Report on the CIMPA Research School:

Mathematical modeling and numerical simulation for wave propagation and imaging

Universidad Simón Bolívar, Caracas, Venezuela, April 16th to April 27th, 2012

http://www.cimpa.co.usb.ve

(by the local organizers)

This research school was dedicated to recent progress of mathematical modeling and numerical computations related to wave propagation and imaging. Thanks to the financial support of CIMPA, eight (8) graduate students from five (5) different foreign countries were accepted and attended the school; and thanks to local support from different sponsors, twenty four (24) venezuelan graduate students, from five (5) different universities, were accepted and attended the school.

The foreign students came from: Honduras (studying in Puerto Rico) (1), Costa Rica (2), Ecuador (studying in Chile) (1), Colombia (1), and Peru (3). The venezuelan students came from: Universidad Central de Venezuela, Caracas (4), Universidad de Carabobo, Valencia (3), Universidad Simón Bolívar, Caracas (11), Universidad de Oriente, Cumaná (2), and Universidad Centro Occidental Lisandro Alvarado, Barquisimeto (4).

The courses were dedicated on one hand to mathematical modeling (Data assimilation, Introduction to wave propagation, and control theory) and, on the other hand, to scientific computing theory (Iterative methods for solving large-scale linear systems of equations, and Numerical methods for solving non-linear systems of equations), and practice on free software (Scilab, and FreeFem++). The courses were given by nine (9) invited professors from several countries: France (7), Brazil (1), and USA (1). In addition, at the end of each day (except Fridays) we had an invited speaker giving talks on some specialized research topics related to the school. The invited speakers came from Venezuela (5), Spain (1), and France (1).

One of the most important aspects of this school was to organize some mini-projects around the school's topics, consisting in building basic practical solvers for some specific research problems. At the beginning of the school, the students were organized into groups of 6 people, and a specific basic modeling problem was handled to each group. The problems were designed by the same professors in charge of the courses, in advance, and the groups were organized mixing different nationalities and different universities. Every one of those problems required a combination of skills obtained from the given courses.

In order to solve the practical research problems, the students met with the professors every afternoon, during the second week, in a Computer Room with the required equipments; and the second Friday was entirely dedicated to the presentation of the obtained solutions by the different groups.

All the theoretical courses and conferences were held in the same room, located in the same building where we had the coffee breaks. The practical courses and the computational activities to solve the mini-projects were held in a different room, within five minutes walking distance from the first room.

The entire academic schedule, with the specific names of the courses and professors is presented in the chart below (last page).

All the foreign students and foreign professors stayed at the same hotel (Alba Caracas Hotel) during the entire school. A special transportation was hired to take them from the hotel to campus early in the morning to have breakfast at the university cafeteria, and to take them back to the hotel, right after dinner, which was also delivered in the same cafeteria. At noon, all the students and professors (foreign and Venezuelan) met together for lunch at the same cafeteria. Every Friday, before dinner, we had social activities (theater and live music), in one of the university halls. On Saturday April 21st, we had an excursion to a near-by historical town (El Hatillo).

In our opinion, the school, which is the first CIMPA Research School organized in Venezuela, was a total success. All the activities (academic and non-academic) ended up as planned. The courses and the conferences were of high level, and the students worked hard (as usual some of them harder than others) and the presentation of the mini-projects on the second Friday was a nice satisfaction to all of us: professors and organizers. The obtained solutions in every case were much better than expected. The mini-projects as well as the different lecture notes can be found at:

http://www.lamfa.u-picardie.fr/chehab/CIMPA/cimpa_main.html

We now present a financial report concerning expenses and sources of support for all the different activities associated with the school.

Item	Cost (in Euros)	Financing Institution
Lodging Hotel Alba Caracas	15,517.66	BCV/ Spain Embassy in Venezuela
Food expenses (breakfast, lunch, and dinner)	3,927.65	CIMPA/ IMU
Coffee Breaks	2,790.70	Funindes-USB
Transportation	947.46	IMU
Welcome kit (folder, pads, pens)	252.99	IMU
Identification, posters and certificates	279.21	IMU
Airfare for Prof. Martínez	733.88	USB
Airfare for Prof. Ervedoza	712.60	France Embassy in Venezuela
Airfare for Prof. Szyld	1,037.04	CIMPA
Airfare for Intl Students	4,000.00	CIMPA
Total	**30,199.19**	

In addition, campus memorabilia was given out to each participant as well as several gifts thanks to generous donations from the university´s publishing house, *Editorial Equinoccio* and the university´s foundation *Asociación de Amigos USB*. A small thank you gift was given to our lecturers thanks to the donations of local artists. These donations are not quantified in the table above.

The percentage of the total cost received by each financing institution is detailed in the following table:

Financing Institution	Percentage of total cost
CIMPA	22%
BCV	49%
IMU	13%
USB	2%
Funindes-USB	9%
Emb. France	2%
Emb. Spain	2%
Total	**100%**

First Week
(16/4 to 22/4)

Opening: Monday 16/4, 8:00-8:30

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
8:30 to 10:15	**Basic Control Theory** Ervedoza (Toulouse, France)				Scilab B. Pinçon	Excursion day (everybody)	Free day
10:15 to 10:40	**Coffee Break**						
10:40 to 12:25	**Efficient Methods for Solving Large Linear Systems of Equations** D. Szyld (Temple, USA)				Scilab B. Pinçon		
12:25 to 2:15	**Lunch**						
2:15 to 4:00	**Data Assimilation** M. Asch (UPJV, Amiens, France)				FreeFem G. Sadaka		
4:00 to 4:30	**Coffee Break**						
4:30 to 5:30	Mercedes Siles M.	Abraham Salazar	Juan Guevara	José L. Sánchez	FreeFem G. Sadaka		

Second Week
(23/4 to 27/4)

	Monday	Tuesday	Wednesday	Thursday	Friday
8:30 to 10:15	**Introduction to Wave Propagations** X. Antoine (IECN, Nancy, France)				Project's Solution
10:15 to 10:40	**Coffee Break**				
10:40 to 12:25	**Efficient Methods for Solving Large Nonlinear Systems of Equations** J.M. Martínez (Univ. Campinas, Brazil)				Project's Solution
12:25 to 2:15	**Lunch**				
2:15 to 4:00	**Projects Description and Possible Solutions** J.P. Chehab, Y. Mammeri				Project's Solution
4:00 to 4:30	**Coffee Break**				
4:30 to 5:30	Youcef Mammeri	Minaya Villasana	W. La Cruz D. Cores	Seraphine Mefire	Project's Solution