

Thierry FRAICHARD

Born on Feb. 1st, 1964 in Sellières (FR), male, French citizen.

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Education

French Habilitation (HDR):

- *Contributions to Motion Planning*, March 06, Grenoble Inst. of Technology (Grenoble INP).
Expert Evaluators: Jean-Claude Latombe (Stanford University), Jean-Paul Laumond (CNRS) & Carlos Canudas (CNRS) ; Committee Members: Philippe Jorrand (CNRS), Bernard Espiau (INRIA), James Crowley (Grenoble INP) & Christian Laugier (INRIA).

PhD:

- *Motion Planning for a Nonholonomic Mobile in a Dynamic Workspace*, PhD in Computer Science, April 92, Grenoble INP. Expert Evaluators: Jean-Claude Latombe (Stanford University) & Jean-Paul Laumond (CNRS); Committee Members: Jean-Pierre Verjus (Grenoble INP), Jean-Daniel Boissonnat (INRIA) & Yves Demazeau (CNRS); Advisor: Christian Laugier (INRIA).

Other diplomas:

- Master in Computer Science (DEA), June 88, Grenoble INP, *Motion Planning in a Multi-Agent World*.
- Master in Software Engineering (DESS), June 86, Univ. Joseph Fourier, Grenoble (FR).

Professional History

- Current position: INRIA Research Scientist @ INRIA Grenoble Rhône-Alpes.
- Previous professional experiences:

Start	End	Institution	Position
Oct. 93	Present	INRIA Grenoble Rhône-Alpes	INRIA Research Scientist
June 14	May 15	Bar Ilan Univ. Ramat Gan (IL)	Guest Scientist
Sep. 07	Aug. 08	Swiss Federal Inst. of Technology (ETH), Zurich (CH)	Guest Scientist
Sep. 02	Dec. 02	Riken Inst. Tokyo (JP)	JSPS Research Fellow
Nov. 01	Dec. 01	Nanyang Technological Univ. (SG)	Tan Chin Tuan Fellow
Nov. 00	Jan. 01	Nanyang Technological Univ. (SG)	Tan Chin Tuan Fellow
Dec. 93	Nov. 94	Robotics Inst., Carnegie Mellon Univ., Pittsburgh (US)	Post-Doctoral Fellow
Sep. 91	Aug. 93	Univ. Pierre Mendès-France, Grenoble	Junior Lecturer (ATER)
Sep. 88	Aug. 91	Inst. Nat. Polytechnique de Grenoble	Doctoral Fellow

Prizes and Awards

- Honours:
 - INRIA Scientific Excellence Award*: awarded by INRIA to its top researchers [March 14],
 - IEEE Senior Membership*: awarded by IEEE to its top 10% members in recognition of their professional excellence [Feb. 09].
 - European Robotics PhD Award*: granted to my PhD student, Dizan Vasquez, by the European Robotics Network (EURON). This award is yearly given to the best Robotics PhD thesis in Europe [Apr. 09].
- Conference Paper Awards:
 - Paper [43] nominated for the best paper award at the IEEE Int. Symp. on Robot and Human Interactive Communication (RO-MAN), Edinburgh (UK) [Aug. 14].
 - Paper [67] of 2007 Int. Symp. of Robotics Research (ISRR) selected for publication in IEEE Trans. on Intelligent Transportation Systems [6].
 - Paper [86] of 2003 Int. Conf. on Field and Service Robotics (FSR) selected for publication in Int. Journal of Robotics Research [11].
 - Paper [87] of 2003 IEEE-RSJ Int. Conf. on Intelligent Robots and Systems (IROS) selected for publication in Advanced Robotics journal [12].
- Merit-Based Grants and Fellowships:
 - Japan Society for the Promotion of Science, Visiting Fellowship [02].
 - Nanyang Tech. Univ. (Singapore), Tan Chin Tuan Visiting Fellowships [00] and [01].
 - French Ministry of Research and Education, Doctoral Scholarship [88-91].

Supervision of Research Activities

I regularly supervise the work of graduate students originating from the French academic system or from foreign universities. I have also supervised the work of a number of Post-Doctoral fellows and contracted engineers. They are listed below. Unless otherwise indicated, the supervision was complete.

PhD Students

1. Matteo Ciocca, Univ. of Grenoble, *Safe Robot Motion, Expected Spring 20*. Co-supervision with Dr. Pierre-Brice Wieber.
2. Jose Grimaldo Da Silva Filho, Univ. of Grenoble, *Human-Robot Motion - An Effort-Based Approach, Expected Fall 19*.
3. Rémi Paulin, Univ. of Grenoble, *Human-Robot Motion - An Attention-Based Approach, Expected Spring 18*. Co-supervision with Prof. Patrick Reignier.
4. Muhammad Bouguerra, Univ. of Annaba (DZ), *Viability and Guaranteed Motion Safety, Expected Spring 18*. Co-supervision with Prof. Mohamed Fezari.
5. Sara Bouraine, Centre de Développement des Techniques Avancées, Algiers (DZ), *Contribution to Motion Planning in Dynamic Environments for Car-Like Robots - The Robucar Case, May 16*. Co-Supervision with Prof. Hassen Salhi.

