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LINGUISTIC MODELS

The user‗s interaction with a computer is often viewed in terms of a language, so it is not surprising that several modeling formalisms have developed centered around this concept. BNF grammars are frequently used to specify dialogs.

The models here, although similar in form to dialog design notations, have been proposed with the intention of understanding the user‗s behavior and analyzing the cognitive difficulty of the interface.

BNF- Backus-Naur Form

Representative of the linguistic approach is Reisner‗s use of Backus-Naur Form (BNF) rules to describe the dialog grammar . This views the dialog at a purely syntactic level, ignoring the semantics of the language. BNF has been used widely to specify the syntax of computer programming languages, and many system dialogs can be described easily using BNF rules.

For example, imagine a graphics system that has a line-drawing function. To select the function the user must select the ‗line‗ menu option. The line-drawing function allows the user to draw a polyline, that is a sequence of line arcs between points. The user selects the points by clicking the mouse button in the drawing area. The user double clicks to indicate the last point of the polyline.

For example,imagine a graphics system that has a **line-drawing** function

draw line ::= **select line + choose points + last point**

select line ::= pos mouse + CLICK MOUSE

choose points ::= choose one | choose one + choose points

choose one ::= pos mouse + CLICK MOUSE

last point ::= pos mouse + DBL CLICK MOUSE

pos mouse ::= NULL | MOVE MOUSE+ pos mouse

The aims in the description are of two types: non-terminals, shown in lower case, and terminals, shown in upper case.

Terminals represent the lowest level of user behavior, such as pressing a key, clicking a mouse button or moving the mouse.

Non-terminals are higher-level abstractions. The non-terminals are defined in terms of other non-terminals and terminals by a definition of the form name ::= expression The ::= symbol is read as is defined as.

Only non-terminals may appear on the left of a definition. The right-hand side is built up using two operators + (sequence) and | (choice). For example, the first rule says that the non-terminal draw-line is defined to be select-line followed by choose-points followed by lastpoint. All of these are non-terminals, that is they do not tell us what the basic user actions are. The second rule says that select-line is defined to be position mouse (intended to be over the _line_ menu entry) followed by CLICK-MOUSE. This is our first terminal and represents the actual clicking of a mouse. Position-mouse is, we look at the last rule. This tells us that there are two possibilities for position-mouse (separated by the _|_ symbol). One option is that position-mouse is empty - a special symbol representing no action. That is, one option is not to move the mouse at all.

The other option is to doa MOVE-MOUSE action followed by position-mouse. This rule is recursive, and this second position-mouse may itself either be empty or be a MOVE-MOUSE action followed by position-mouse, and so on. That is, position-mouse may be any number of MOVE-MOUSE actions whatsoever. Similarly, choose-points is defined recursively, but this time it does not have the option of being empty.

It may be one or more of the non-terminal choose-one which is itself defined to be (like select-line) position-mouse followed by CLICK-MOUSE.

The BNF description of an interface can be analyzed in various ways. One measure is to count the number of rules. The more rules an interface requires to use it, the more complicated it is. This measure is rather sensitive to the exact way the interface is described.

For example, we could have replaced the rules for choose points and choose-one with the single definition choose-points ::= position-mouse + CLICK-MOUSE | position-mouse + CLICK-MOUSE + choose-points.

Task-action grammar

Measures based upon BNF have been criticized as not cognitive enough. They ignore the advantages of consistency both in the languages structure and in its use of command names and letters. Task-action grammar (TAG)

- Making consistency more explicit
- Encoding user's world knowledge
- Parameterized grammar rules
- Nonterminals are modified to include additional semantic features

In BNF, three UNIX commands would be described as:

copy ::= cp + filename + filename | cp + filenames + directory
move ::= mv + filename + filename | mv + filenames + directory
link ::= ln + filename + filename | ln + filenames + directory

Possible values using TAG

Op = copy; move; link
Rules file-op[Op] ::= command[Op] + filename + filename
| command[Op] + filenames + directory
command[Op = copy] ::= cp
command[Op = move] ::= mv
command[Op = link] ::= ln

THE CHALLENGE OF DISPLAY-BASED SYSTEMS

Hierarchical and grammar-based techniques were initially developed when most interactive systems were command line, or at most, keyboard and cursor based. There are significant worries, therefore, about how well these approaches can generalize to deal with more modern windowed and mouse-driven interfaces. Pressing a cursor key is a reasonable lexeme, but moving a mouse one pixel is less sensible. In addition, pointer-based dialogs are more display oriented. Clicking a cursor at a particular point on the screen has a meaning dependent on the current screen contents. This problem can be partially resolved by regarding operations such as select region of text or click on quit button as the terminals of the grammar. If this approach is taken, the detailed mouse movements and parsing of mouse events in the context of display information (menus, etc.) are abstracted away. Goal hierarchy methods have different problems, as more

display-oriented systems encourage less structured methods for goal achievement. Instead of having well-defined plans, the user is seen as performing a more exploratory task, recognizing fruitful directions and backing out of others.