

Report of activities as Visiting Professor

Carmen Arévalo

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This report describes my activities in teaching and research during my visit under the sponsorship of Prof. Felice Iavernaro at the Mathematics Department of the University of Bari "Aldo Moro" during October-December 2019.

1 Research seminar

On October 24 I gave a talk titled *Error estimation for adaptive multistep methods*, based on [3]. I showed that estimating the error is important for the efficiency of adaptive algorithms that require the control of step size ratios in order to achieve a desired accuracy. Also, I showed that this should not be done in the same way as it is done for one step methods because the error model is essentially different as it depends on several previous steps. Finally, I showed how this model can be obtained for each particular multistep method and how to extract the error estimate from this model.

2 Course on Numerical Approximation of Functions

I gave a 16 hours course on Numerical approximation of functions, based on the book *Approximation theory and methods* by M. J. D. Powell and also on the Notes on Introduction to Computing with Geometry by C.K. Shene. The topics covered were:

1. Best approximations on different spaces and with different norms.
2. Approximation operators and their norms.
3. Polynomial interpolation and Chebyshev points.
4. Minimax approximation.
5. The Remez exchange algorithm.
6. Bèzier curves
7. B-splines

3 Research activity

I have started a collaboration with Professor Francesca Mazzia, of the Department of Computer Science, on the topic of B-spline generation for algorithms to solve boundary value problems. The idea is to find a relation between B-spline linear multistep methods [4,5] and the grid-independent generation of multistep methods by means of piecewise polynomials as done in [1]. Also, we have discussed the issue of using a technique for solving system of equations that would increase the efficiency of the algorithm in the code MODES, based on [2].

REFERENCES

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5. F Mazzia, A Sestini and D. Trigiante: *B-Spline linear multistep methods and their continuous extensions*. SIAM J Numer Anal (2006) 44: 1954-1973.
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