GNU Algol 68 Coding Guidelines

For GCC version 17.0.0 (pre-release)

(GCC)

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Short Contents

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1 Stropping

The GNU Algol 68 compiler supports two stropping regimes:

- The classic *UPPER stropping*, which is one of the standard stropping regimes defined in the Standard Hardware Representation for Algol 68. This regime uses upper-case letters to encode bold letters and lower-case letters to encode non-bold letters.
- The modern *SUPPER stropping*, which is a GNU extension. This is the standard stropping regime in GCC, and its rules are similar to the naming conventions widely used in many modern programming languages. The resulting programs have a very modern feeling.

In GCC we use SUPPER stropping only. The only instance of UPPER stropping are in test cases. Some of the guidelines and considerations in this document may also be useful in programs using UPPER stropping.

2 Formatting

The placement of spaces and empty lines in the program text plays an important role when it comes to readability.

2.1 Empty lines

Empty lines are often used in programs to separate logical parts in a sequence of statements or expressions. This avoids the code to look like walls of text, which are somewhat difficult to read. This of course also applies to Algol 68, but to a much lesser degree due to the exceptionally clean syntax of the language. Therefore we favor a compact formatting to a reasonable extent.

Please be frugal with empty lines, especially within enclosed clauses.

It is not necessary nor advisable to have separated "declaration parts" in serial clauses, because declarations can appear anywhere. However empty lines may still be useful to group related declarations together.

It is often better to use an explanatory comment rather than an empty line, again especially within enclosed clauses.

2.2 Spaces before parentheses

Do not put spaces before open-parentheses in routine calls.

But make sure to always put a space between `union` or `struct` and the open parenthesis that follows in declarers.

Likewise, please put a space before the open parenthesis when the enclosed clause in a cast is a closed clause.

Examples:

```
{ No space before open-parentheses in calls }
puts(fixed(count,0) + "'n");

{ Space between `union' or `struct' and `(' }
mode Number = union (int,long int,real,long real)

{ Space before '(' in casts }
ref JSON_Fld (fields) := field;
```

2.3 Spaces after parentheses

When writing routine texts always place a space between the formal parameters pack and the mode of the value yielded by the routine.

When writing operator and procedure declarators do not put a space between the parameter modes pack and the mode of the yielded value.

Also in declarers, do not put a space after `op` or `proc` and the parameter modes pack.

```
{ Space after formal parameters pack in routine text }
json_foreach_elem(a, (ref JSON_Val v) void: len +:= 1)
```

```
{ No space after parameters pack in procedure and operator
  declarators }
proc(string)void error;
```

2.4 Spaces within packs

With "pack" we refer to the following source constructs which are collections of other constructs enclosed between (and) symbols:

- The actual parameters in a call.
- The formal parameters in a routine text.
- The fields in a struct mode declarator.
- The modes of the united modes in an union mode declarator.
- The modes of the parameters in an operator or procedure declarator.

Spaces are optional after commas in packs when both the preceding and following symbols are tags.

Put a space after commas in packs when the next construct is not a tag, but only if the preceding construct is a tag.

Do not put spaces before commas in packs.

Examples:

```
{ Spaces are optional around commas surrounded by tags }
process(socket, resp, fragmented);
process(socket,resp,fragmented);
op E = (Symbol a,b) bool: a = b;
op E = (Symbol a, b) bool: a = b;

{ Space after commas separating a non tag and a tag }
op E = (Symbol s, Word w) bool: s E w;
mode M = struct (int i, real r);

{ No spaces in commas separating non tags }
proc(int,string,[]real)int callback;
op(int,int)int handler;
mode Data = union (void,bool,int)
```

2.5 Spaces in row displays

Within row displays spaces are optional after commas, but please never put spaces before commas.

```
{ Spaces are ok after commas in row-displays }
[]int a = (1,2,3);
[]int b = (1, 2, 3);
[]string names = ("jemarch",
                  "mnabipoor",
                  "pietr0");
```

2.6 Spaces in formulas

Do not put spaces after monadic operators whose representation is not a bold word.

However, if the monadic operator is represented by a bold word, always put a space between the operator and the operand, even when the operand starts with a parenthesis.

Always put spaces before and after dyadic operators if the formula is not parenthesized. Spaces are optional if the formula is parenthesized, provided the operator is not represented by a bold word. Note however that if long tags are involved extra spaces may be advisable even for parenthesized formulas.

