Curriculum vitae

Monica CRUBÉZY
Born on March 7, 1972 (France)
French

I.N.R.I.A Sophia Antipolis - Projet ORION
2004, route des Lucioles - B.P. 93
06902 Sophia Antipolis Cédex - FRANCE
Fax : (+33) 4 92 38 79 39
Tel : (+33) 4 92 38 78 12
Email : Monica.Crubezy@sophia.inria.fr
URL : http://www.inria.fr/orion/personnel/Monica.Crubezy/

EDUCATION:

- 1995-1999: **Ph.D.** in computer science at Institut National de Recherche en Informatique et Automatique (French National Institute for Research in Computer Science and Control), Sophia Antipolis, France (INRIA-Sophia Antipolis).
  Supervisors: Sabine Moisan and Monique Thonnat.
  Subject: "Program supervision for medical image processing."
- 1994-1995: **Master of Science** in artificial intelligence and pattern recognition at Université Pierre et Marie Curie of Paris, France (D.E.A. I.A.R.F.A., Paris VI).
- 1989-1994: **Engineering degree** at Ecole Polytechnique Féminine (EPF), Sceaux, France. Computer science specialisation.

RESEARCH INTERESTS:

- Artificial intelligence: program supervision, knowledge-based systems, knowledge representation, problem-solving, planning, knowledge acquisition, knowledge sharing and reuse.
- Medical imaging: medical image processing, computer-aided diagnosis, radiological workstations.
- Miscellaneous: software reuse, distributed applications, human-machine interfaces.

RESEARCH EXPERIENCE:

- **Ph.D.** in the ORION research group at INRIA-Sophia Antipolis, on knowledge-based program supervision for medical image processing [5]. Program supervision (PS) aims at automating the management of the decisions involved in the use of a program set, such as: appropriate choice and combination of programs, parameter setting, execution control details. Within the framework of a knowledge-based system, PS offers means to reuse both knowledge and strategy used by experts to solve a problem with these programs in a certain domain.

  My work consists in defining PS solutions adapted to the specifics of medical image processing (MIP). However powerful, up-to-date MIP methods require many different skills to be used appropriately: this crucially restricts their diffusion among health-care professionals. Within this concern, my work aims at providing them with means to benefit from research-level MIP software, by coupling it with knowledge-based PS techniques. Although not fully automatic, a PS system discharges them from the expertise about managing MIP use, therefore enabling them to focus on their clinical tasks.

  My approach consists in the reuse and combination of knowledge representations from both PS and MIP domains. On the one hand, considering PS as a problem-solving task, I have adapted the general model of PS developed in ORION to fit MIP specifics. On the other hand, I have enriched the expertise enclosed in the PS system thanks to a formalisation of the knowledge and reasoning process involved in the skilled use of MIP.

  I have designed a *PS system for MIP* (MedIA), suitable to take into account the rich, non-exhaustive and evolving character of the MIP domain. Following MIP experts' reasoning process, the *engine* of this system implements a PS strategy that mixes skeletal plan refinement, abstract step solving and operator-based plan adaptation. Besides, it integrates the *knowledge* specific to MIP domain; in particular, data and domain objects are represented under different perspectives, structured according to the role of each piece of information for the supervision strategy [4]. I have implemented this PS system within our componential platform for knowledge-based system development. This way, I have participated to its improvement and to a better specification of the reusable problem-solving components it provides [3].

