SNePS 3 USER’S MANUAL \(^1\)

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and

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Chapter 1

Syntax

1.1 Notation

The syntax is given in this chapter using Extended Backus-Naur Form (EBF). Terminal symbols are surrounded by the quotation marks “‘” and “’”. Sequences of items are separated by commas, “,”. Parentheses “(” and “)” are used as grouping brackets. Alternatives are separated by “|”. Optional symbols are surrounded by “[” and “]”. Material that can be repeated zero or more times is followed by “∗”. Material that can be repeated one or more times is followed by “+”. Each syntactic rule is terminated by “;”. Material starting with “//” and extending to the end of the line is a comment. The symbol ‘ appearing instead of a comma indicates that the two surrounding items are to appear without whitespace separating them; otherwise consecutive items must be identifiable to the reader as separate tokens. Items in *italics* are expected to be understood without definition herein. The characters *i*, *j*, and *k* stand for any non-negative integers such that *i* ≤ *j* ≤ *k*. Material in *red* has not yet been implemented.
CHAPTER 1. SYNTAX

1.2 Syntax of Well-Formed Terms

The language in which SNePS 3 well-formed terms are expressed is a version of Common Logic Interchange Format (CLIF) (ISO/IEC, 2007).

Every non-atomic \texttt{wft} (that is, a \texttt{wft} other than an \texttt{atomicwft}) is given a \texttt{wft}-name when it is stored into the SNePS knowledge base. The \texttt{wft}-name of every stored term may be seen by evaluating the user command (\texttt{list-terms}). The user expression \texttt{wfti} is a syntactic abbreviation of the \texttt{wft} that was assigned \texttt{wfti} as its \texttt{wft}-name. If no \texttt{wft} has yet been assigned that \texttt{wft}-name, \texttt{wfti} is syntactically illegal.
1.3 Syntax of Paths

In this section is presented the syntax of path expressions used in `definePath` and `defineSlot`.

\[
\text{path} = \text{slotname} | \text{slotname} \sim '-' | '!' | '(' , 'converse' , \text{path} , ')' | '(' , 'kplus' , \text{path} , ')' | '(' , 'kstar' , \text{path} , ')' | '(' , 'compose' , \text{path} , ')' | '(' , 'or' , \text{path} , ')' | '(' , 'and' , \text{path} , ')') | '(' , 'irreflexive-restrict' , \text{path} , ')' | '(' , 'restrict' , \text{path} , (\text{atomicwft} | \text{wft} \sim 'i') , ')')
\]
Chapter 2

User Commands

.+.−.+.∗.+./.  [Function]
Each function takes an arbitrary number of arguments, each of which can be a number or a term that looks like
a number. The function unboxes each of its arguments, applies the corresponding Lisp arithmetic function,
and returns the boxed version of the result.

.<.<=.>.>=.=.=. /=.  [Function]
Each function takes an arbitrary number of arguments, each of which can be a number or a term that looks like
a number. The function unboxes each of its arguments, applies the corresponding Lisp relational function,
and returns t or nil, appropriately.

(allTerms &key (test #'(lambda (x) t)))  [Function]
Returns a set of all the terms in the knowledge base that satisfy the test, which defaults to the always True
function.

(ask exprpat)  [Function]
Returns a set of instances of the term pattern exprpat or its negation that are derivable in the current
context; or the empty set if there are none.

(askif exprpat)  [Function]
Returns a set of instances of the term pattern exprpat that are derivable in the current context; or the empty
set if there are none.

(askifnot exprpat)  [Function]
"Returns a set of instances of the negation of the term pattern exprpat that are derivable in the current
context; or the empty set if there are none.

(assert expr)  [Function]
Asserts the term expressed by expr in the current context.

(assert! expr)  [Function]
Asserts the term expressed by expr in the current context, and triggers forward inference.

(attachPrimaction term primfun)  [Function]
Puts the function named primfun in the primaction slot of the given term, which must be an Act
or an Action. If term is an Act, it can then be performed; if it is an Action, an Act can then be
performed whose Action is term.

(box n) [Function]
Returns a term whose name looks like n, building it if necessary.

(clearkb &optional (clearall nil)) [Function]
Reinitializes the SNePS knowledge base. If clearall is non-nil also reinitializes all slots, and case-
frames, but not the semantic types.

(currentContext) [Function]
Returns the current context.