6. Marco Polo Cruz Ramos, Tecnológico de Monterrey (ITESM), *Design of Interaction Systems for Mobile Robots Collaboration; a Marsupial Robot Team for Search and Rescue Operations Case Study*, Dec. 12. Co-Supervision with Prof. Jose-Luis Gordillo.
7. Alessandro Renzaglia, Univ. of Grenoble, *Adaptive Stochastic Optimization for Cooperative Coverage with a Swarm of Micro Air Vehicles*, Apr. 12. Co-Supervision with Dr. Agostino Martinelli.
8. Qadeer Baig, Univ. of Grenoble, *Multi Sensor Data Fusion for Detection and Tracking of Moving Objects from a Dynamic Autonomous Vehicle*, Mar. 12. Co-Supervision with Prof. Olivier Aycard.
9. Luis Martinez, Inst. Nat. Polytechnique de Grenoble (INPG), *Safe Navigation for Autonomous Vehicles in Dynamic Environments: an Inevitable Collision State (ICS) Perspective*, Nov. 10.
10. Vivien Delsart, Univ. Joseph Fourier (UJF), *Autonomous Navigation in Dynamic Environments: a Trajectory Deformation Approach*, Oct. 10.
11. Stéphane Petti, Ecole Nat. Sup. des Mines de Paris, *Safe Navigation within Dynamic Environments: a Partial Motion Planning Approach*, Jul. 07.
12. Dizan Vasquez, INPG, *Incremental Learning for Motion Prediction of Pedestrians and Vehicles*, Feb. 07.
13. Christophe Coué, INPG, *Bayesian Model for Multi-Modal Analysis of Cluttered Environments : an Automotive Application*, Dec. 03, co-supervision with P. Bessière.
14. Alexis Scheuer, INPG, *Continuous-Curvature Path Planning for Nonholonomic Mobile Robots*, Jan. 98.
15. Raphaël Mermond, INPG, *Motion Planning with Geometric Uncertainty in Sensing and Control*, June 97.
16. Philippe Garnier, INPG, *Reactive Motion Execution Control for Vehicles in Dynamic and Structured Environments*, Dec. 95. Co-Supervision with Dr. C. Laugier.

Master Students

1. Vilma Muço, Int. Master of Science in Informatics at Grenoble (MOSIG), Univ. of Grenoble, *Safe Navigation for Robots*, June 17.
2. Hang Yu, MOSIG, Univ. of Grenoble, *Safe Navigation of Biped Robots Subject to Passive Friendly Safety and Balance Constraints*, June 16. Co-supervision with Dr. Pierre-Brice Wieber.
3. Andre Van Den Berg, MOSIG, Univ. of Grenoble, *Analysis of Social Navigation for a Robot*, June 13.
4. Antoine Bautin, MOSIG, Univ. of Grenoble, *Uncertainty and Inevitable Collision States*, June 09.
5. Juan Lahera, MOSIG, *Cooperative Navigation for Car-Like Vehicles*, June 09.
6. Vivien Delsart, “Image, Vision and Robotics” Master (IVR), Univ. of Grenoble, *Motion Autonomy in Dynamic Environments: an Elastic Approach*, June 07.
7. Ouri Maler, IVR, *Multi-Robot Navigation in Urban Dynamic Environment*, June 07.
8. Rishikesh Parthasarathi, IVR, *Characterization of the Inevitable Collision States for a Car-Like vehicle*, June 06.
9. Alejandro Vargas, IVR, *Coupling On-Board and Off-Board Vision for Localization*, Sep. 04.
10. Julien Bulet, “Intelligence, Interaction and Information” Master, Univ. of Grenoble, *Motion under Uncertainty of a Mobile Robot*. Co-supervision with Prof. Olivier Aycard, June 04.
11. Dizan Vasquez, IVR, *Motion Estimation for Mobile Obstacles: A Statistical Approach*, Sep. 03.
12. Stéphane Blondin, IVR, *Motion Planning for an Automated Vehicle in a Partially Known Environment*, June 02.
13. Fabrice Vincent, IVR, *Environment Modelling and Localization for a Vehicle*, June 97.
14. Raphaël Mermond, IVR, *Path Planning for a Nonholonomic Robot under Geometric Uncertainty*, June 96.
15. Alexis Scheuer, IVR, *Nonholonomic Trajectory Planning in a Dynamic Workspace*, June 92.

Foreign Graduate Students

PhD Level:

1. Frank Moosmann, Univ. of Karlsruhe (DE), *Detecting Moving Objects Using a 3D Range Sensor*

[Nov. 08–Apr. 09].

2. Kristijan Macek, Swiss Federal Inst. of Technology (ETH), Zurich (CH) *Safe Vehicle Navigation in Dynamic Urban Environments* [Sep. 07–Aug. 08].
3. Hannah Kurniawati, Nat. Univ. of Singapore, *Motion Autonomy in Dynamic Environments: An Elastic Strip Approach* [Mar.–Aug. 06].

Master Level:

1. Carlos Di Pietro, Universidad de Buenos Aires (AR), *Design of Robot Companion* [June–Nov. 13].
2. Thomas Fisher, Univ. of Buenos Aires (AR), *Attention-Based Navigation for a Service Robot* [May–Oct. 12].
3. Nicolas Alvarez-Picco, Univ. of Rosario (AR), *Safe Navigation with Uncomplete Information* [Apr.–Sep. 10].
4. Leonardo Scandolo, Univ. of Rosario (AR), *Anthropomorphic Navigation in Dynamic Environments* [Sep. 10–Feb. 11].
5. Luis Martinez, Instituto Tecnológico Autónomo de México (ITAM), México (MX), *Inevitable Collision States*, [Aug.–Oct. 06].
6. Hugo Ortega, Tecnológico de Monterrey (ITESM), Campus Monterrey (MX), *Detecting and tracking moving objects with a pan-tilt camera* [Apr.–Jul. 04].
7. Alejandro Vargas, Tecnológico de Monterrey (ITESM), Campus Cuernavaca (MX), *Iterative motion planning in dynamic environments* [Sep. 01–Feb. 02].