  Both to specify needs in PS and to validate my solutions, I study *two applications*, based on different approaches of MIP. My first study is led in collaboration with the I.N.S.E.R.M. (French National Institute for Health and Medical Research) Unit 66 (Biomedical morphological and functional imaging group, directed by R. Di Paola), which has now become Unit 494 (Quantitative Medical Imaging

team, directed by Pr. A. Todd-Pokropek), Paris, France. It concerns Factor Analysis of Medical Image Sequences, for NM/MRI dynamic sequences [2]. An extension is in progress, in collaboration with Cermep-Creatis, Hospital for Neuro-cardiology, Lyon, France. My second study [6] concerns an application of brain segmentation on 3D MRI images based on computer vision methods (mainly mathematical morphology), in collaboration with the Epidaure team at Inria-Sophia Antipolis.
A last part of my work concerns the phase of execution control performed by a PS engine. To meet information exchange, process synchronisation and user interaction requirements for applications designed to run in an autonomous way, I have developed a proxy mechanism, inspired by domains such as distributed applications and multi-agent systems.
- **M.Sc. practical training** (6 months) at Inria-Sophia Antipolis, in collaboration with the Inserm Unit 66, Paris (F. Aubry, V. Chameroy and R. Di Paola).
  Subject : Evaluation of a knowledge-based program supervision system (Ocapi) for medical image sequence processing [1].

Professional experience:

- February to July 1994: **Engineering graduation practical training** at Aéroports de Paris, Orly, France (Paris Airports, Air Traffic Department - Radar Processing).
  Subject : Design and development of a prototype to recognise vehicles circulating on the airport grounds, using images from a video camera and an image processing system. Implementation of methods for pattern recognition, e.g. based on neural nets (C++ on PC-Windows).
- February to April 1993: **Project work** at Informatique C.D.C., France (Research, Development and Advanced Technology Department, and Information Technology Department of the Direction of Banking and Financial Affairs).
  Subject : Extension of an object-oriented prototype for financial accounting to integrate the handling of multi-currency exchanges (C++ on SUN-Sparc workstation, Sybase/Unix database).

Programming skills:

- Languages: C, C++, Le-Lisp, Prolog, Pascal, Fortran, Cobol, Sql.
- Operating systems: Unix, Ms-Dos.
- Graduation project (1993-1994): design and implementation of a Cad software, including an image synthesis module (C++), a data base (Oracle, RS-6000), a GUI (Windows-C++) and an intelligent analyser of natural language requests (Prolog).

Foreign languages:

- English: bilingual (TOEIC test in 1990; CCIFB diploma in 1990).
- Spanish: read, written, spoken.

Miscellaneous:

- Elected representative of the 110 Ph.D students at Inria-Sophia Antipolis in 1995-1996.
- Elected in the students' union (for 800 students) at EPF in 1991-92.

References:

[1] M. Crubézy. Evaluation d'un système de pilotage de programmes pour le traitement de séquences d'images médicales. Master's thesis, Université Pierre et Marie Curie, Paris VI, September 1995. (Rapport de DEA).

[2] M. Crubézy, F. Aubry, S. Moisan, V. Chameroy, M. Thonnat, and R. Di Paola. Managing Complex Processing of Medical Image Sequences by Program Supervision Techniques. In *SPIE Medical Imaging'97*, volume 3035, pages 614–625, February 1997.

[3] M. Crubézy, M. Marcos, and S. Moisan. Experiments in Building Program Supervision Engines from Reusable Components. In Henri Prade, editor, *ECAI 98. 13th European Conference on Artificial Intelligence*, volume Workshop on Applications of Ontologies and Problem-Solving Methods, pages 44–53, Brighton, UK., August 1998. John Wiley & Sons, Ltd.

[4] M. Crubézy, S. Moisan, F. Aubry, J. van den Elst, and V. Chameroy. Program Supervision in Medical Imagery. In L. Lock Lee and J. Hough, editors, *Eighth Australian Joint Artificial Intelligence Conference*, Applications Stream, pages 32–40, Canberra, November 1995.

[5] Monica Crubézy. *Extension des capacités de pilotage de programmes pour le traitement d'images médicales.* PhD thesis, Université de Nice-Sophia Antipolis, France, February 1999. Submitted.

[6] M. Thonnat, S. Moisan, and M. Crubézy. Experience in Integrating Image Processing Programs. In *Internatianal Conference on Computer Vision Systems*, Las Palmas, Canary Islands, January 1999. To be published.