

## R É S U M É

### Per-Olof Gutman

Date & place of birth:	May 21, 1949, Höganäs, Sweden
Date of immigration to Israel:	December 19, 1982
Marital Status:	Married + 4
Languages:	Swedish, English, Polish, Hebrew, German, Russian, French, Italian, (Spanish, Swahili)
Army service:	Swedish Army Language School 1967-68 + reserve duty until 1982. Final rank: Lieutenant. Israeli Navy: 1986-2001. Rank: Turai.
Web site:	<a href="http://www.technion.ac.il/~civil/gutman/">http://www.technion.ac.il/~civil/gutman/</a>

### ACADEMIC DEGREES

B.Sc.	Aug 1973	School of Engineering Physics, Lund Institute of Technology, Lund, Sweden (Sektionen för Teknisk Fysik, Lunds Tekniska Högskola).
M.Sc.	Jun 1977	Dept. of Engineering Systems, University of California, Los Angeles, U.S.A.
Ph.D.	Mar 1982	Automatic Control, School of Engineering Physics, Lund Institute of Technology, Lund
Docent	April 1988	(British equivalent: Honorary Research Fellow) Department of Automatic Control, School of Engineering Physics, Lund Institute of Technology, Lund.

## ACADEMIC APPOINTMENTS

2008	Guest professor	Department of Signals and Systems, Chalmers University of Technology, Göteborg, Sweden.
2007-	Professor	Faculty of Civil and Environmental Engineering, Technion, Haifa.
2005 – 2006	Visiting Professor <sup>1</sup>	Dipartimento di Ingegneria, Università del Sannio, Benevento, Italy (sabbatical year).
1998– 2007	Associate Prof.	Faculty of Civil and Environmental Engineering, Technion, Haifa (until 2002 with the Fac. of Agricultural Engineering)
1995-1996	Directeur de recherche CNRS associé/ Professeur associé <sup>2</sup>	Laboratoire d'Automatique de Grenoble, ENSIEG/INPG, Grenoble, France (sabbatical year).
1989	Professor	Selected, in an international competition, as Professor of Automatic Control at the Norwegian Institute of Technology, Trondheim. Position declined due to personal reasons.
1988 - 2008	Guest professor/Docent <sup>3</sup>	Division of Optimization & System Theory, Department of Mathematics, Royal Institute of Technology, Stockholm, Sweden. (1-2 months/year)
1988-1998	Senior Lecturer	Faculty of Agricultural Engineering, Technion, Haifa.
1987	Adj. Lecturer	Faculty of Electronic Systems, Tel Aviv University, Tel Aviv.
1984-1986	Adj. Lecturer	Faculty of Electrical Engineering, Technion.

<sup>1</sup> The title “Visiting Professor” was approved by Prof. Luigi Glielmo, Dean, Dipartimento di Ingegneria, Università del Sannio. The position was financed by the European Union Marie Curie Transfer of Knowledge Program.

<sup>2</sup> “Directeur de recherche CNRS associé” during the first part of my stay, “Professeur associé”, paid by INPG, during the second part. Here “associé” means that I was considered as a “directeur de recherche CNRS” and “Professeur”, respectively, but for a period limited to my stay in France. Source Prof. Luc Dugard, ex-head of Laboratoire d'Automatique de Grenoble.

<sup>3</sup> <http://www.math.kth.se/optsys/staff/staff.html>

1984	Adj. Lecturer	Department of Applied Mathematics, Weizmann Institute of Science, Rehovot.
1983-1984	Res. Assoc.	(Amit Mechkar). Faculty of Electrical Engineering, Technion, Haifa.
1982-1983	Univ. Lecturer	Department of Automatic Control, Lund Institute of Technology, Lund, Sweden.