Post-doctoral Fellows

1. Gang Chen, Inst. Nat. des Sciences Appliquées de Lyon (FR), *Autonomous Navigation in Dynamic Environments* [Feb. 06–Jan. 07].
2. Fernando De La Rosa, Inst. Nat. Polytechnique de Grenoble (FR), *ParkView: an Experimental platform for the interpretation of Complex Dynamic Scenes* [Sep. 03–Aug. 04].
3. Guo Dong, Nanyang Tech. Univ. (SG), *Multi-Sensor Data Fusion to Sense The Environment of a Car* [Nov. 99–Oct. 00].
4. Alain Lambert, Université de Technologie de Compiègne (FR), *Planning Safe Motion Strategies for Nonholonomic Vehicle* [Apr.–Oct. 99].

Contracted Engineers

1. Gang Chen, *Autonomous Navigation in Dynamic Environments* [Jan.–June 10].
2. Stéphane Laforêt, *Design of a Control Architecture for Autonomous Navigation* [Jan.–Dec. 07].
3. Eric Boniface, *Design of a Map Server for Dynamic Environments* [Nov. 04–Oct. 05].
4. Frédéric Hélin, *Design of a Map Server for Dynamic Environments* [Jan.–Jul. 03].
5. Gilles Liévin Gilles, *Reactive Motion Planning for Car-Like Vehicles* [Sep. 89–Aug. 90].

Engineer Interns

1. Adrian Bourgaud, Ecole Nat. Supérieure d’Informatique et de Mathématiques Appliquées de Grenoble (ENSIMAG), *Déplacement d’un robot dans une foule* [Feb.–May 13].
2. Antoine Durand-Gasselin, Ecole Nat. Supérieure de Cachan, *Inevitable Collision States: A Tool for Safety* [June–Aug. 07].
3. Frédéric Favier, Magistère Univ. Joseph Fourier de Grenoble (UJF), *Collision Detection in an Automotive Context* [Jan.–Sep. 04].
4. Joël Schaerer, Inst. Nat. des Sciences Appliquées de Lyon (INSA), *Computing Inevitable Collision States* [Aug–Dec. 03].
5. Pierre Billiau, ENSIMAG, *Steering Methods for Car-Like Vehicles* [Jul.–Sep. 01].
6. Sébastien Fave, Ecole Universitaire d’Informatique de Grenoble, *Iterative motion planning* [Jul.–Sep. 01].
7. Kok Hin Chan, Nanyang Tech. Univ. (NTU), *Planning and controlling the motion of the Cycab vehicle* [Jan.–June 00].

8. Richard Desvigne, Ecole des Hautes Etudes Industrielles de Lille, *Continuous-Curvature Path Planning for Nonholonomic Mobile Robots [June–Nov. 99]*.

Collective Responsibilities

Program Committee Membership

I regularly serve on Program Committees (see list below). In particular, I serve as an Associate Editor¹ for the two main conferences in Robotics, namely the IEEE Int. Conf. on Robotics and Automation (ICRA), and the IEEE-RSJ Int. Conf. on Intelligent Robots and Systems (IROS). I also served as an Associate Editor for the 2010 edition of the IEEE Intelligent Vehicles Symp. (IV), the premier annual forum on Intelligent Transport.

- IEEE Int. Conf. on Robotics and Automation (ICRA): *PC member since 05, Associate Editor since 09.*
- IEEE-RSJ Int. Conf. on Intelligent Robots and Systems (IROS): *PC member since 97, Associate Editor since 10.*
- Eur. Conf. on Mobile Robots (ECMR): *PC Member since 09.*
- Int. Workshop on Robot Learning and Planning (RLP) in association with RSS, Ann Harbor (US), *June 16.*
- IEEE Int. Symp. on Robot and Human Interactive Communication (RO-MAN), Kobe (JP), *Sep. 15.*
- Robotics Science and Systems Int. Conf. (RSS), Rome (IT), *July 15.*
- IFAC Symp. on Robot Control (SYROCO), Dubrovnik (HR) *Sep. 12, Associate Editor.*
- Robotics Science and Systems Int. Conf. (RSS), Los Angeles (US), *June 11.*
- IEEE Intelligent Vehicle Symp. (IV), San Diego (US), *June 10, Associate Editor.*
- Int. Symp. on Distributed Autonomous Robotic Systems (DARS), Tsukuba (JP), *Nov. 08.*
- Int. Workshop on Planning, Perception and Navigation for Intelligent Vehicles, Roma (IT), *Apr. 07.*
- IEEE Int. Conf. Robotics and Biomimetics (ROBIO), Kunming (CN), *Dec. 06; Bangkok (TH), Feb. 09.*
- Workshop on Robotics of the Mexican Encounters in Computer Science, San Luis Potosi (MX), *Sep. 06.*
- Robotics Science and Systems Int. Conf. (RSS), Philadelphia (US), *Aug. 06.*
- Iberoamerican Conf. on Artificial Intelligence, Puebla (MX), *Nov. 04.*
- Int. Symp. on Automotive Technology and Automation. Florence (IT), *June 92.*
- European Workshop on Intelligent Co-pilot. Grenoble, *Dec. 91.*

Conference Organization

I have helped in the organization of a number of international events including two high-profile Robotics conferences: Robotics Science and Systems Int. Conf. (RSS) in 08, and IEEE-RSJ Int. Conf. on Intelligent Robots and Systems (IROS) in 97. I have also set up the first two international workshops on guaranteed motion safety.

