

## “The 13-11 Benchmark”

### Background

Asanovic et al. described in their landmark publication “The Landscape of Parallel Computing Research: A View from Berkeley” (2006), a set of challenging parallel computing problems for the era of modern many-core and heterogeneous hardware systems. This set of parallel computing problems comprises of 13 ‘dwarfs’.

A dwarf is an algorithmic method that captures a pattern of computation and communication. Examples are the problems of dense linear algebra computation, graph traversal, finite state machine simulation etc. All these algorithmic problems demand a proper mapping to modern execution environments, in order to benefit from the increasing number of cores available.



Beside the existence of challenging algorithmic problems, modern many-core systems also face the non-existence of parallel benchmarks that rank their performance appropriately. Classical parallel benchmark suites are prepared for homogeneous parallel environments with uniform memory architectures. Since this no longer matches recent hardware trends, a new way of benchmarking large scale many-core systems is desperately needed.

### Description

The Masters project “13-11 Benchmark” aims at the definition, implementation and testing of a parallel benchmark suite for heterogeneous many-core systems. The students in this project will evaluate and understand the currently defined 13 dwarfs and their existing implementations. Based on this understanding, a reference implementation of the dwarf problems will be developed as a benchmark suite.

The implementation has to be conducted with the latest C++ version 11. The project will specifically rely on the new concurrency support in this version of the language, which is available in Clang and the MS Visual Studio 11 compilers.

### References

- Krste Asanovic, Rastislav Bodik, James Demmel, Tony Keaveny, Kurt Keutzer, John Kubiawicz, Nelson Morgan, David Patterson, Koushik Sen, John Wawrzynek, David Wessel, and Katherine Yelick. 2009. A view of the parallel computing landscape. *Commun. ACM* 52, 10 (October 2009), 56-67. DOI=10.1145/1562764.1562783 <http://doi.acm.org/10.1145/1562764.1562783>

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