Choosing and using programming languages

Introduction

- What are we trying to achieve?
- Choosing a language
- Good practice
- Future plans

What do we use programming for?

- Simulations (e.g. SPH, radiative transfer)
- Data processing: scripting, custom analysis
- ???

What languages do we use?

- Fortran 77, Fortran 90/95
- C/C++
- Perl
- Java
- Python
- ???

The program should be ...

- Correct: correct enough for the application
- Reliable (?)
- Efficient (computer time or your time?)
- Portable (?)
- Maintainable (?)
- Easy to read, avoid premature optimisation
- Easy to modify (?)

Choosing a suitable language

- Choice of language can make the task easier
- Quick for human vs. quick for computer
- Pedantic vs. lax
- Compiled vs. interpreted (shell-like or Perl-like)
- Available libraries (e.g. MPI)

Case 1: Torus

- Fast for computer (compiled, no VM)
- Needs to run on parallel, distributed memory (needs MPI libraries)
- Numerics need to be good
- Choose Fortran or C/C++

Case 2: post processing data in text files

- Fast for me
- Good string handling capabilities
- Easy to modify
- Perl, UNIX commands (e.g. awk, grep), IDL

Case 3:

- ???

Why use good practice?

- Makes programs much easier to write and maintain - particularly with >1 developer
- Program is also for people to read - record your method.
- Importance may vary (e.g. large projects with many developers, long term projects)
- Code re-use

Some ideas

- Layout of code: indentation, use of spaces
- When to add comments?
- Names: meaningful, useCapitalLetters or underscores_are_cool (language dependent conventions)
- Logic and flow: avoid GOTOs, positive logic, easy for a person to read

Compiled languages

- Compile time errors are easier to fix than run time errors
- Be rigourous: `Impicit none`, `Use strict` etc.
- Use the compiler: (extra) warnings, debug flags, enforce standards

Future plans

- Specific languages: Fortran 90, Perl
- More UNIX
- Debugging
- Optimisation
- Version control
- Correctness checking: benchmarking, verification etc.
- ???