- Guaranteeing Motion Safety for Robots, workshop of the Robotics Science and Systems Int. Conf., Los Angeles (US), *June 11 (organization) <http://safety2011.inrialpes.fr>.*
- Guaranteeing Safe Navigation in Dynamic Environments, workshop of the IEEE Int. Conf. on Robotics and Automation, Anchorage (US), *May 10 (organization) <http://safety2010.inrialpes.fr>.*
- Robotics Science and Systems Int. Conf., Zürich (CH), *June 08 (local arrangements).*

¹An Associate Editor has to handle the review process of a set of papers, *i.e.* assign reviewers, assess each paper and write its review report.

- France-Korea Workshop on Advanced Driver Assistance Systems, Paris, *Dec. 05* (organization).
- France-Korea Symposia on Dependable Robotic Navigation, Seoul (KR) *Oct. 04 and Oct. 05* (organization).
- IEEE-RSJ Int. Conf. on Intelligent Robots and Systems (IROS). Grenoble, *Sep. 97* (secretary).
- European Workshop on Intelligent Co-pilot. Grenoble, *Dec. 91* (organization).

Reviewing Activities

I review papers for the main international journals and conferences in my field on a regular basis. I am also an expert evaluator for different research agencies worldwide.

Expertise

- Expert evaluator for the European Commission (6th, 7th and H2020 Framework Programs).
- Expert evaluator for the CNRS and the French Research Agency (ANR).
- Expert evaluator for the Cyprus Research Foundation.
- Expert evaluator for the Czeck Science Foundation.
- Expert evaluator for the Israel Science Foundation.
- Expert evaluator for the Research Agency of the Piemont Region, Italy.

Journals

- IEEE Trans. on Robotics (TRO).
- IEEE Trans. on Robotics and Automation (TRA).
- IEEE Trans. on Control Systems Technology (TCST).
- IEEE Trans. on Systems, Man and Cybernetics (TSMC).
- IEEE Systems Journal (ISJ).
- IEEE Trans. on Intelligent Vehicles (TIV).
- IEEE Trans. on Industrial Electronics (TIE).
- Int. Journal of Robotics Research (IJRR).
- Advanced Robotics (AR)
- Autonomous Robots (AURO).
- Journal of Field Robotics (JFR).
- Robotics and Autonomous Systems (RAS).
- IFAC Int. Journal on Mechatronics (IJM).
- Int. Journal on Robotics and Autonomous Systems (IJRA).
- Int. Journal of AI Research (JAIR).
- Int. Journal of Aerospace Engineering (IJAE).
- Revue d'Intelligence Artificielle (RIA).

Conferences

- Int. Workshop on the Algorithmic Foundations of Robotics (WAFR).
- Robotics Science and Systems Int. Conf. (RSS).
- IEEE Int. Conf. on Robotics and Automation (ICRA).
- IEEE-RSJ Int. Conf. on Intelligent Robots and Systems (IROS).
- Int. Joint Conf. on Artificial Intelligence (IJCAI).
- IEEE Intelligent Vehicle Symp. (IV).
- IEEE Conf. on Decision and Control (CDC).
- EuroGraphics (EG).
- Eur. Conf. on Mobile Robots (ECMR).
- IFAC Symp. on Robot Control (SYROCO)
- IEEE Int. Conf. on Robotics and Biomimetics (ROBIO).
- IEEE Int. Conf. on Advanced Intelligent Mechatronics (AIM).
- Int. Symp. on Distributed Autonomous Robotic Systems (DARS).
- Int. Conf. on Control, Automation, Robotics and Vision (ICARCV).
- IEEE Int. Symp. on Assembly and Task Planning (ISATP).
- IEEE Int. Conf. on Advanced Robotics (ICAR).

- IEEE/IEEJ/JSAI Int. Conf. on Intelligent Transportation Systems (ITSC).
- Int. Conf. on Intelligent Autonomous Systems (IAS).
- Iberoamerican Conf. on Artificial Intelligence (IBERAMIA).

Community Service

Whenever possible, I get involved in the life of my host institutions (primarily by sitting on different institutional committees). I am currently a member of the Technological Development Committee, the IT Service Committee and the Center Committee of the INRIA Grenoble Rhône-Alpes Research Center. I was also co-responsible of the “Graphics, Vision and Robotics” track of the Int. Master of Science in Informatics at Grenoble (MOSIG).

- INRIA Grenoble Rhône-Alpes IT Service Committee², [Jan. 12-Present].
- INRIA Grenoble Rhône-Alpes Technological Development Committee³ [May 10-Present].
- INRIA Grenoble Rhône-Alpes Research Center Committee⁴ [June 16, present], [Feb. 01-Jan. 08] & [Nov. 10-May 13].
- “Graphics, Vision and Robotics” track of the MOSIG Master [Aug. 12-June 14].
- CNRS-GRAVIR Laboratory Committee [Jan. 03-Dec. 06].
- INRIA Grenoble Rhône-Alpes Health and Safety Committee⁵ [Sep. 00-Aug. 07].
- INRIA Joint Administrative Committee⁶ [Jan. 97-Dec. 99].

