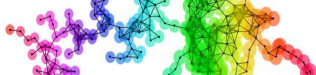


UNIVERSITY OF TWENTE.

Welcome to PiE 2014

Thomas Weinhart and Wouter den Otter



Broad outline

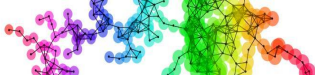
Course code : 191158510

- Programming in MATLAB, July 7-11 [1.5 EC]
- Programming in C++, July 14-18 [1.5EC]

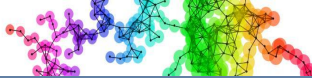
Please note it is possible to do only the C++ part [for 1.5 EC] or MATLAB part [for 1.5 EC].

If you take both parts, the averaged grade is given.

Also possible to extend to 5EC by doing further exercises from APiE (weighted average is used).

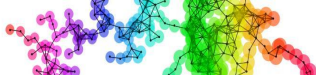


- What can we do with the computer
 - Evaluation of (experimental) data
 - Solving physical/engineering problems
 - Numerical ‘experiments’
- How do we do that?
 - Compiler languages (C, C++, Fortran, ...)
 - Interpreted languages (**MATLAB**,...)
- What do we learn?
 - Syntax of language
 - Translate problems to algorithms
 - Practical experiences (*How to debug*)



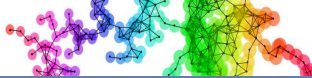
Advantages of MATLAB (Disadvantages of C++)

- Ease of use
- Visualisation
- many additional packages available (SimLink etc....)
- many more ...



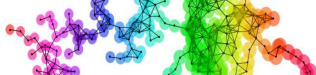
Advantages of C++ (Disadvantage of MATLAB)

- Free software
- Portability (Supercomputer, can be made parallel)
- Speed, orders of magnitude faster
- Compatibility
- You control the type of variables and storage structure
- Fully Object Oriented Programming



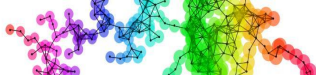
Goals of the course

- Teach you how to write, compile and run small programs in MATLAB and C++
- Basic elements of the language **for** loops, **if** statements etc...
- How to translate a problem into a computer code
- How to test and debug programs. Most of ‘coding’ time is bug fixing.
- How to write structured reusable code



Goals of the course

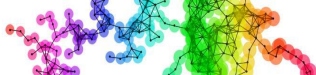
- How to use MATLAB to perform simple calculations, matrix operators.
- How to use MATLAB to plot different type of data in 2D and 3D.
- Introduction to MATLAB symbolic toolbox
- Write programming in MATLAB.
- Use of the MATLAB interactive debuggers
- How to vectorise code and get some speed back



Plan

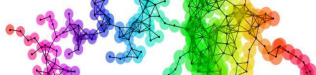
- MATLAB taught by Thomas Weinhart on July 7-11,
- C++ taught by Wouter den Otter on July 14-18.

Lectures and exercise classes take place in OH 218, with lectures from 8:45 to 12:30, exercises from 13:45-17:30 (the mix between lectures and exercises might vary)



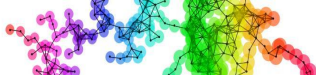
How is it examined

- There are two final assignments: One for C++ and one MATLAB
- Only the final assignments will be accessed.
- For each assignment there will be an oral exam.
- Both final assignments must be handed in by 9 am on Monday 4th of August.



What you will learn from this course

- Basic programming constructs
- How to debug and find errors
- How to write code in a clear reusable fashion
- For final assignments, you will write code to solve real problems

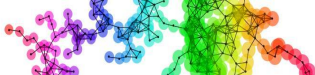


APiE

- The purpose of APiE is to teach you new methods and implement simple versions of them.
- ≈ 10 assignments each like the final assignments of PiE.
- Will teach you the basics of the
 - Discrete particle method (both for fluids and solids)
 - Finite difference methods
 - Finite element method
 - Smoothed particle hydrodynamics (SPH)
 - Monte Carlo methods (random numbers)
 - Finite volume methods
- Can be done as self-study; as soon as you finish PiE.
- Up to 5 extra EC available; so 8 EC in total possible.

Exercise at

<http://www.utwente.nl/ctw/msm/education/Exercises/>



Demonstration of simulations

<http://youtu.be/5D9rSSM0feU>