DIAGNOSTIC TECHNIQUES ON MASSIVELY PARALLEL ARCHITECTURES

NASA Grant NAG5-2220

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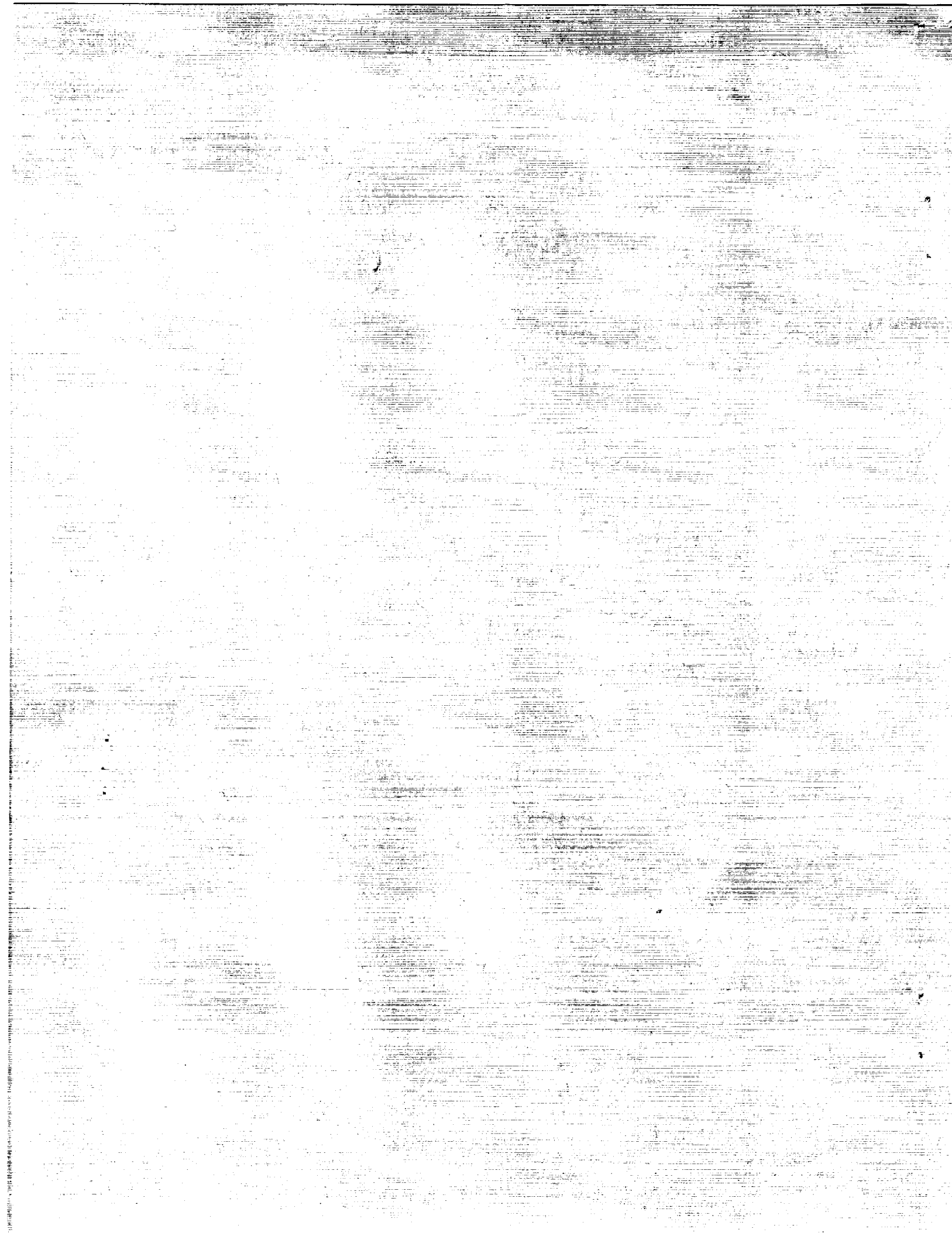

Implementation of Helioseismic Data Reduction and Diagnostic Techniques on Massively Parallel Architectures

NASA Grant NAG5-2220

Principal Investigator: **Dr. Sylvain G. Korzennik**

Period Covered: 03/01/93 - 12/31/96

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Data Assimilation on the Intel Delta Touchstone

Under the direction of Dr. Rhodes, and the technical supervision of Dr. Korzennik, the data assimilation of high spatial resolution solar dopplergrams has been carried out throughout the program on the Intel Delta Touchstone supercomputer.

For instance, the ingestion and reduction of some 240 GB of raw data, covering 100 days of observation, lead to the determination of some 600,000 rotational splittings. The analysis of these splittings lead to a new inference of the solar internal rotation rate as a function of depth and latitude. This work was presented at an invited review talk given at the GONG '94 meeting (Los Angeles, July 1994).

Code Development

With the help of a research assistant, partially supported by this grant, and under the supervision of Dr. Korzennik, code development was carried out at SAO, using various available resources. To ensure cross-platform portability, PVM was selected as the message passing library.

A parallel implementation of power spectra computation for helioseismology data reduction, using PVM was successfully completed. It was successfully ported to SMP architectures (*i.e.* SUN), and to some MPP architectures (i.e. the CM5). Due to limitation of the implementation of PVM on the Cray T3D, the port to that architecture was not completed at the time.

This code was extensively used, mostly on SMP architecture, in the analysis of Mt. Wilson solar data, as well as other helioseismological data set.

We have also started the conversion of our inverse problem solvers to a parallel implementation. We have investigated some of the existing parallel implementation for the core algorithms, and have start using some of the SCALPACK routines that will be used for the parallelization of these codes. While proof-of-concept programs have been successfully developed, the port of the actual code had not yet been completed.

Finally, I must point out that our work was hindered by two distinct factors: first the lack of stability of several platforms, mostly from a software rather than a hardware standpoint severely hampered progress. Second, the parallel implementations tackled under this program turned out to be more complex than what I had expected could be handled by my research assistant.