## **PROFESSIONAL EXPERIENCE**

2009-2010	Ingénieur/Chercheur: Commissariat à l'énergie atomique; CEA-LIST DIASI/Interactive Robotics Laboratory, Fontenay-aux-Roses, France (sabbatical year).
2006-2007	Research consultant with Volvo Construction Equipment Ltd, Eskilstuna, Sweden, with Royal Institute of Technology, Stockholm.
2005	Consultant: RaySat Ltd, Lod. Control of mobile satellite antennas.
2004	Consultant: Aelis Photonics Ltd, Natanya. Automatic control for optical filters.
2003	Consultant: MES Ltd, Ceasarea. Signal processing for optical sperm measurements.
2002	Consultant: Applied Materials Inc., Rehovot. Active Scanning Electron Microscope noise cancellation.
2001	Consultant: Smart Robotics Ltd., Lavon. Window cleaning robots.
2001	Consultant: Oraccess Ltd., Natanya. Free space optics communication.
2000	Consultant. Siemens-Elementa AB, Stockholm. Respirator development.
1996-2001	Consultant: Zen Research Ltd, Ramat Gan. Optical storage technology.
1994-1999	Consultant: El-Op Electro-Optics Industries, Rehovot. Line-of-sight stabilization. Stabilized platform modeling and simulation. Development of algorithms for computer aided control design. Control Systems Design training.
1994	Consultant: Orbot Instruments, Yavne. Auto-focus algorithms.
1993	Consultant: KLA, Migdal Haemek: Stabilization of inspection table.

- 1993            Consultant: Servotech, Rishon le Zion: Robust robot control.
- 1991            Consultant: ACS, Migdal Haemek: Digital control algorithms for motion controller.
- 1990            Consultant: AAA, Ashdod: Automatic inspection machine for bottling plants.
- 1989-90        Scientist: Control Systems Section, El-Op Electro-Optics Industries, Rehovot, Israel.
- 1984-89        Senior Expert/Scientist: Control Systems Section, El-Op Electro-Optics Industries, Rehovot, Israel: Line-of-sight stabilization with mirrors and optical wedges, stabilized platforms and guns, scanners, trackers and high precision servo loops.

## **RESEARCH INTERESTS**

Control of uncertain systems with non-differentiable non-linearities;  
 Robust and Adaptive control, including identification and computer aided control systems design; Optimal control;  
 Control Applications in Agricultural and Environmental Engineering, including greenhouse control and control of water and waste water systems;  
 Process control (paper machines, aero-electric power station);  
 Control of off-road vehicles, including autonomous vehicles; Traffic control.

## **TEACHING EXPERIENCE**

“Systems engineering”: Undergraduate: Department of Signals and Systems, Chalmers University of Technology, Göteborg, Sweden (2008).

“Introduction to Control”: Undergraduate: Faculty of Agricultural Engineering, Technion, Haifa (1989-2002). Faculty of Civil and Environmental Engineering, Technion, Haifa (2002-2003, 2006-2008).

“Systems Analysis”. Undergraduate. Faculty of Civil and Environmental Engineering, Technion, Haifa (2003-).

“Introduction to Control I”: Undergraduate: Faculty of Civil and Environmental Engineering, Technion, Haifa (2003-2005).

“Control Project”. Undergraduate. Faculty of Civil and Environmental Engineering, Technion, Haifa (2001-).

“Control Laboratory”; Undergraduate: Faculty of Agricultural Engineering, Technion, Haifa (1999-2002), Faculty of Civil and Environmental Engineering, Technion, Haifa (2002-).

“Robust control design with QFT”: Graduate: El-Op Electro-Optical Industries, Rehovot (1998); Laboratoire d’Automatique de Grenoble, ENSIEG, Grenoble, France (1996); Royal Institute of Technology, Stockholm, Sweden (1996, 1999, 2002, 2005); Linköping University, Sweden (2003), Lund University, Sweden (2004); Università del Sannio, Benevento, Italy (2005); Chalmers University of Technology, Göteborg, Sweden (2007), CEA, Fontenay-aux-Roses, France (2009).

“Multivariable control design”: Graduate: Missile division of RAFAEL - Weapons Development Authority, Haifa (1994).

“Control Systems Design”: Undergraduate/graduate: Faculty of Agricultural Engineering, Technion, Haifa (1991-2002). Faculty of Civil and Environmental Engineering, Technion, Haifa (2002-).

“Systems and Control”: Undergraduate/graduate: Faculty of Agricultural Engineering, Technion, Haifa (1990-2002). Faculty of Civil and Environmental Engineering, Technion, Haifa (2002-).