Examples:

```
{ No space after non-bold monadic operators }
int i = -10;

{ Always a space after bold monadic operator }
int i = ABS (base + offset)

{ Spaces in dyadic operator }
total := a + b;
index := cnt +:= 1;
total := (a + b);
index := (cnt +:= 1);
total := (a+b);
index := (cnt+:=1)
```

2.7 Spaces in declarers

Do not put spaces after ']' in row mode declarers.

Do not put spaces after the bounds of a declarer.

Also, do not put spaces directly within the bounds of a declarer, unless for indentation purposes. Since bounds can contain any unit, the general rules apply within these.

Examples:

```
{ No space after `]' in declarers }
[]int a = (1,2,3);

{ No spaces after bounds in declarers }
mode List = [10]int,
     MatrixList = [10][3,3]int,
     Numbers = []union (int,real);

{ No spaces directly within bounds in declarers }
mode MyString = [1:10@]MyChar,
     DynamicTable = [read_int(10, 20),
                     read_int(10, 20)]char;
```

2.8 Spaces in indexers and trimmers

While indexing and trimming a multiple, never put a space between the indexed tertiary and the SUB symbol.

Do not put spaces directly within indexers and trimmers, unless for indentation purposes. As an exception to this rule, you can put a single space before the "at" operator @ if desired.

Examples:

```
{ No space between tertiary and '[' }
int i = a[i];
int i = a[10:20]

{ No direct spaces within trimmers and indexers, but before  }
[]int a = b[2:5@10];
[]int c = d[10:20 @1];
```

2.9 Spaces in brief clause forms

It is generally a good idea to have spaces around | and |: within the brief forms of conditional clauses, case clauses and conformity clauses.

When the brief forms are very short and the units are number denotations, it may be more clear to not use spaces, especially when the form is an operand in a formula.

Examples:

```
{ Space around | and |: in brief forms }
(v | (void): "empty", (bool b): (b | "true" | "false"))

{ No spaces may be more readable sometimes }
int n = 2 + (c>3|10|20);
```

3 Comments

Use "foo" to refer to formal parameters when documenting procedures or operators.

Use `whatever' to refer to any other source construct that is not a formal parameter.

Use {{ and }} delimiters for commenting out code. Remember comments in modern Algol 68 are nestable.

Examples:

```
int error_hash = 0;

{ Return a hash code for the string "s", or `error_hash' if the string
  is too long.  }

proc hash_string (string s)

{{ int no_longer_needed; }}
```

4 Syntactic Conventions

4.1 Closed clauses

Algol 68 allows using `(` and `)` instead of `begin` and `end` to delimit closed clauses. In fact, parenthesized expression in other programming languages are realized in Algol 68 with closed clauses, in a very orthogonal way. Both forms are useful and can generally be used according to the programmer's taste. However, this section contains a few guidelines and recommendations on this regard.

Use parentheses for closed clauses that span a single line, regardless of the context. Having `begin` and `end` symbols in the same line looks weird and confusing.

As a general rule, always use parentheses in closed clauses that are operands in a formula. Exceptionally, using `begin` and `end` in formula operands may be preferable if the operand contains many declarations and units, and only if it spans for more than one line. In this case, however, please consider factoring the code in the operand into a routine and replace it with a procedure call.

The preferred indentation for a closed clause whose contents span more than one line, and that uses `begin` and `end` symbols as delimiters, is to indent the contents right at the right of the `begin` symbol. The `end` symbol shall then be placed in its own line, with the same indentation level than the opening symbol.

If the closed clause contains empty lines, or if the line preceding the closed clause is so long that it would "hide" the first line in the closed clause, then it is ok to put the first unit or declaration in the line after `begin`. This usually happens when the closed clause is the body of a long routine text.