(defineCaseframe type frame &key docstring fsymbols) [Function]
Defines a caseframe, where: type is the name of a SNePS semantic type; frame is either (slot1 ... slotn) or ('function-symbol slot1 ... slotn); docstring is a caseframe documenta-
tion string; fsymbols is a list of function symbols required if first of the frame is not quoted.

(defineContext name &key (docstring "") (parents '(BaseCT)) hyps) [Function]
Defines a new context with the given name, docstring, parent contexts, and initial hypotheses. If docstring
is omitted, it defaults to the empty string. If parents is omitted, it defaults to ' (BaseCT). If hyps is
omitted, it defaults to the empty list.

(definePath slotname path) [Function]
Given a slot name, slotname, and a path expression, path (see §1.3), generate the functions that will
compute that path and its converse, and store them in the slot named slotname.

(definePrimaction primactionfun vars &body forms) [Macro]
Creates the primitive action function named primactionfun. vars should be a (possibly empty) list of
slot names that get bound to the appropriate node sets. However, if any var is enclosed in parentheses, it
gets bound to a member of the appropriate node set. forms syntax is just as it is for defun. Returns the
function name, primactionfun.

(defineSlot name &key type docstring posadjust negadjust min max path) [Macro]
Defines the slot named name. type must be a semantic type. It defaults to Entity. docstring
must be a string. It defaults to the empty string. posadjust must be either reduce (default), expand, or
none. negadjust must be either reduce, expand (default), or none. min must be a positive integer.
It defaults to 1. max must be either nil (default) or an integer equal to or greater than min. path must be
either nil (default) or a path (see §1.3).

(defineTerm term &optional (semtype 'Entity)) [Function]
If term is not already a term in the SNePS knowledge base, it is added to the KB with the semantic type
semtype, which defaults to Entity. If term is already a term in the KB with semantic type currenttype:

- if currenttype is a subtype of semtype, the type of term is left as is;
- if semtype is a subtype of currenttype, the semantic type of term is lowered to semtype;
- if currenttype and semtype have one greatest common subtype, the semantic type of term is
  changed to that type;
• if \texttt{currenttype} and \texttt{semtype} have several greatest common subtypes, the user is asked which one (s)he wants \texttt{term} to be, and \texttt{term}'s semantic type is changed to that type;

• otherwise, an error is generated.

The term is returned.

\begin{verbatim}
(defineType newtype supers &optional docstring)
[Macro]
Defines \texttt{newtype} to be a SNePS semantic type, and a subtype of the types listed in the list \texttt{supers}. If \texttt{docstring} is given, it is set as the documentation string of the new type. Returns a string-message, either of success or what the problem was.
\end{verbatim}

\begin{verbatim}
(defrule rulename &body rulebody)
[Macro]
Defines a rule with the given name, and a body looking like

\begin{verbatim}
[description-string] [lhs... =>] rhs...
\end{verbatim}

An \texttt{rhs} element can be any form, including (:subrule [lhs... =>] rhs), to be evaluated in the binding environment of the \texttt{lhs}. An \texttt{lhs} element can be

• a pattern;

• (:bind variable value);

• (:break);

• (:for elt in list) or any other \texttt{loop for} clause;

• (:unless predicate);

• (:when predicate).

Variables, symbols of the form \texttt{?var}, may be bound by a pattern clause, a :bind clause, or a :for clause. If an unbound variable occurs in a pattern clause, it is bound by the function \texttt{find}, without any inference. A pattern clause containing no unbound variables is given to the \texttt{askif} function.

\begin{verbatim}
(demo &key file pause)
[Function]
Echoes and evaluates the forms in the \texttt{file}. If \texttt{pause} is non-nil (the default is nil), will pause after echoing each form, but before evaluating it. If the \texttt{file} is omitted, a menu will be presented of available demos.
\end{verbatim}

\begin{verbatim}
(describe-terms &rest ftnames)
[Macro]
Prints a description of all the given terms.
\end{verbatim}

\begin{verbatim}
(erase-term term)
[Function]
Erases the \texttt{term} from the knowledge base completely. Returns the term if successful, nil if there are dependencies that prevent the term from being erased.
\end{verbatim}

\begin{verbatim}
(find exprpat)
[Function]
Returns two values: a set of instances of \texttt{exprpat} that are in the knowledge base; and a set of substitutions, which when applied to \texttt{exprpat} would give those instances. \texttt{exprpat} may be any wft with variables, symbols starting with a “?”, in the place of any subterms.
\end{verbatim}
(find-term name)               [Function]
Returns the term named \textit{name}, or \texttt{nil} if there isn’t one. The name of an atomic term is a symbol, string, or
number. The name of a molecular term is its \textit{wftname}.

