic concepts of UAN and then guides you through several examples. Verbal explanations and visual animation are used, whenever appropriate. The system provides facilities for creating, storing, printing and retrieving stored task descriptions. In addition to these facilities, reference facilities (e.g. UAN notations dictionary and task library) are also provided on-line. Further, an example of the use of UAN in the development of a real world application CMS (Calendar Management System) is also made available. CMS is believed to be useful in understanding how UAN in conjunction with the associated scenario can be helpful in describing user behavior in the process of interface development.

You will be requested to perform two tasks using the UAN Tutorial system. During the first task you will navigate through the system using menus. In the second task
you will create task descriptions, make scenarios, save and retrieve them and discuss about your opinion of UAN Tutor with the experimenter.

D.4 Task Set 1 (Navigation Tasks)

1 Pull-down menu “Help” and select “All about UAN”
2 Click on “What is UAN?”
3 Click on “Done”
4 Pull-down menu “Help” and select “How to use this System”
5 Close the UANHelp window
6. Pull-down menu “Examples” and select “Calendar Management”
   6a Click on the button with right arrow icon (to change the scenario)
7 Pull-down menu :“Reference” and select “Task Library”
8 Click on “Drag_Multiple_Select”
9 Click on “Edit Task List” and then on “Done”
10 Enter “Single” and then click on “FIND”
   10a Click on “no” on prompt
11 Close the “Reference window”
12 Pull-down “Reference” menu and select “UAN dictionary”
13 Close the “Dictionary” window
14 Pull-down menu “Tutor” and select “Getting Started”
15 Pull-down menu “Tutor” and select “Guided Tour”
16 Click on “Ready” and then on “Start”
17 Click on “Next”
18 Click on “Back”
19 Pull-down menu “File” and select “New Task”
20 Type “This is where the UANs for tasks are written” where the cursor is blinking
21 Choose “A” from the “Tools” Palette and click at any point in the screen area labeled “Scenario”
22 Type “This is where the scenario relevant for the task is made”
23 Pull-down menu “File” and select “Go to Next Window”
   23a Pull-down menu “File” and select “New Task”
24. Type “This is the second window” where the cursor is blinking
25 Pull-down menu “File” and select “Open Task”
26 Choose file “Area” from the list and click on “Open”
27 Click anywhere on the “latest version” window
28 Click anywhere on the “New one” window
29 Close the current window
   29a Click on “no” on prompt
30 Pull-down menu “Tutor” and select “Time for Quiz”
   30a Click on “no” on prompt
31 Click on answer 2 of question b
32 Click on “See Answers”
33 Click on “Hide Answers”
34 Pull-down menu ”File” and select “Exit”

D.5 Task set 2 (Task Performance Tasks)

1 Make a scenario containing three small rectangles within a larger one. Label the inner
   rectangles as file-1, file-2, file_3 respectively.
2 Type the following Tasks and UAN in the task area
   ~[file_1]Mv^ file_1-!: !file_1!
   Selected=file_1
3 Save this task on filename “Test”
4 Go to next window
5 Open Task “Change Format”
6 Copy the Task “Select_Single_File” from the reference “Task Library” in to the
   current window
7 Refer the UAN dictionary and find all instances of “cursor”
8 Close both the dictionary and Task Library windows
9 Close the active window “New one”
10 Pull_down menu “ File” and select ”Exit
11 Pull-down ” and select “Quit Hypercard”
D.6 Questionnaire (Quantitative)

Section 1
Please read the questions carefully, then circle the specific number that matches your response to the question.

1) How do you rate the organization of menus?

<table>
<thead>
<tr>
<th>bad</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>very good</th>
</tr>
</thead>
</table>

2) How appropriate or inappropriate was the terminology?

<table>
<thead>
<tr>
<th>inappropriate</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>appropriate</th>
</tr>
</thead>
</table>

3) How informative or uninformative was the feedback from the system?

<table>
<thead>
<tr>
<th>uninformative</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>informative</th>
</tr>
</thead>
</table>

4) How easy or difficult was it to navigate through the system?

<table>
<thead>
<tr>
<th>difficult</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>easy</th>
</tr>
</thead>
</table>

5) How taxed or untaxed was your memory while completing task 2?

<table>
<thead>
<tr>
<th>taxed</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>untaxed</th>
</tr>
</thead>
</table>

6) Do you feel that you needed more training to operate the system?

<table>
<thead>
<tr>
<th>no</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>yes</th>
</tr>
</thead>
</table>

7) What is your overall reaction to UAN Tutor?

<table>
<thead>
<tr>
<th>frustrating</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>satisfying</th>
</tr>
</thead>
</table>

8) How easy or difficult did you find it to open the Dictionary?

<table>
<thead>
<tr>
<th>difficult</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>easy</th>
</tr>
</thead>
</table>

9) How easy or difficult did you find it to refer to the Task Library?

<table>
<thead>
<tr>
<th>difficult</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>easy</th>
</tr>
</thead>
</table>
10) Did you ever feel that you were “lost” at any time?  
   yes  no  
   1  2  3  4  5  

11) How would you rate this system for its overall usefulness as a tutorial for UAN?  
   poor  excellent  
   1  2  3  4  5  

Section II (Qualitative)  
Please read the questions carefully and then give your opinions in the space provided.  
1) Did the system responses match your expectations?  

2) What are the aspects that you liked most about the system?  

3) What are the aspects that you disliked the most about the system?  

4) What would you change about the interface or system to make it easier to use?  

5) Were the screens consistent (physical location of items, use of words, placement of “buttons”, style or appearance)?
## Usability Specification Table

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Measuring Concept</th>
<th>Measuring Method</th>
<th>Worst Case</th>
<th>Planned Level</th>
<th>Best Case</th>
<th>Now Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ease of Navigation</td>
<td>Benchmark Task: Navigation Task</td>
<td>Time to complete Task</td>
<td>10 min</td>
<td>5 min</td>
<td>2 min</td>
<td>n/a</td>
</tr>
<tr>
<td>Task Performance Accuracy</td>
<td>Benchmark TaskII: Performance Task</td>
<td>No. of errors</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>n/a</td>
</tr>
<tr>
<td>Overall Reaction of the user</td>
<td>Subjective Questionnaire</td>
<td>Mean Rating</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>n/a</td>
</tr>
</tbody>
</table>

## Usability Performance Table

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Measuring Concept</th>
<th>Measuring Method</th>
<th>User 1</th>
<th>User 2</th>
<th>User 3</th>
<th>Avg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ease of Navigation</td>
<td>Benchmark Task: Navigation Task</td>
<td>Time to complete Task</td>
<td>7 m</td>
<td>8 m</td>
<td>6 m</td>
<td>7 m</td>
</tr>
<tr>
<td>Task Performance Accuracy</td>
<td>Benchmark TaskII: Performance Task</td>
<td>No. of errors</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Overall Reaction of the user</td>
<td>Subjective Questionnaire</td>
<td>Mean Rating</td>
<td>4</td>
<td>4</td>
<td>n/a</td>
<td>4</td>
</tr>
</tbody>
</table>

m= time in minute
n/a = Not available
<table>
<thead>
<tr>
<th>Importance</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td></td>
<td>'Graying Out' of Buttons Problem</td>
</tr>
<tr>
<td>High</td>
<td>Speed Problem</td>
<td></td>
</tr>
</tbody>
</table>