

## The use of paragraphs in AUTOMATH

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The use of paragraphs in AUTOMATH.

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The use of paragraphs in AUTOMATH.

0. The aim of this note is to guide writers of Automath-texts in the simplifying (but, in cases of bad use, tangling) world of paragraphs. The use of paragraphs is independent of the chosen member of the Automath-family of languages.
1. A paragraph is a piece of Automath text, starting with a paragraph opening (e.g.: + PARA 1 \$) and ending upon a paragraph closure which must contain the same paragraph identifier (-PARA 1 \$). See for syntax: AUT-PI language reference manual. Inside a paragraph zero or more lines may occur and also other paragraphs may occur. Paragraphs occur always nested.

Example (~~~~ denotes a line).

```
+ PARA 1 $
~~~~
~~~~
+ PARA 11 $
~~~~
+ PARA 111 $
~~~~
- PARA 111 $
~~~~
- PARA 11 $
+ PARA 12 $
~~~~
- PARA 12 $
- PARA 1 $
```

2. Some definitions to enable easy explanations.
- a) A line L belongs to a paragraph P iff P is the smallest paragraph enclosing L. (So : no other matching pair of paragraph opening and paragraph closure encloses L and occurs inside P).
- b) A constant c belongs to a paragraph P iff c is defined in a line L belonging to P.
- c) A paragraph P is mother of paragraph Q iff P is the smallest paragraph enclosing Q.

d) A paragraph P is ancestor of paragraph Q iff P is mother of Q or P is ancestor of the mother of Q.

Example: (we leave out the \$ sign)

	line no.	mother is:	belongs to:
+A		?	
x := y	1		A
+B		A	
z := x	2		B
-B			
z := x	3		A
-A			

3. In the example of section 2. one will detect two different lines, both defining a constant z. If one later wants to refer to one or both of them, one needs a method to distinguish properly between them. In such a case one may use a paragraph-reference. (See for syntax : AUT-PI language reference manual).

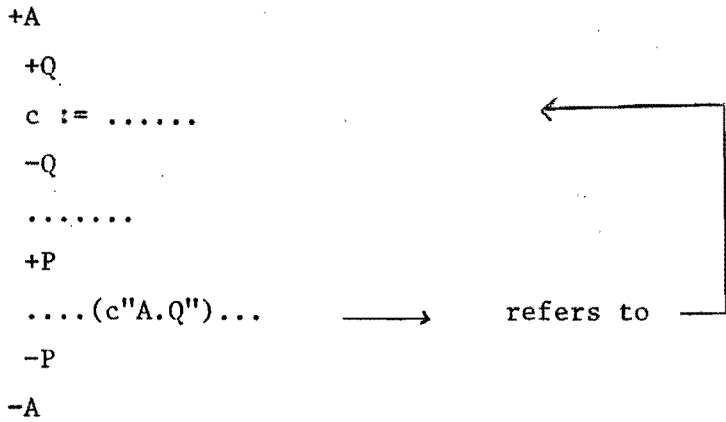
How to construct such a reference?

Suppose we are writing a line in some paragraph P and we want to refer to a constant c belonging to some other paragraph Q.

We will write down the identifier c, immediately followed by a paragraph reference built up as follows:

- i) A paragraph reference is a string of paragraph identifiers, separated by periods and enclosed in paragraph quotes ("").
- ii) The first paragraph identifier (read from left to right) must indicate either an ancestor of both P and Q, or P, if P is ancestor of Q, or Q if Q is ancestor of P.
- iii) Each following identifier must indicate a daughter paragraph of the preceding one.
- iv) The last identifier must indicate the paragraph Q.

Example: (we leave out the \$; c := ... denotes the definition of c, .... (c"A.Q") .... denotes a reference to c).



4. Some rules, necessary to let the paragraph references work correctly:
  - a) All constants, belonging to one paragraph, must have mutually distinct identifiers.
  - b) All paragraphs, having the same mother, must have mutually distinct identifiers.
  - c) A paragraph may not have the same identifier as one of it's ancestors.
5. Once a paragraph is closed, it may be reopened. This is done by writing (e.g.) + \*PARA 1 \$. The reopened paragraph is closed again by: - PARA 1 \$ (so, without an \*). This reopening may be done with due observance of the following:  
We have to revise the notion paragraph:

- 1) A paragraph segment is a piece of Automath text, starting with a paragraph-opening or -reopening and ending upon the matching paragraph closure. (With matching we mean: there is no smaller piece of text, also ending upon a paragraph closure with the same identifier).
- 2) A paragraph is the union of all paragraph segments, having the same mother and bearing the same identifier.

N.B. the rules, given in section 4 must obey this new definition.

6. Some additional rules:
  - a) If a paragraph reference is made from some paragraph P to some other paragraph P to some other paragraph Q and P is ancestor of Q, one will write a reference like: "P. ... .Q". In this case one may omit the identifier P.
  - b) If (see a) Q is ancestor of P, one may omit the reference at all (this is called : automatic referencing).
  - c) Also contextbase variables may be followed by a paragraph reference (see language reference manual 4.1). Again, referencing follows the same rules as described above.

6. Final example using the different possibilities of paragraph nesting and referencing.

text	line no.	mother is	belongs to	refers to
+A		?		
p := ...	1		A	
+B		A		
+C		B		
... (p) ...	2		C	1
p := ...	3		C	
+D		C		
... (p) ...	4		D	3
-D		C		
-C		B		
p := ...	5		B	
+ * C		B		
... (p) ...	6		C	3
... (p"A") ...	7		C	1
+ * D		C		
... (p) ...	8		D	3
-D		C		
-C		B		
... (p"B.C") ...	9		B	3
... (p" .C") ...	10		B	3
... (p) ...	11		B	5
-B		A		
+E		A		
+F		E		
... (p"A.B.C") ...	12		F	3
-F		E		
-E		A		
-A		?		