\texttt{*KRNovice*}             [Variable]
If set to a non-null value (the default value is \texttt{nil}), slots and caseframes will automatically be created
whenever a function symbol is used that is not already associated with a caseframe. The slots will be named
\texttt{fn}, \texttt{arg1}, \texttt{arg2}, \textit{etc.}, and both slots and caseframes will have their default parameters. This should only
be used by novices, or for very quick tests, as the careful modeling required by defining types, slots, and
caseframes might be ignored.

(list-caseframes )            [Function]
Prints all the caseframes.

(list-contexts )              [Function]
Prints a list of all the contexts.

(list-slots )                 [Function]
Prints a list of all the SNePS slots.

(list-terms &key (asserted nil) (types nil)) [Function]
Prints a list of all the terms in the KB. If \texttt{asserted} is non-null, only asserted propositions will be printed;
otherwise, all terms will be printed. If :\texttt{types} is non-null, the type of each term will also be printed.

(listkb )                     [Function]
Prints the current context and all propositions asserted in it.

(noshowproofs )              [Function]
Turns off the effects of \texttt{showproofs}.

(pathsfrom terms path)        [Function]
Returns the set of terms at the end of the given \textit{path} (see \S1.3) from \textit{terms}, which must be a term, the
name of a term, a list of terms or names of terms, or a set of terms.

(perform actform)             [Function]
Performs the \texttt{Act} expressed by the form \textit{actform}.

\texttt{*PRECISION*}          [Variable]
A positive integer: a floating point number will be rounded to this number of decimal places before being
converted to a term.

(remove-from-context term ctx) [Function]
Removes the provided \textit{term} from the context \textit{ctx}. The term will still be asserted in contexts it isn’t removed
from.

(sameFrame newf oldf)         [Function]
Associates the same frame associated with the function symbol \textit{oldf} with the symbol, or list of symbols,
\textit{newf}. 
(setCurrentContext ctx) [Function]
If ctx is a context name, makes the context named ctx the current context. If ctx is a context, makes it the current context. Else raises an error.

(showproofs &key (goals nil)) [Function]
Turns on printing of the proofs of derived terms. If goals is non-nil, a message is printed whenever: a goal or subgoal is issued; a goal or subgoal is found asserted in the knowledge base; a rule fires. If goals is nil (default) a message is printed only when a rule fires, thus printing a proof.

(showTypes ) [Function]
Graphically displays all the defined semantic types.

(startGUI &rest terms) [Macro]
Starts the SNPS 3 GUI. Takes a variable number of terms to display on the graph. Each term is either found or defined using defineTerm. If no terms are given, the entire graph will be displayed.

(unassert prop &optional (cntxt (currentContext))) [Function]
Unasserts the proposition prop in the given context and all ancestor contexts. Currently there is no belief revision, so propositions derived using prop might still be asserted, and prop, itself, might be rederivable.

(unbox term) [Function]
If term is a number, return it; if term's name looks like a number, return the number; else throw an error.

(withInstances (variables of pattern &body forms) [Macro]
For each asserted substitution instance of pattern, evaluates the forms in forms, with each variable in variables taking on the term appropriate for the instance. Question mark variables in pattern that are not in variables take on the values they should have gotten in an enclosing withInstances.
For example,

(withInstances (?x ?y) of (Isa ?x ?y)
  (format t "˜s is an instance of ˜s.˜%" ?x ?y))

or

(withInstances (?x ?y) of (Isa ?x ?y)
  (format t "˜s is an instance of ˜s.˜%" ?x ?y)
(withInstances (?z) of (Ako ?y ?z)
  (format t "˜s is an instance of ˜s, and also of ˜s.˜%" ?x ?y ?z)
  (assert '(Isa ,?x ,?z))))

(writeKBToTextFile file &optional headerfile) [Function]
Writes the KB to the given text file, so that when that file is loaded, all the propositions asserted in the current KB will be asserted in the new KB. If the headerfile is included, a load of that file will be written before any of the asserts.
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