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Research Faculty Summit 2012

ADVANCING THE STATE OF THE ART

F# for (Computer) Science and Engineering

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Introduction

Increasing complexity

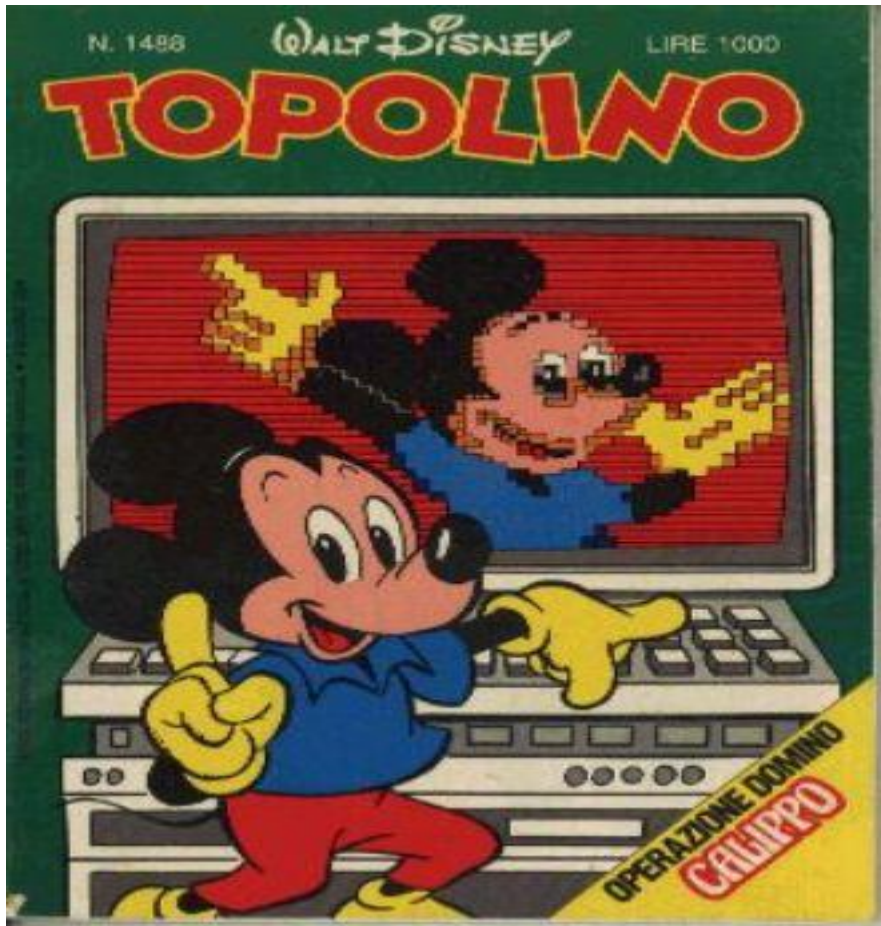
Machine
programming

Algorithms

Software
Coordination

Traditional languages
difficult to use for
non-computer scientists

Talking to machines in the '80



BASIC was advertised as the language of the future

Commodore 16: nuovorintoso, portentoso...
Per cominciare alla grande.

... niente costoso L.199.000 + IVA

Arriva un home computer favoloso, l'ideale per iniziare subito e meglio.
Commodore 16: nuovo, grintoso, portentoso... e niente costoso. Commodore 16 è completo, versatile, potente (usa il BASIC

3.5, la versione più potente del linguaggio; è utile per sviluppare l'apprendimento del linguaggio del futuro.
È facilissimo da usare, è divertente e ti dà una mano a risolvere un sacco di problemi.

Commodore 16 è un "super-Vic" per quanto riguarda la capacità, la memoria (16K), le prestazioni.
È anche un videogioco superbo, con grafica in alta risoluzione, due generatori di suono incorporati,

entusiasmanti cartucce giochi. Commodore ti fa scegliere. Commodore Italiana S.p.A.

commodore
COMPUTER



Matlab and Excel...

- ...have become the tools many scientists use every day
- Dynamic languages (i.e. Python) are used too
- Some scientists still use C/C++/Fortran code BUT they are decreasing in numbers
- Why?
- Software and computers are not anymore made only by/for science and engineering



F#

.NET language

Interoperates with C#/C++

Type inference

Has an interactive evaluation

Efficient

Feels like Python and, with VS, like Matlab



VSLab

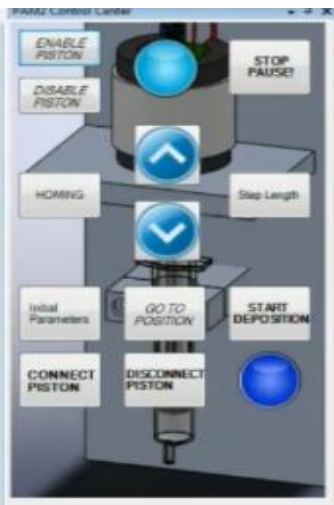
- Add-in for Visual Studio
- Allows to interactively define and create VS toolwindows
- Enables Visual Studio to be extended interactively
- Matlab-like interaction (using Math.NET or other math library)
- Available on Visual Studio Shell



