On the integration of the Curriculum Initiative on Parallel and Distributed Computing in the Spanish university system

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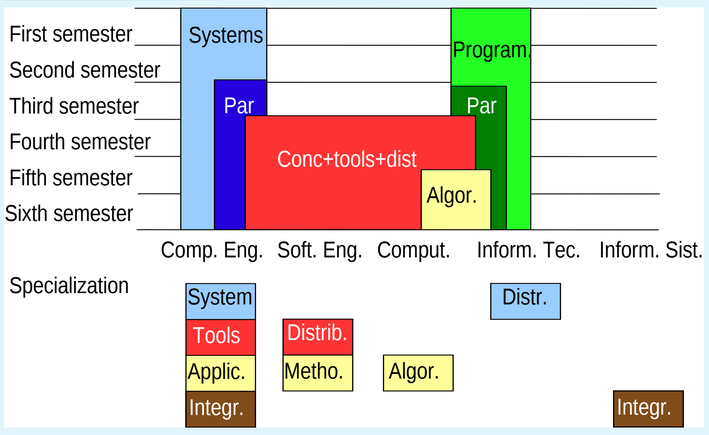
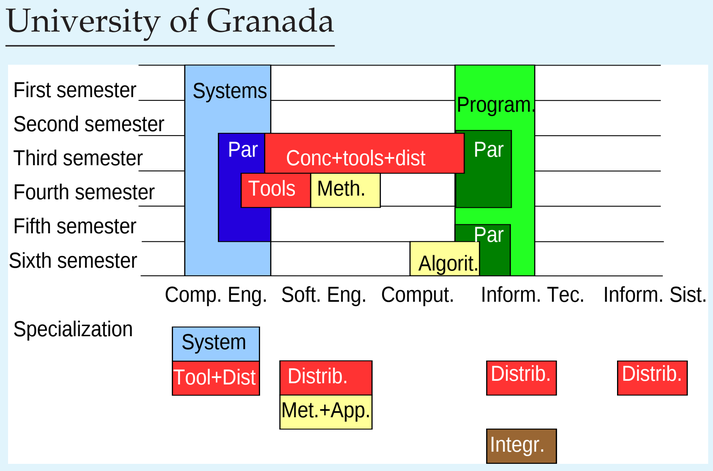
Parallelism in CS in Spain

Our proposal

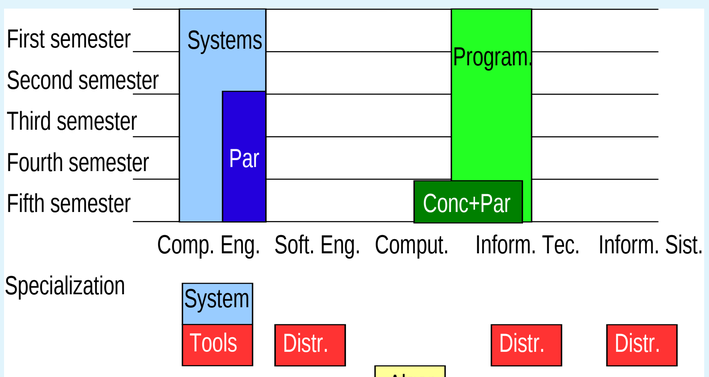


- Parallelism from the third semester in both System and Programming courses.
- Basic concepts of concurrency, tools for parallelism and distributed computing in System and Programming courses, and possibly with some specific course for these concepts.
- Algorithmic aspects in the last common semesters, preferably included in Programming or Concurrency courses.
- Different aspects of parallelism depending on the specialization, with each aspect having a distinct orientation in different specializations.

University of Granada



University of La Laguna



University of Murcia

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Topics of the Curriculum Initiative PDC in the Spanish system

Figures represent to what extent each topic is treated in common courses. Green means it is a core topic, yellow is for non-core topics, and red is for a topic not treated. For non-core topics the specialities where the topic is studied more in depth are indicated. In the proposal the topic should be core in those specialities, and for each university the topic is considered as core (C) or non-core (N). Clearly, the figures represent only an approximation to the reality because how deep a topic is treated depends on a set of factors, but the schemes have been produced from the study plans of the universities, which are now in the first or second year of implantation.