Since my HDR, I have been a member of the following PhD/HDR defence committees:

- Alexandre Boeuf (PhD), Univ. of Toulouse (FR), *July 17* (expert evaluator).
- Suhyeon Gim (PhD), Univ. of Clermont-Ferrand (FR), *June 17* (expert evaluator).
- Sawssen Jalel (PhD), Univ. of Toulouse (FR), *Dec. 16* (expert evaluator).
- Vicent Girbés Juan (PhD), Universitat Politècnica de València (ES), *Apr. 16* (expert evaluator).
- Jose Miguel Vilca Ventura (PhD), Univ. of Clermont-Ferrand (FR), *Oct. 15* (expert evaluator).
- Hélène Vorobieva (PhD), Univ. d’Evry (FR), *Nov. 14*.
- Jean Grégoire (PhD), Ecole Nat. Sup. des Mines de Paris, *Sep. 14* (expert evaluator).
- Asma Azim (PhD), Univ. of Grenoble, *Dec. 13* (president).
- Adam Houénou (PhD), Technological Univ. of Compiègne, *Dec. 13* (expert evaluator).
- Jim Mainprice (PhD), Univ. of Toulouse (FR), *Dec. 12* (expert evaluator).
- Sébastien Rubrecht (PhD), Univ. Pierre et Marie Curie, Paris, *Sep. 11* (president).
- Ahmed Benzerrouk (PhD), Univ. of Clermont-Ferrand (FR), *Apr. 11* (president).
- Olivier Aycard (HDR), Univ. of Grenoble (FR), *Dec. 10*.
- Pierre Avanzini (PhD), Univ. of Clermont-Ferrand (FR), *Dec. 10* (expert evaluator).
- Kristijan Macek (PhD), Swiss Federal Inst. of Technology (ETH), Zurich (CH), *Jul. 10* (expert evaluator).
- Sofiane Ahmed Ali (PhD), Univ. du Havre (FR), *Apr. 08* (expert evaluator).

I also served as an expert evaluator in the selection committee for an Associate Professor position at Univ. Polytech, Clermont-Ferrand (FR) (May 11), and in the Robotics PhD 1st Year Validation Jury of the Ecole Nat. Sup. des Mines de Paris (May 12).

Management

I have so far been involved in 26 National, European and Bilateral research projects. I was the principal coordinator of three of these. I also took the leadership of two European project workpackages.

²Comité des utilisateurs des moyens informatiques (CUMI)

³Commission du développement technologique (CDT).

⁴Comité de centre (CoC).

⁵Comité local hygiène et sécurité (CLHS).

⁶Commission Administrative Paritaire (CAP).

Research Project Coordination

1. French-Korean project Star **SafeMove**, “Dependable Robotic Navigation” [*Jan. 04–Dec. 05*].
This project involved three partners: (1) Sungkyunkwan University, Seoul (KR), (2) CNRS-LASMEA Clermont-Ferrand, and (3) INRIA Grenoble (E-MOTION group). Eleven permanent researchers (including myself) and six PhD students were primarily involved. The key purpose of the project goal was to strengthen the cooperation between France and Asia in the domain of Automated Transportation. To that end, three bilateral workshops were organized. In the wake of Safemove, two larger French-Asian projects with partners from China, Japan and Singapore were launched: (1) **FACT**, “French-Asian Cyber Transportation”, [*Nov. 05–Dec. 07*], and (2) **City-home**, “From Cyber Transportation to Mobile Service Robots”, [*Nov. 08–Dec. 11*].
2. French project Robea **ParkNav**, “Interpretation of Complex Dynamic Scenes and Reactive Motion Planning” [*Oct. 02–Sep. 05*].
This project involved six official partners: (1) LAAS-CNRS Toulouse, (2-5) INRIA Grenoble (E-MOTION, MOVI and PRIMA groups + SED support group), and (6) INRIA Rennes (LAGADIC group). Blue Eye Video, a spin-off company of PRIMA, was also involved in the project. Seven permanent researchers (including myself), three engineers, one post-doc and five PhD students were primarily involved. The purpose of the project was to study real-world modelling using vision and autonomous navigation in dynamic environments.
3. French-Mexican project Lafmi **NavDyn**, “Navigation of an Autonomous Vehicle in a Dynamic Environment” [*Oct. 02–Sep. 04*].
This project involved two partners: (1) Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM) and (2) INRIA Grenoble (SHARP group). Five permanent researchers (including myself) and three PhD students were primarily involved. The purpose of the project was to study moving object detection using vision and autonomous navigation in dynamic environments.

Research Workpackage Coordination

1. European project FP6-IST-12224 **Carsense**, “Sensing of Car Environment at Low Speed Driving”, “Sensor Data Fusion” workpackage [*Jan. 00–Dec. 02*].
CarSense was a large European project with 13 partners including major car manufacturers (BMW, Fiat, Renault) and part suppliers (Autocruise, Jena, IBEO, Thales, TRW). The “Sensor Data Fusion” workpackage involved two partners: (1) INRETS-LCPC, and (2) INRIA Grenoble (SHARP group). Three permanent researchers (including myself) and two PhD students were primarily involved. The purpose of this workpackage was to build a map of the surroundings of the CarSense vehicle.
2. European project Inco-Copernicus “Multi-Agent Robot Systems for Industrial Applications in the Transport Domain”, “Navigation of Mobile Robots” workpackage [*Feb. 97–Jan. 99*].
Copernicus was a European project with nine partners from Germany, France and Eastern Europe including Mercedes-Benz. The “Navigation of Mobile Robots” workpackage involved four partners: (1) St Petersburg University, (2) Minsk University, (3) Ufa University, and (4) INRIA Grenoble (SHARP group). Five permanent researchers (including myself), one post-doc and five PhD students were primarily involved. The purpose of this workpackage was to develop novel navigation strategies for transport vehicles.

Partnership in Research Project

1. European project H2020-ICT-645097 **COMANOID**, “Multi-Contact Collaborative Humanoids in Aircraft Manufacturing”, [*Jan. 15–Dec. 19*].
2. French action ANR-11-LABX-0025-01 **RHUM**, “Robots in Human Environments”, [*Sep. 15–Dec. 18*].
3. French project FUI **PRAMAD 2**, “Domestic Assistance Robot”, [*Sep. 11–Aug. 14*].
4. INRIA Large Scale Initiative Action **PAL**, “Personally Assisted Living”, [*Jan. 11–Dec. 14*].
5. European project FP7-ICT-246587 **INTERACTIVE**, “Accident Avoidance by Active Intervention for Intelligent Vehicles”, [*Jan. 10–June 13*].