Teaching F# to scientists and engineers

- Started in 2008 with VSLab
- Collaboration with «Centro E. Piaggio» at University of Pisa
- Graduate and master students from Biomedical engineering course
- Goal: give to engineers a tool like Matlab (with less math libraries) capable of:
 - Interactive evaluation
 - Easy interaction with devices
 - Shipping standalone program eventually

PAM²



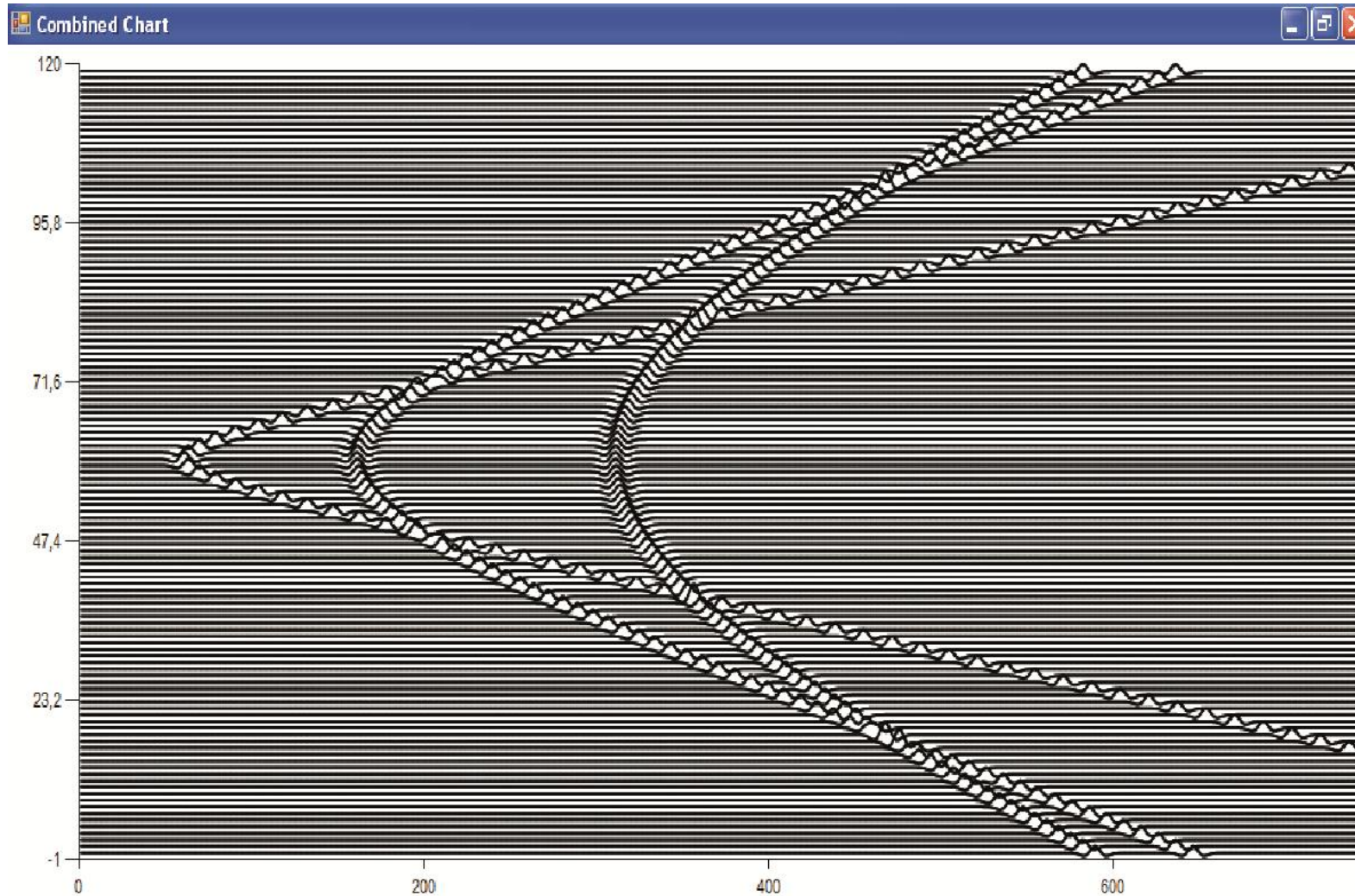
Fabrication of microstructures



Another useful lesson

- 2011: course on scientific programming at Scuola Normale Superiore (class of Science)
- Topics discussed interactively in Visual Studio

Just arrived...





And for Computer Science?

- ML has been used as first programming language by many CS courses in the past
- At UniPisa we *come back* from Java to ML 3yrs ago
 - F# was a driver (industrial support)
 - Good for start programming (top level)
 - Rich of core programming concepts
- Use of F# in UI programming course
 - Interactive interface building
 - Access to real world UI toolkits (WinForms, WPF, GTK#, ...)



Conclusions

- Functional programming (and F# syntax) is accepted by scientists and engineers quickly
- The OO programming constructs are easily accepted in the use BUT writing classes is a barrier
- F# has proven to be a good common language between computer scientists and scientists/engineering

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