

**Rafael Murrieta-Cid**  
 Centro de Investigación en Matemáticas  
 A.P. 402, Guanajuato Gto, C.P. 36000, México  
 Phone : +52 (473) 732 7155 Ext 49662.  
 Fax: +52 (473) 732 5749.  
 e-mail: murrieta@cimat.mx

**Research interests:**

Robotics, Motion Planning, Pursuit-Evasion Games, Control Theory, Cyber-Physical Systems,  
 Computer Vision

**1. Education:**

<i>Degree</i>	<i>Thesis/Dissertation</i>	<i>University</i>	<i>Date</i>
Ph. D.	Computer Vision for Outdoor Mobile Robots	“Institut National Polytechnique” (INPT) of Toulouse France	November 1998
D.E.A.*	Computer Vision for Outdoor Mobile Robots	INPT Toulouse France	September 1995
M. Sc.	The Color as a Symbolic Identifier	Tec de Monterrey, Campus Monterrey	December 1993
B. Sc. in Physics Engineering		Tec de Monterrey, Campus Monterrey	December 1990

\* D.E.A. stands for “Diplôme d’Etudes a Profundies” Diploma of Advanced Studies, former postgraduate degree equivalent to a Master in France.

**2. Experience:**

03/06 - present                    “Investigador Titular”, in the Mathematical Computing Group at the CIMAT – Center for Mathematical Research, México.

08/04 - 01/06                    Professor and Director Mechatronics Center, Tec de Monterrey, campus Estado de México.

09/02-07/04                    Postdoctoral Research Associate in the Beckman Institute and Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign, USA.

01/00-07/02                    Assistant Professor in the Electrical Engineering Department at Tec de Monterrey, campus of México City.

11/98 -12/99                    Postdoctoral Research Affiliate in the Computer Science Department, Stanford University, USA.

04/96 -10/96                    Visiting Ph.D. Student in the Computer Science Department, Stanford University, USA.

09/94 -11/98                    Doctoral Student Researcher, in the “Groupe de Robotique et Intelligence Artificielle” (RIA) of the “Laboratoire d’Analyse et d’Architecture de Systèmes du Centre National de la Recherche Scientifique” (LAAS/CNRS), in Toulouse, France.

08/91-12/93                    Master Student and Research Assistant at Tec de Monterrey, campus Monterrey, Center of Artificial Intelligence and Center of Integrated Manufacturing Systems, México.

### 3. Ph.D. Thesis Supervision:

- Lourdes Muñoz Gómez, Exploration and Map Building with Multiple-Robots, Ph.D. Dic. 2007.
- Moisés Alencastre Miranda, Robot Navigation Under Uncertainty, Ph.D. Dic. 2007.

### 4. M.Sc. Thesis Supervision:

- Israel Becerra Durán, Pursuit-Evasion Problems Under Incomplete Information with Mobile Robots, Oct. 2009.
- Juan Pablo García Gudiño, Pursuit-Evasion Problems with Mobile Robots, May 2008.

### 5. Current Ph.D. Students:

- Judith Espinoza León, Object Search with a Mobile Manipulator Robot in 3-D Environments.
- Ubaldo Ruiz López, Pursuit-Evasion Games between a Differential Drive Robot and an Omnidirectional Agent.
- Rigoberto López Padilla, Robot Navigation Using Topological Representations of the Environment.
- Luis Manuel Valentín Coronado, Exploration and Map Building Under Uncertainty with Multiple-Heterogeneous Robots.
- Israel Becerra Durán, Search and Pursuit-Evasion Problems with Mobile Robots.