6. French-Asian ICT project **CITYHOME**, “From Cyber Transportation to Mobile Service Robots”, [Nov. 08–Dec. 11].
7. European project FP7-IST-212154 **HAVEIT**, “Highly Automated Vehicles for Intelligent Transport”, [Feb. 08–Aug. 11].
8. European project FP6-IST-27140 **BACS**, “Bayesian Approach to Cognitive Systems”, [Jan. 06–Feb. 10].
9. European project FP6-IST-212154 **CYBERCARS 2**, “Close Communications for Cooperation between Cybercars” [Jan. 06–Dec. 08].
10. French-Asian ICT project **FACT**, “French-Asian Cyber Transportation”, [Nov. 05–Dec. 07].
11. **PROFUSION I**, “Robust and Optimized Perception by Sensor Data Fusion”, horizontal activity within the European Integrated Project FP6-507075 Prevent, “Preventive and Active Safety Applications” [Feb. 04–Jan. 08].
12. French project PREDIT3 **MOBIVIP**, “Véhicules Individuels Publics pour la Mobilité en Centre Ville” [Jan. 04–Dec. 06].
13. French projet PREDIT3 **PUVAME**, “Protection des usagers Vulnérables par Alarmes ou Manœuvres d’Evitement” [Oct. 03–Apr. 06].
14. European project FP6-IST-28487 **CYBERCARS**, “Cybernetic Cars for a New Transportation System in the Cities” [Aug. 01–Jul. 04].
15. French CNRS program “Man-Machine Cooperation For Driving Assistance” [Sep. 99–Aug. 03]
16. French project **La Route Automatisée** [Jan. 98–Dec. 01]
17. French-Russian Liapunov Inst. project, “Optimal Control For Nonholonomic Vehicles” [Jan. 97–Dec. 98].
18. French project **PRAXITELE** [May 93–June 97].
19. French CNRS “Intelligent Machines” program on driving assistance [Jan. 94–Dec. 97].
20. European project Eurêka **Prometheus Pro-Art**, “Program for a European Traffic with Highest Efficiency and Unprecedented Safety” [Jan. 87–Dec. 94].
21. European project Cost “Modelling an Autonomous Agent in a Multi-Agent World” [Jan. 88–Dec. 89].

Mobility, Collaborations

Visiting Positions

Besides my post-doctoral stay at the Robotics Inst. in Carnegie Mellon Univ., Pittsburgh PA (I was there from Dec. 93 to Nov. 94 to work with Prof. Matthew Mason on non-prehensile manipulation), I have made a number of long-term visits in different research groups worldwide.

- June 14–May 15: Guest Scientist, Robotics & Artificial Intelligence Lab., Bar Ilan Univ., Ramat Gan (IL).
Host: Prof. Gal Kaminka; Topic: Human-Robot Motion.
- Sep. 07–Aug. 08: Guest Scientist, Autonomous Systems Lab., Swiss Federal Inst. of Technology (ETH), Zürich (CH).
Host: Prof. Roland Siegwart; Topic: Safe Automated Driving.
- Sep.–Dec. 02: Japan Society for the Promotion of Science Fellow, Distributed Adaptive Robotics Research Unit, Riken Inst., Saitama (JP).
Host: Prof. Hajime Asama; Topic: Inevitable Collision States.
- Nov. 00–Jan. 01 and Nov. 01: Tan Chin Tuan Fellow, Intelligent Systems Lab., Nanyang Tech. Univ. (NTU), Singapore.
Host: Prof. Michel Pasquier; Topic: Partial Motion Planning.

Collaborations

- Prof. Gal Kaminka, Robotics & Artificial Intelligence Lab., Bar Ilan Univ., Ramat Gan (IL).

This collaboration on the topic of Human-Robot Motion started with my one-year visit at Prof. Gal Kaminka’s Lab. The primary purpose of my visit there was to explore how his computer-based cognitive models that can understand human actions and intent can be adapted to Human-Robot Motion.

- Prof. James Kuffner, Robotics Inst., Carnegie Mellon Univ., Pittsburgh (US).
This collaboration on the topic of Inevitable Collision States prompted us to organize the first workshop on *Guaranteeing Safe Navigation in Dynamic Environments* in association with the 2010 IEEE Int. Conf. on Robotics and Automation (<http://safety2010.inrialpes.fr>). It culminated in the edition of a special issue on motion safety for the *Autonomous Robot* journal [35].
- Prof. Zvi Shiller, Univ. of California, Los Angeles (US) and Univ. of Judea and Samaria, Ariel (IL).
This collaboration on the topic on Motion Safety has been going on for a several years now. Besides a joint publication [123], the primary outcome of this collaboration has been the development of several key concepts pertaining to safe motion in dynamic environments.
- Prof. Jose-Luis Gordillo, Centro de Sistemas Inteligentes, Tecnológico de Monterrey (MX).
This collaboration on the topic of autonomous navigation in dynamic environments started informally in the early 00’s. It was formalized in the framework of the French-Mexican project LAFMI NavDyn, *Navigation of an Autonomous Vehicle in a Dynamic Environment [Oct. 02–Sep. 04]*. It has recently been renewed via the PhD of Marco Polo Cruz Ramos [*Dec. 12*].
- IMARA team, INRIA Paris-Rocquencourt Research Center.
The collaboration with IMARA goes way back. We have been involved together in a number of national, European and international projects related to intelligent transport systems, *e.g.* HaveIt, Cybercars, Mobivip. Stéphane Petti, a PhD student of mine, was actually working at IMARA in Paris. The main point of this collaboration has been the transfer and the validation of the technologies I develop on the experimental platforms (road network, vehicles) available there.

