FORTRAN TIPS

• Do not try to save time by using short names for variables. time is better than t for a time variable. Xcoord is better than x. You may use short names for intermediate calculations:

\[
\begin{align*}
  x2 & = Xcoord(i)^{**2}/25. \\
  \text{Force} & = \text{Velocity} * (1. +x2 / (1.+x2) )
\end{align*}
\]

• Use “natural” names. t for a variable denoting a time-step could lead to a mistake. Use dt or deltat.

• Use the same name for the same variable in different subroutines. The following is an example of a bad style of programming:

```
........
COMMON /A1/ x(n),y(n),z(n), mass(n)
CALL SUB1
....
SUBROUTINE SUB1
....
COMMON /A1/ U(n),B(n),V(n), x(n)
```

You should write:

```
SUBROUTINE SUB1
....
COMMON /A1/ x(n),y(n),z(n), mass(n)
```

• Do not use arrays, if you do not need them.

• Do not use variables, if you do not need them:

   Instead of:

   ```
   Do i=1,N-1
   i1 = i + 1
   Do j =i1,N
   V(j) = j**2 + i1
   EndDo
   EndDo
   ```

   Write:

   ```
   Do i=1,N-1
   Do j =i+1,N
   V(j) = j**2 + i+1
   EndDo
   EndDo
   ```

• Do not abuse the previous rule.

• Try not to use labels. Instead of:
Do 10 i=1,N-1
Do 10 j=i+1,N
    V(j)=j**2 + i+1
    CONTINUE

Write:
Do i=1,N-1
Do j=i+1,N
    V(j)=j**2 + i+1
EndDo
EndDo

• If is “cheap”
• Be careful with integers:
  \[ a = 1/3 \times b \]
gives \( a = 0 \). You should write \( a = 1/3 \times b \).
• Do not write \( a**(1./2.) \) or \( a**0.50 \) or even \( a**2. \). Use \( \text{sqrt}(a) \) or \( a**2. \) instead— it is 100 times faster.
• Instead of \( a**0.25 \) use \( \text{sqrt}(\text{sqrt}(a)) \).
• Try to rewrite expressions to minimize the number of operations. Example: instead of
  \[ y = a + b \times x + c \times x \times 2 + d \times x \times 3 + e \times x \times 4 \]
(10 multiplications and 4 additions) use:
  \[ y = a + x \times (b + x \times (c + x \times (d + x \times e))) \]
(4 multiplications and 4 additions)
• It is very easy to make a mistake and it is very difficult to find a mistake in FORTRAN. Typos are especially hard. Read your code. Trace it step-by-step for a very simple problem.
• Use \text{PARAMETER} statement for constants.
• Write short and clear comments. \text{In-line comments} are especially handy:
  \[ a = 1/3 \times b \quad ! \text{This is a comment} \]
  \[ c = 3.e+10 \quad ! \text{light velocity} \]