The preferred indentation for a closed clause whose contents span more than one line, and that uses `(` and `)` symbols as delimiters, is to indent the contents right at the right of the `(` symbol. The `)` symbol finishing the closed clause shall not be placed in its own line.

```
{ No `begin' and `end' in the same line }
int i = 2 + (3+4);
int i = 2 + (int i = random(); i % 10 );
bool test = case v in (string): (puts (s); true) out false esac;

{ Closed clauses as formula operands }
int i = 2 + (int cnt := 0;
             to UPB data[@1] do cnt +:= 1 od;
             cnt)
int j = 2 + begin int cnt := 0;
                  to UPB data[@1] do cnt +:= 1 od;
                  cnt
                  end

{ Closed clause with no empty lines }
begin int fd = fopen ("data', file_o_rdonly")
      puts ("first line: " + fgets (fd, 0));
      fclose (fd)
```

```
end;

{ Closed clause with no empty lines but with preceding
  line of similar length }
proc parse_number = int:
begin
      int num := 0;
      while num := num * 10 + ABS ch - ABS "0";
            isdigi(getachar)
      do ~ od;
      ungeachar(ch);
      num
end;

{ Closed clause with empty lines }
proc main_proc = int:
begin
      { Auxiliary procs }
      proc aux1 = int: ...;
      proc aux2 = int: ...;

      { Computation }
      aux1;
      aux2;

      { Result }
      aux1 + aux2
end

{ Indentation of closed clauses using `(' and `)' delimiters }
proc parse_number = int:
(int num := 0;
 while num := num * 10 + ABS ch - ABS "0";
       isdigi(getachar)
 do ~ od;
 ungeachar(ch);
 num)
```

4.2 Indexers and trimmers

Algol 68 allows using `(` and `)` instead of `[` and `]` in bounds and slices to represent the SUB and BUS symbols. This is supported by ga68 via the `-fbrackets` command-line option in order to ease the porting of old code, and it is disabled by default. Please always use square brackets for indexing in new code.

4.3 Conditional clauses

If a conditional clause is still clear and not of excessive length when written on a single line, just do it.

Start the enquiry clause in the if-part of a conditional clause right after the `if` symbol, not in the next line.

The serial clauses in the then- and if-parts of the conditional clause shall be indented five positions right, which is the length of both the `then` and `else` symbols plus one.

The first declaration or unit in the then- and if-parts shall be placed in the same line than the `then` and `else` symbols, respectively.

Place the `fi` closing symbol in its own line, with the same indentation level than the matching `if`. The exception to this rule is when the conditional clause has no else-part and the then-part spans for a single line that is not too long. In that case, place the `fi` in the same line than `then`.

Examples:

```
{ Very small conditional clause in a single line }
if idx < 0 then fatal("invalid idx") fi

{ Short conditional-clause with `fi' in the same line
  than `then' }
if argc /= 3
then puts("expected two arguments'n") fi

{ A conditional-clause that spans several lines }
if a > 10
then puts("truncating");
     a := 10
fi
```

4.4 Loop clauses

If a loop clause is small enough to fit in a single line without occupying most of it, just do it.

If a loop clause spans two lines, and the second line is not too long, you can put `od` in the same line than `do`.

If a loop clause spans several lines, please put the `do` symbol in its own line, indented to the same level than the clause's frobyts.

Examples:

```
{ Very short loop-clause in a single line.  }
for a to argc do puts ("arg: " + argv[a]) od;

{ Short loop-clause with `od' in the same line than `do' }
for i from LWB a to UPB a
do total +:= a[i] od
```

```
{ A loop-clause that spans several lines }
while NOT exit
do string cmd = get_command;
   process_command(cmd)
od
```

4.5 Case and conformity clauses

Do not write a case or conformity clause in a single line, unless you are using the brief form. Unlike conditional and loop clauses, these are difficult to read.

Please put the `in`, `out` and `ease` symbols in their own lines, with the same indentation level than the matching `case`.

Start the choices right after the `in` symbol, in the same line. All the choices may fit in a single line. If they don't, please put each choice in its own line.

```
{ Short case clause }
case i
in 100, 200, 300 out 0 esac;

{ Long case clause }
case i
in 100,
   200,
   300
ouse i % 100
in 100,
   200,
   300
esac;

{ Long conformity clause }
case v
in (void): "empty",
   (bool b): (b | "true" | "false"),
   (string s): s
esac
```

4.6 Procedure and operator declarations

In procedure and operator declarations, if the body of a routine text starts with 'begin', put it at the same indentation than the `pub`, `proc` or `op`. Otherwise, indent it three spaces to the right relative to the `pub`, `proc` or `op`.

Examples:

```
{ Body of routine is a `begin'..`end' closed clause }
proc checked_div = (int a,b) int:
begin
      if b = 0 then fatal ("div by zero") fi;
```

```
      a % b
end;

{ Body of routine does not start with `begin' }
proc checked_div = (int a,b) int:
   (b = 0 | fatal ("div by zero"); skip | a % b);

{ Body of routine is not a closed clause }
proc checked_div = (int a,b) int:
   if b = 0
   then fatal ("div by zero"); skip
   else a % b
   fi;
```

4.7 Contracted declarations

Please don't be shy to use contracted forms of declarations. They can make the program much more readable and they make it easier to add new declarations, because they prevent writing the same text again and again.