Teaching

Table 1 summarizes my teaching activities. I teach on a regular basis. Besides courses directly related to my research activities, i.e. Robotics and motion planning, I am teaching in other domains as well, e.g. programming. I have been giving a yearly Motion Planning course at the graduate level (Master 2 of Univ. of Grenoble) and in the French-Mexican Summer School on Image and Robotics. In 2011, this course has been completed by two introductory Robotics courses given at the graduate (Master 1) and undergraduate (Licence 3) levels. I was also co-responsible of the “Graphics, Vision and Robotics” track of the Int. Master of Science in Informatics at Grenoble (MOSIG).

Graduate Level

- *Autonomous Robotics and Motion Planning*, Int. Master of Science in Informatics at Grenoble (MOSIG), second year, half a semester, course given in English [*08-10*] & [*15-present*].
- *Introduction to Perception and Robotics*, MOSIG, first year, half a semester, course given in English [*10-16*].
- *Advanced Motion Planning*, Doctoral course, Univ. of Grenoble, one week [*05-06*].
- *Motion Planning*, Master “Image, Vision and Robotics” (IVR), second year, Univ. of Grenoble, one semester [*01-07*].
- *Robot Programming*, IVR, second year, one semester [*94-07*].

Undergraduate Level

- *Introduction to Robotics*, Univ. of Grenoble [*Spring 11-14*].

⁷**C**: lecture; **TD**: tutorial; **TP**: lab work.

⁸Annual volume in hours (heqTD).

⁹**P**: participant; **R**: responsible.

Subject	Level	University	Type ⁷	Volume ⁸	Years	Role ⁹
Algorithms & programming	IUT Info	Grenoble II	TD-TP	41.5	88-91	P
Robot programming	Eng. 3	ENSIMAG	TD-TP	33.5	88-91	P
Algorithms & programming	IUT Info	Grenoble II	TD-TP	192	91-93	P
Robot programming	M2 IVR	ENSIMAG	TD-TP	14	94-07	R
Robot task planning	Eng. 3	Damascus (SY)	C	30	00	R
Knowledge representation	Eng. 3	Grenoble I	C-TD-TP	19	05-07	P
Artificial Intelligence	M1 Info	Grenoble I	C-TD	19	05-07	P
Robotics	Eng. 3	CNAM	C-TD-TP	4.5	01-02	R
Motion algorithms	M2 IVR	ENSIMAG	C	18	01-08	P
Motion planning	Summer School IR		C	6	00-09	R
Robot programming	Summer School ACPS	ENSIEG	C-TP	17	01-05	R
Advanced Motion planning	PhD	Grenoble I	C	18	04-06	R
Motion planning	Grad School	Zaragoza (ES)	C	30	06	R
Autonomous Robotics	M2 MOSIG	ENSIMAG	C	18	08-10	P
Introduction to Robotics	L3 Info	Grenoble I	C-TD-TP	15	10-14	R
Introduction to perception & Robotics	M1 MOSIG	ENSIMAG	C-TD-TP	22.5	10-16	R
Programming, virtual reality	High School	INPG	TP	6	11-12	P
Java project audit	L3 MIAGE	Grenoble I	TD	20	11-12	P
Motion planning	Grad School	Algiers (DZ)	C	9	13	R
Introduction to programming	Eng. 1	ENSIMAG	TP	18	12-14	P
Autonomous Robotics	M2 MOSIG	ENSIMAG	C	22.5	15-present	R

Table 1: My teaching activities in chronological order.

- *Knowledge representation*, Univ. of Grenoble [*Spring 06 and 07*] and Polytech Grenoble, one semester [*Fall 05 and 06*].
- *Robotics*, Conservatoire Nat. des Arts et Métiers (CNAM), Grenoble, half a day *May 02*.
- *Robot Programming*, Ecole Nat. Sup. d’Informatique et de Mathématiques Appliquées de Grenoble (ENSIMAG), one semester [*88–96*].
- *Computer Technology*, Inst. Univ. de Technologie (IUT), Grenoble, one semester [*88–93*].

Summer Schools

- *Motion Planning*, Summer School on Image and Robotics, various locations in France and Mexico, half a day [*00-07*].
- *Robotics and Motion Planning*, Summer School on Automatic Control for Production Systems, Grenoble, one day [*01–05*].

Invited Courses

- *Motion in Dynamic Environments*, Bar Ilan Univ., Ramat Gan (IL), half-day, *Dec. 14*.
- *Motion Planning*, Centre for Development of Advanced Technologies, Algiers (DZ), two days, *Jan. 13*.
- *Motion Planning*, Univ. of Zaragoza (ES), one week, *June 06*.
- *Robotics*, Univ. Stendhal, Grenoble, one day, *Aug. 01*.
- *Task and Motion Planning*, Inst. Supérieur des Sciences Appliquées et de Technologies (ISSAT), Damascus (SY), one week, *Feb. 00*.

Dissemination of Scientific Knowledge

Publications in Popular Journals

- Th. Fraichard. Will the driver Seat Ever be Empty?. *ERCIM News*, 109, Apr. 17.
- Th. Fraichard. Cybercar: l’alternative à la voiture particulière. *Navigation (Paris)*, 53(209), Jan. 05.
- Th. Fraichard. Motion Planning for Autonomous Car-like Vehicles. *ERCIM News*, 42, July 00.