### 6. Selected Journal Publications:

- Rafael Murrieta-Cid, Ubaldo Ruiz, José Luis Marroquin, Jean-Paul Laumond and Seth Hutchinson, Tracking an Omnidirectional Evader with a Differential Drive Robot, *Journal Autonomous Robots*, special issue on Search and Pursuit/Evasion with Mobile Robots, Vol. 31, No 4, pages 345-366, November 2011.
- Judith Espinoza, Alejandro Sarmiento, Rafael Murrieta-Cid and Seth Hutchinson, Motion Planning Strategy for Finding an Object with a Mobile Manipulator in Three-Dimensional Environments, *Journal of Advanced Robotics*, Vol 25, No 13-14, pages 1627-1650, August 2011.
- Alejandro Sarmiento, Rafael Murrieta-Cid and Seth Hutchinson, An Efficient Motion Strategy to Compute Expected-Time Locally Optimal Continuous Search Paths in Known Environments, *Journal of Advanced Robotics*, Vol. 23, No 12-13, pages 1533-1560, October 2009.
- Benjamín Tovar, Rafael Murrieta-Cid and Steven LaValle, Distance-Optimal Navigation in an Unknown Environment without Sensing Distances, *IEEE Transactions on Robotics*, Vol. 23, No. 3, pages 506-518, June 2007.
- Rafael Murrieta-Cid, Teja Muppirala, Alejandro Sarmiento, Sourabh Bhattacharya and Seth Hutchinson, Surveillance Strategies for a Pursuer with Finite Sensor Range, *International Journal of Robotics Research*, Vol. 26, No. 3, pages 233-253, March 2007.
- Sourabh Bhattacharya, Rafael Murrieta-Cid and Seth Hutchinson, Optimal Paths for Landmark-based Navigation by Differential Drive Vehicles with Field-of-View Constraints, *IEEE Transactions on Robotics*, Vol. 23 No. 2, Pages 47-59, February 2007.
- Benjamín Tovar, Lourdes Muñoz-Gómez, Rafael Murrieta-Cid, Moisés Alencastre-Miranda, Raúl Monroy and Seth Hutchinson, Planning Exploration Strategies for Simultaneous Localization and Mapping, *Journal Robotics and Autonomous Systems*, Vol 54(4), pages 314-331, April 2006.
- Rafael Murrieta-Cid, Benjamín Tovar and Seth Hutchinson, A Sampling-Based Motion Planning Approach to Maintain Visibility of Unpredictable Targets, *Journal Autonomous Robots*, Vol. 19. No 3 pages 285-300, December 2005.

- (i) Rafael Murrieta-Cid, Carlos Parra and Michel Devy, Visual Navigation in Natural Environments: From Range and Color Data to a Landmark-based Model, *Journal Autonomous Robots*, Vol. 13, No. 2, pp. 143-168, September 2002.
- (j) Baptiste Marcel, Maurice Briot and Rafael Murrieta-Cid, “Calcul de Translation et Rotation par la Transformation de Fourier”, *Journal “Traitement du Signal”*, Vol. 14 No. 2, pages 135-149, 1997.

