Special Volume

Dedicated to Víctor Pereyra on the occasion of his seventieth birthday

This special volume of ETNA is dedicated to Víctor Pereyra on the occasion of his seventieth birthday. It contains selected papers contributed by friends and colleagues from the international scientific computing community. Some of the papers were presented at a conference on numerical simulation held in Venezuela in October 2007 to honor Víctor Pereyra for his outstanding contributions to the development of scientific computing in Venezuela.

A native of Argentina, Víctor Pereyra spent the first part of his scientific career in Venezuela. His presence was crucial in the development of applied mathematics there. He was instrumental in the creation of various computer science and scientific computing programs, and in the establishment of applied mathematics research groups at several universities. After his move to California, he continued throughout the years to support those programs by encouraging and mentoring students and researchers.

His main areas of interest in numerical analysis were defined early in his career. After a first degree in mathematics at the Universidad de Buenos Aires, he started work at the Instituto de Cálculo. There, he switched from pure to numerical mathematics with an astronomy project that involved least-squares data fitting and ordinary differential equations.

During his postgraduate years at Stanford and Madison, Víctor Pereyra continued this early connection with differential equations, and developed the first of his fruitful long-term research interests: deferred corrections methods for nonlinear operator equations. He worked on all aspects of the methods, from the abstract analysis to the practical implementation.

It has always been his conviction, reflected both in his teaching and his research, that the best way to finish a numerical analysis project is with the production of a public domain program. The PASVA software package, designed for variable order, adaptive mesh (h-p refined) finite difference methods for boundary value problems, reflects this principle. Versions of this code are now part of several commonly-used scientific subroutine libraries.

In addition to deferred corrections, Víctor Pereyra developed a number of techniques necessary for the effective implementation of the PASVA codes. These include fast Vandermonde solvers and several generalizations of Vandermonde systems as they apply to numerical differentiation, interpolation and quadrature in several dimensions.

His early experimental work with least-squares was followed by many contributions ranging from regularization of ill-posed problems and iterative methods for nonlinear least-squares to the work undertaken in collaboration with Gene Golub on variable projections for separable nonlinear least-squares problems. This research concluded with another much-used program, VARPRO, which has ample modern applications, of which medical imaging is probably the most significant.

While visiting Caltech and Stanford in 1976, Víctor Pereyra started working on seismic ray tracing, and thus became involved in his third major area of interest: computational geophysics. He designed a complete system for 3D forward and inverse modeling for exploration geophysics, producing the package called INTEGRA. While it was designed with oil exploration in mind, it also has applications in earthquake seismology and geothermal energy.

More recently, using his expertise in optimization and simulation of physical processes, Víctor Pereyra created an integrated set of optimal design tools to facilitate the use of optimization techniques in applications.

Alongside the support he has given to the Venezuelan applied mathematics community, Víctor Pereyra has had collaborations and extensive influence in other countries in Latin America. He has ties with the Argentinian scientific community and is a consultant to several academic institutions on computer science. He has organized numerous international meetings on the application of computational methods to science and engineering, which have brought together researchers and students from North, Central, and South America. He is currently the chair of the Industrial Advisory Board of the Computational Science Research Center at San Diego State University. This special volume is in appreciation of his many years of fruitful research and dedicated service to the scientific community throughout the Americas.

In a final note, we want to acknowledge the enthusiasm with which Gene Golub, a friend of Víctor Pereyra for more than forty years, promoted this special volume until his untimely death.

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