“Optimal Control”: Graduate: Department of Electronic Systems, Tel Aviv University, Tel Aviv (1987).

Seminars on “Computer Aided Control Systems Design and Analysis” for undergraduate and graduate students: Department of Electrical Engineering, Technion, Haifa (1984-86).

“Adaptive Control”: Graduate: Department of Applied Mathematics, Weizmann Institute of Science, Rehovot (1984).

“Signals and Systems”: Undergraduate: Faculty of Electrical Engineering, Technion, Haifa (1983-84).

“Extension Course in Automatic Control for Engineers in Industry”: Graduate: Department of Automatic Control, Lund Institute of Technology, Lund, Sweden (1982)

“Automatic Control for Chemical Engineering Students”: Undergraduate: Department of Automatic Control, Lund Institute of Technology, Lund, Sweden (1981).

“Patterns of Problem Solving”: Undergraduate: Department of Engineering Systems, University of California, Los Angeles, U.S.A. (1977-78).

High school Mathematics teacher at Pugu Secondary School, Dar-es-Salaam, Tanzania, employed by the Swedish International Development Authority (1973-75).

## **TECHNION ACTIVITIES**

- 1992-93 Representative of the Faculty of Agricultural Engineering to the Technion Computer Committee.
- 1996 - 2002 Representative of the Faculty of Agricultural Engineering to the Technion Interdept. Committee for Quality Assurance.
- 1999 Member of the Faculty of Agricultural Engineering Dean Election Search Committee.
- 2001 - 2002 Co-ordinator of the Graduate Studies Committee of the Faculty of Agricultural Engineering, including representation to the Technion General M.E. program Committee.
- 2002 - 2005 Representative of the Faculty of Civil and Environmental Engineering to the Technion Interdepartmental Committee for Quality Assurance.
- 2002 Associated with the founding of the Swedish Technion Society, Chairman: Prof. Anders Lindquist, Royal Inst Techn, Stockholm.
- 2002 - Member of the board of the Swedish Technion Society.
- 2003 - 2005 Representative of the Faculty of Civil and Environmental Engineering to the Technion General M.E. program Committee.
- 2007 - 2009 Representative of the Faculty of Civil and Environmental Engineering to the Technion Computer Committee.
- 2008 - 2009 Member of the Technion Senate Permanent Committee for Undergraduate and Graduate Studies.

## **PUBLIC PROFESSIONAL ACTIVITIES**

- 1981 - Reviewer for the following journals: IEEE Trans. on AutomaticControl, Automatica, IEEE Trans. on Control Theory and applications, IEEE Trans. on Circuits and Systems, ASME Jour. of Dynamic Systems, Measurements & Control, IEE Journal D (Control), Int. J. Adapt Contr. & Signal Proc., Optimal Control Appl. and Methods, J. on Agricultural Engineering Research, SIAM J. of Control and Optimization, J. Food Engineering, Mathematics and Computers in Simulation, J. Process Control.
- 1985 Organized 1-day workshop on “Non-linear Control” for the Israel Association for Automatic Control.

- 1986 Organized a one-day workshop on “Feedback Control Design with the Horowitz Method” for the Israel Association for Automatic Control.
- 1988 Organized a two-day workshop on “Robust Feedback Control Design: the Horowitz Method” for Institute of Electrical and Electronics Engineers, USA, at the 27th Conference on Decision and Control, Austin, Texas.
- 1997 Organized a one-day workshop on “Robust Control with QFT” for the Israel Association for Automatic Control.
- 1997- Member of the International Federation of Automatic Control (IFAC) Technical Committee on Modeling and Control in Agricultural Processes.
- 2002 Associate Editor of Automatica which is the main journal of the International Federation of Automatic Control.
- 1999 Organized the annual Israel Association for Automatic Control Graduate Control Students’ Seminar Day.
- 1999 Organizing a one-day workshop on “Vehicle and Traffic Control” for the Israel Association for Automatic Control.
- 1999 Expert Evaluator for the European Commission CRAFT program.
- 2001 Evaluator of research proposals for the Swedish Council for Scientific Research.
- 2002-2003 Guest editor of Mathematics and Computers in Simulation.
- 2002- Member of the State of Israel Ministry of Agriculture (Chief Scientist Office) Steering Committee on Greenhouse Technologies.
- 2004 Expert Evaluator for the European Commission CRAFT program (under the 6<sup>th</sup> framework).
- 2004 - 2009 On the Board of the Israeli Association for Automatic Control.
- 2005 Co-organized 1-day workshop on “Model Predictive Control” for the Israel Association for Automatic Control.
- 2008 Evaluator for the Israel Science Foundation (Electrical Engineering)
- 2009 Expert Evaluator for the European Commission FP7 program.