## 7. Selected Conference Publications:

- (a) Ubaldo Ruiz and Rafael Murrieta-Cid, A Homicidal Differential Drive Robot, to appear *IEEE International Conference on Robotics and Automation 2012*, Saint Paul MN, USA, May 2012.
- (b) Judith Espinoza and Rafael Murrieta-Cid, Repairing Plans for Object Finding in 3-D Environments, *IEEE/RSJ International Conference on Intelligent Robots and Systems 2011*, pages 4528-4535, San Francisco California, USA, Sept. 2011.
- (c) Lourdes Muñoz, Moises Alencastre, Rigoberto López and Rafael Murrieta-Cid, Exploration and Map-Building under Uncertainty with Multiple Heterogeneous Robots, *IEEE International Conference on Robotics and Automation 2011*, pages 2295-2301, Shanghai China, May 2011.
- (d) Israel Becerra, Rafael Murrieta-Cid and Raul Monroy, Evader Surveillance under Incomplete Information, *Proc IEEE International Conference on Robotics and Automation 2010*, pages 5511-5518, Anchorage Alaska, USA, May 2010.
- (e) Jean-Bernard Hayet, Claudia Esteves and Rafael Murrieta-Cid, A Motion Planner for Maintaining Landmark Visibility with a Differential Drive Robot, *Proc Eight International Workshop on the Algorithmic Foundations of Robotics, WAFR 2008*, Guanajuato, México, *G.S. Chirikjian et al (Eds.) Springer Tracts in Advanced Robotics, STAR 57*, pages 333-347, 2009.
- (f) Rafael Murrieta-Cid, Raúl Monroy, Seth Hutchinson, and Jean Paul Laumond, A Complexity Result for the Pursuit-Evasion Game of Maintaining Visibility of a Moving Evader, *Proc IEEE International Conference on Robotics and Automation 2008*, pages 2657-2664, Pasadena California, USA, May 2008.
- (g) Teja Muppirala, Rafael Murrieta-Cid and Seth Hutchinson, Optimal Motion Strategies Based on Critical Events to Maintain Visibility of a Moving Target, *Proc IEEE International Conference on Robotics and Automation 2005*, pages 3837-3842, Barcelona, Spain, April 2005.
- (h) Alejandro Sarmiento, Rafael Murrieta-Cid and Seth Hutchinson, A Sample-based Convex Cover for Rapidly Finding an Object in a 3-D environment, *Proc IEEE International Conference on Robotics and Automation 2005*, pages 3497-3502, Barcelona, Spain, April 2005.
- (i) Rafael Murrieta-Cid, Alejandro Sarmiento, Sourabh Bhattacharya and Seth Hutchinson, Maintaining Visibility of a Moving Target at a Fixed Distance: The Case of Observer Bounded Speed, *Proc IEEE International Conference on Robotics and Automation 2004*, pages 479-484, New Orleans, USA, April 2004.
- (j) Benjamín Tovar, Steven M. LaValle and Rafael Murrieta-Cid, Optimal Navigation and Object Finding without Geometric Maps or Localization, *Proc IEEE International Conference on Robotics and Automation 2003*, pages 464-470, Taipei, Taiwan, September 2003.
- (k) Rafael Murrieta-Cid, Carlos Parra, Michel Devy, Benjamín Tovar and Claudia Esteves, Building Multi-Level Models: From Landscapes to Landmarks, *Proc IEEE International Conference on Robotics and Automation 2002*, pages 4346-4353, Washington, USA, May 2002.
- (l) Rafael Murrieta-Cid, Héctor González and Benjamín Tovar, A Reactive Motion Planner to Maintain Visibility of Unpredictable Targets, *Proc IEEE International Conference on Robotics and Automation 2002*, pages 4242-4248, Washington, USA, May 2002.

8. **Professional Service:** Reviewer: IEEE Transactions on Robotics, International Journal of Robotics Research, Journal Autonomous Robots, Journal Robotics and Autonomous Systems, Journal Robotica. Co-organizer and lecturer of the Second Summer School France-México on Images and Robotics, Tec de Monterrey Campus Cuernava, Cuernavaca México, summer 2001. This summer school was organized by the National Institute of Research in Computer Science and Control (INRIA) France, the Tec de Monterrey, México and the Franco-Mexican Laboratory on Computer Science.
9. **Collaborators:** M. Devy, S. Hutchinson, J. C. Latombe, J. P. Laumond, S. LaValle, R. Monroy.
10. **Honors and Awards:**
  - The Romulo Garza Award (third place in Science and Technology) from the Tec de Monterrey (2011), for the paper Planning Exploration Strategies for Simultaneous Localization and Mapping, by B. Tovar, L. Munoz-Gomez, R. Murrieta-Cid, M. Alencastre-Miranda, R. Monroy, and S. Hutchinson, Robotics and Autonomous Systems, Elsevier, Vol. 54, No. 4, April 2006, pp. 314-331.
  - Best paper award, 1st place, 4th Mexican International Conference on Artificial Intelligence (MICA) 2005 (432 submitted papers from 43 countries, acceptance rate 28 %), “A Framework for Reactive Motion and Sensing Planning: A Critical Events-based Approach”, Rafael Murrieta-Cid, Alejandro Sarmiento, Teja Muppirala, Seth Hutchinson, Raul Monroy, Moises Alencastre-Miranda, Lourdes Muñoz-Gomez and Ricardo Swain.
  - Best paper award, 1st place, IX Ibero-American Conference on Artificial Intelligence (IBERAMIA) 2004 (304 submitted papers from 21 countries, acceptance rate 31%), “A Multi-robot Strategy for Rapidly Searching a Polygonal Environment”, Alejandro Sarmiento, Rafael Murrieta-Cid and Seth Hutchinson.
  - Member of “Sistema Nacional de Investigadores” (SNI) México 2006-present. Level 1.
  - PhD. Dissertation selected by the LAAS/CNRS for INPT outstanding PhD. dissertations competition 1998.