ARCHITECTURE	Proposal	Granada	La Laguna	Murcia	Valencia
Taxonomy					
Superscalar					
SIMD/Vector					
Pipelines					
Streams			C-CE		
MIMD					
Multithreading					
Multicore					
Heterogeneous		N-CE N-SE	N-CE	C-CE N-SE	
SMP					
NUMA					
Message-passing					
Memory hierarchy					
Floating point				N-CE	
Performance metrics					

PROGRAMMING	Proposal	Granada	La Laguna	Murcia	Valencia
SIMD			C-CE C-Co		C-CE
Shared memory			C-CE C-Co		C-CE
Distributed memory					C-CE
Client server		N-CE C-SE C-IT C-IS	C-SE		C-CE
Hybrid	CE	N-SE	N-CE	C-CE N-SE	C-CE
Task/thread spawning					C-CE
SPMD		C-CE C-SE	C-Co	C-CE C-SE	
Data parallel	CE	C-CE C-SE	C-Co	C-CE C-SE	C-CE
Parallel loop	CE		C-Co	C-CE C-SE	C-CE
Array languages		N-CE	N-CE	N-CE	
Shared memory notations					C-CE
SPMD notations	CE	C-CE C-SE	C-Co	C-CE C-SE	
SemantCE and correctness			N-Co	N-CE N-SE	
Synchronization					C-CE
Concurrency defects					
Performance computation			C-CE C-Co		C-CE
Performance data				C-CE C-SE	
Performance monitoring		N-CE	N-CE N-Co	N-CE	C-CE
Performance metrCEs	CE		C-CE C-Co	C-CE C-SE	C-CE

ALGORITHM	Proposal	Granada	La Laguna	Murcia	Valencia
Cost of computation		C-CE C-SE	C-Co	C-CE C-SE	C-CE
Cost reduction		C-CE C-SE	C-Co	C-CE C-SE	C-CE
Cost tradeoffs		N-CE N-SE		N-CE N-SE	C-CE
Scalability	CE	C-CE C-SE	N-Co	C-CE C-SE	C-CE
Model-based notations		N-SE		N-SE	C-CE
Notions scheduling	CE		C-CE		C-CE
Divide-conquer	SE, Co	C-SE	C-Co	C-CE C-SE	
Recursion	SE	C-SE	N-Co	C-CE C-SE	
Scan	CE	N-CE C-SE		C-CE C-SE	
Reduction	CE	N-CE C-SE		C-CE C-SE	
Stencil iterations	SE, Co	C-SE			
Dependencies		C-SE		N-CE N-SE	
Series-parallel comp.	SE, Co	N-SE			
Graph embedding					
Communication					
Synchronization					
Sorting	SE, Co	N-SE	C-Co	C-CE C-SE	
Selection	SE, Co	N-Co N-SE	C-Co	C-CE C-SE	
Graph algorithms		C-SE	C-Co	C-CE C-SE	
Specialized computations	CE, Co	N-Co N-SE	N-Co	C-CE C-SE	C-CE

CROSS CUTTING	Proposal	Granada	La Laguna	Murcia	Valencia
Why and what paral.		N-CE N-SE		N-CE N-SE	
Concurrency					
Non-determinism					
Power					
Locality					
Cluster		C-CE C-SE			
Cloud/grid	CE, SE, IT, IS	N-CE N-SE C-IT	N-SE N-IT		
P2P	IT, IS	C-SE	N-SE N-IT		
Fault tolerance	CE, IT	N-CE C-SE		N-CE N-SE	
Security		N-CE N-SE C-IT N-IS	C-CE C-IT	N-SE N-IT	
Distributed transactions	IT	N-CE C-IS		N-SE N-IT	
Web search	SE, IT	C-CE N-SE C-IT	C-IT N-IS		
Social networking	IS	C-IS C-IT	C-IT C-IS		
Collaborative comp.	IS	C-SE	C-IT C-IS		
Performance modeling					
Web services	IS	C-IS	C-IT	C-SE N-IT	
Pervasive computing	IT	N-SE C-IT		N-IT	
Mobile computing	IT	N-CE N-SE		C-CE N-IT	

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