However, care should be taken when declaring operators and procedures. In these cases, contracted declarations should only be used when declaring very short, one or two lines long routines. The last routine in the list of joined declarations can be a bit longer.

Examples:

```
{ Contracted declarations lead to compact and very
  readable code }
int disconnected = 0, connected = 0, unknown = 2;
pub ref JSON_Val json_no_val = nil,
    ref JSON_Elm json_no_elm = nil;
    ref JSON_Fld json_no_fld = nil;

{ Use contracted declarations for short routines }
op + = (States ss, State s) States: MoreStates (heap States := ss, s),
   + = (Transitions ts, Transition t) Transitions:
         MoreTransitions (heap Transitions := ts, t)
```

4.8 Brief clause forms

The obvious context where to use the brief forms of conditional, case and conformity clauses is when these clauses appear as operands in formulas. They match well with parenthesized closed clauses.

It is also ok to use brief forms of clauses out of formulas, especially inside case and conformiy clauses. But please be careful, as brief forms may be confused sometimes.

Examples:

```
{ Brief forms in formulas }
int res = (a=0 | fatal("div by zero"); skip | den/a);
```

```
{ Brief forms out of formulas }
for i to ELEMS str
do char newline = REPR 10, tab = REPR 9, c = str[i];
   (c = "\" | res +:= "\\"
    |: c = newline | res +:= "\n"
    |: c = tab | res +:= "\t"
    |  res +:= c)
od
```

5 Naming

Unlike most other programming languages, which are not stropped, in Algol 68 it is possible to have tags with the same name as reserved words, by appending an underscore character to the tag. For example, a tag `if` can be written as `if_`. It is important to note that the trailing underscore is not part of the tag: it is just a stropping artifact. This is always better than contriving artificious synonyms that are often confusing or too long. A copying routine has arguments "from" and "to"? Call them `from_` and `to_`. A struct mode has fields "in" and "out"? Call them `in_` and `out_`.

Please use fully upper-case bold words for operator indicants. This makes it easier for text editors to highlight them in a different style than mode indicants, and look more symmetrical in case of dyadic operators. For example, use `ABS` and not `Abs`.

6 Programming Style

This section contains some recommendation on the usage of the facilities of the language.

6.1 Writing routines

Use routines liberally! Routines are cheap, very easy to write thanks to the excellent Algol 68 syntax for routine texts, and first-class citizens in the language. They also have access to the lexical environment. So if you find yourself wanting to write a macro in order to repeat some little calculation, just write a small procedure or operator instead.

Choose identifiers that are expressive of meaning in order to clarify both the intent of the procedure or operator and the code written that uses it.

Consider using overloaded operators in preference to procedures with united mode parameters to encourage users of the operator to create new versions of the operator for different parameter types, rather than leaving the users trying to figure out how to hack the united mode definition.

The high level of orthogonaliy of Algol 68 combined with the structural type equivalence and the nice compact syntax of declarers makes mode names way less relevant than in many other programming languages. In particular if a routine takes a parameter that is an united mode, and that particular united mode is either not used anywhere else or very short, just write the declarer, you don't have to name it first.

Please make good use of the lexical block structure of the programming language: is is there to be used. In little local auxiliary routines, do not add arguments just to pass a value that is in the environment; rather, place the declaration of the auxiliary routine near the declarations of the values it accesses. If this is not possible, then it may be wise to judiciously pass those non-nearby values as arguments in order that the programmer be aware that non-nearby values are being accessed or possibly altered.

6.2 Enquiry clauses

Enquiry clauses are not just "boolean expressions" with a fancy name. They can be thought as a sort of specialized serial clauses, and as such they can contain any number of declarations and units while being required to always yield a value of mode `bool`.

Avoid polluting the lexical environment with declarations that are intended to be used exclusively within conditional and loop clauses: use a declaration in the enquiry-clause of the clause instead. This also makes it easier to later refactor code.

Examples:

```
{ The range of `c' is the entire loop clause. }
while char c = getchar;
      c /= char_eof
do
   ... use c ...
od
```

6.3 Nihils

Never use `nil` directly in identity relations; it is very error prone. It is better to define *nihils* for all reference modes that are likely to appear in one.

Examples:

```
mode Node = ...;
ref Node no_node = nil;
while n :/=: no_node do ... od
```

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