



ABCDE



Scientific Report

First name / Family name

Tobias Berka

Nationality

Austria

Name of the *Host Organisation*

INRIA Saclay, Île-de-France

First Name / family name
of the *Scientific Coordinator*

Prof. Laura Grigori

Period of the fellowship

1/04/2012 to 1/10/2012



I – SCIENTIFIC ACTIVITY DURING YOUR FELLOWSHIP

The execution of the project workplan met an unexpected early success in the development of a novel multi-resolution scheme for matrix multiplication, primarily in the form of a formal proof of correctness if no compression is used. I then proceeded to develop a matrix reordering technique based on a variant of the bisecting k-means clustering algorithm. Preliminary experiments indicate that this reordering yields a significant reduction in approximation error if compression is applied to the multi-resolution scheme. Current investigations are based on static, block-wise zeroing, but substantial progress has been made towards the implementation of an adaptive technique, and it is only a matter of weeks until additional results become available. Apart from running code and measurements, I have already documented the above in scientific writing. The proof of correctness has been developed in full detail, along with all supporting text. Several graphics and figures are in preparation, additional explanations been written, and an exhaustive list of literature on clustering and the current state-of-the-art in multi-resolution techniques have been accumulated. To serve as a performance baseline, the development of an alternative and/or combined approach using hierarchical matrices is currently under further development. In addition to the above, I have begun the development of two main parallelization strategies. The first is a data-parallel approach specifically for large rectangular matrices frequently encountered in modern statistics applications. The second is a communication-avoiding strategy for the transformation into the multi-resolution domain, in which the processing is partly carried out redundantly.

II – PUBLICATION(S) DURING YOUR FELLOWSHIP

There are no publications up to this point, but two or more submissions may be possible in late 2012 or early to mid 2013.

III – ATTENDED SEMINARS, WORKHOPS, CONFERENCES

There was no attendance in the first six months.

IV – RESEARCH EXCHANGE PROGRAMME (REP)

The fellowship expires prior to the planned REP visits.