- Th. Fraichard and I. Mazon. *Projet Sharp: Robotique en Environnement Réel*. *Bulletin de l'Association Française d'Intelligence Artificielle*, 27, Nov. 96.

Seminars for General Audiences

- *Introduction to Robotics*, lecture to high school students in Jerusalem (IL), *March 16*.
- *Introduction to Robotics*, lecture primary school students in Jerusalem (IL), *Nov. 13*.
- *How do robots move*, lecture to high school teachers in the framework of the “Informatique au Lycée” initiative, *May 13* [Video part 1 & 2].
- *How does a robot move*, lecture to high school students in Voiron (FR) in the framework of the “Informatique au Lycée” initiative, *Apr. 13*.
- In October 2010, I organized a *Robotics Show* in the 2010 edition of the Fête de la science at INRIA Grenoble Rhône-Alpes. This two-day event was very successful and attracted over 300 participants.
- *Outils pour la conduite automatique*, In'Tech seminar, Antibes, *June 04*.
- *Systèmes de transport Intelligents*, Colloquium of the Institut Français de Navigation, Paris, *Mar. 04*.

Invited Seminars for Academic Audiences

- *Formal methods will not prevent self-driving cars from having accidents*, Forum Méthodes Formelles, Toulouse (FR), *Oct. 17* [*].
- *Will the driver seat ever be empty?*, Bar Ilan Univ., Ramat Gan (IL), *Oct. 13*; Ariel Univ. (IL), *June 13*; Tel Aviv Univ. (IL), *June 13*; Technion, Haifa (IL), *Apr. 13*; LAAS Lab., Toulouse (FR), *Dec. 12*; Ben Gurion Univ., Be'er Sheva (IL), *Dec. 12*.
- *The Difficulty of Safely Navigating Dynamic Environments.*, Ariel Univ. (IL), *Dec. 09*.
- *Safe Autonomous Navigation in Open and Dynamic Envs.*, Univ. of Karlsruhe (DE), *Jul. 09*.
- *Trajectory Generation for Trajectory Deformation*, Ariel Univ. (IL), *Dec. 08*.
- *Motion Safety in Dynamic Environments*, Swiss Polytechnic Federal Inst., Zurich (CH), *Jan. 08*.
- *Dynamic Environments and Safe Motions*, Ariel Univ. (IL), *Dec. 07*.
- *Safely Navigating Dynamic Environments*, Simon Fraser Univ., Vancouver (CA), *Dec. 07*; Carnegie Mellon Univ., Pittsburgh (US), *June 07*.
- *Motion Safety for Mobile Robots*, INRIA Grenoble Rhône-Alpes, *Feb. 07*.
- *Safe Motion in Dynamic Environments*, Univ. of Zaragoza (ES), *June 06*.
- *Safe Motion Planning in Dynamic Environments*, LAAS Lab., Toulouse (FR), *Jan. 05*.
- *Motion Planning in Uncertain Environments*, INRIA Grenoble Rhône-Alpes (FR), *Nov. 04*.
- *Tools for Autonomous Navigation*, SungKyunKwan Univ., Seoul (KR) *Oct. 04*.
- *Inevitable Collision States: a Step Towards Safer Robots*, Tokyo Univ. (JP), *Dec. 02*.
- *From Path to Motion Planning*, Riken Inst., Saitama (JP), *Oct. 02*.
- *Advanced Motion Planning Tech. for Robotic Vehicles*, Nanyang Tech. Univ., Singapore, *Jan. 01*.
- *Continuous-Curvature Path Planning for Car-Like Vehicles*, Riken Inst., Saitama (JP), *Nov. 99*; Tsukuba Univ. (JP), *Nov. 99*.
- *Planning Continuous-Curvature Paths for Car-Like Robots*, Univ. of Brasilia (BR), *Nov. 98*.
- *Car-Like Robots and Moving Obstacles*, Carnegie Mellon Univ., Pittsburgh (US), *Jan. 94*.
- *Planification de mouvement en environnement dynamique*, LIFIA Lab., Grenoble (FR), *Apr. 93*.
- *Path Planning For Nonholonomic Vehicles in Structured Worlds*, LAAS Lab., Toulouse, *Mar. 91*.
- *Motion Planning in a Multi-Agent World*, Artificial Intelligence Lab., Bruxelles (BE), *Jul. 90*.

Miscellaneous

Patents

- The work with Christophe Coue on the Bayesian Occupancy Filter has yielded a French patent by INRIA: #FR0552735, *Procédé d'assistance à la conduite d'un véhicule et dispositif associé (Sep. 09)*.

- The work with Marco Polo Cruz Ramos has yielded a Mexican patent by the Tecnológico de Monterrey: #MX/E/2012/082045, *Rampa retractil automatica para carga y descarga (Dec. 12)*.

Publications

Publication Type	Count
International Journals	17
Popular Journals	4
Book Chapters	13
Editorial Works	2
Peer-Reviewed International Conferences	79
International Conferences	16
Total	131

Table 2: Publication count by type.

Table 2 summarizes my publications by type. The results of my work have been regularly published in the main international conferences in Robotics, e.g. *IEEE Int. Conf. on Robotics and Automation (ICRA)* and *IEEE-RSJ Int. Conf. on Intelligent Robots and Systems (IROS)*. I have also published chapters in reference book series, e.g. *Springer Lecture Notes in Computer Science (LNCS)* and *Springer Tracts in Advanced Robotics (STAR)*, and articles in the top international journals in the Robotics field, e.g. *Int. Journal of Robotics Research (IJRR)*, *IEEE Trans. on Robotics (TRO)* and *Autonomous Robots (AURO)*.

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