Programming Techniques 2024-2025

Lecture 2: Recap of Basic Fortran Topics

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Recap - Variables

Basic data types

- logical
- integer
- real
- complex
- character

Variables

- Are defined after ‘implicit none‘ but before the actual code.
- Can be initialised when defined.

```
program a
  implicit none
  integer :: j, i, k = 4
  real :: f, s = 0.12
  ! Some code here
end program a
```

Recap - Constants

- Constants are variables that do not change during the program's execution.
- Identified by the 'parameter' modifier in the variable definition.
- Can be used to initialise other variables.

```
program a
  implicit none
  real, parameter :: pi = 3.14
  real, parameter :: two_pi = 2*
      pi
  integer :: j, i, k = 4
  real :: f, s = 0.12, r = two_pi
  ! Some code here
end program a
```

Recap - Conditional Execution

```
- if (x) a = 2
```

```
- if (x) then
    a = 2
  end if
```

```
- if (x) then
    a = 2
  else
    a = 3
  end if
```

```
- if (x) then
    a = 2
  else if (y) then
    a = 4
  else
    a = 3
  end if
```

Recap - Loops

- Loops allow you to execute a block of code multiple times.
- ‘do while‘, and ‘do i =‘ loops are commonly used in Fortran.

```
do
  if (x) exit
  ! Some code
end do

do while (a < 10)
  ! Some code
end do

do i = 1, 10
  a = a + i
end do
```

Exercises

Exercise 1:

- Write a program that computes and prints the matrix multiplication of two real arrays.

$$A = \begin{pmatrix} 3 & 2 & 4 & 1 \\ 2 & 4 & 2 & 2 \\ 1 & 2 & 3 & 7 \end{pmatrix} \quad B = \begin{pmatrix} 3 & 2 & 4 \\ 2 & 1 & 2 \\ 3 & 0 & 2 \end{pmatrix}$$

Exercise 2:

- Write a program that reads two real arrays of length n and prints the sum of these arrays.