## **MEMBERSHIP IN PROFESSIONAL SOCIETIES**

- 1979 – 1999 Institute of Electrical and Electronics Engineers, U.S.A.  
1999 – Senior Member, Institute of Electrical and Electronics Engineers, U.S.A.

## **HONORS**

- 1968-69 World Union of Jewish Students Undergraduate Year Scholarship for studies at the Hebrew University, Jerusalem.  
1976-78 A Fulbright grant, a scholarship from the Sweden-America Foundation, Stockholm, and grants from various Swedish and American private foundations, for studies at the University of California, Los Angeles.  
1995 First prize, Third European Control Conference Benchmark Design Competition, Rome, Sept. 1995  
2005 Second prize, ABB Robot Control Competition, Västerås, Sweden.

## **POST-DOCTORAL STUDENTS**

- 1991-93 Salomon Oldak Host: Gutman. Oldak got his Ph.D. at the Department of Mathematics, Weizmann Institute of Science, Rehovot, Israel. Journals: [15], [18]. Present occupation: Associate Professor of Electrical Engineering, California State Polytechnic University, Pomona, California.  
1995-97 Daniele Galardini Host: Prof. Anders Lindquist, Department of Mathematics, Royal Institute of Technology, Stockholm, Sweden. Co-host: Gutman. Galardini earned his Ph.D. at the Université catholique de Louvain, Belgium. Conference: [30]. Present occupation: R&D, TRASYS Space, Bruxelles, Belgium.



- 1998            Jonas Sjöberg            Host: Gutman. Sjöberg got his Ph.D. from the Department of Electrical Engineering, Linköping University, Linköping, Sweden. Conference: [45]. Journal: [62]. Present occupation: Professor, Department of Signals and Systems, Chalmers University of Technology, Göteborg, Sweden.
- 2000-2001      Marco Ivan Ramirez Sosa Moran  
 Host: Prof. Ido Seginer, Co-host: Gutman. Got his Ph.D. from Departamento de Ingeniería Eléctrica, CINVESTAV, México, D.F., México. Conference: [71]. Present occupation: Profesor, Departamento de Ingeniería Mecánica y Mecatrónica, Instituto Tecnológico de Monterrey, Campus Estado de México, Monterrey, México.

## DOCTORAL STUDENTS

### *Completed Theses*

- 1992            Uri Ben-Hanan            Ph.D. Primary supervisor: Prof. K. Peleg. Additional supervisor: Gutman. Thesis: “Optimal classification by time variable features.” Journals: [12], [17]. Conference: [17]. Present occupation: Professor at the Mechanics Eng Dept., ORT Braude College, Carmiel, Israel
- 1993            Claudio Baril            Ph.D. Primary supervisor: Gutman. Thesis: “Control of mechanical systems affected by friction and other nondifferentiable nonlinearities.” Journals: [15], [16], [23]. Conferences: [13], [14], [15], [20]. Present occupation: Private business, Bahia Blanca, Argentina.

1996	Noam Galperin	Ph.D. Primary supervisor: Gutman. Supervisor during Gutman's sabbatical 1995-96: Prof. A. Feuer. Thesis: "Modeling and identification of uncertain systems using Lissajou figures." Journal: [24]. Conferences: [27, 31]. Present occupation: R&D, Oren Semiconductor Ltd., Yoqne'am Illit, Israel.
1999	Rafael Linker	Ph.D. Primary supervisor: Prof. I. Seginer. Additional supervisor: Gutman. Thesis: "Fault detection and identification in greenhouses". Journals: [28], [32]. Conferences: [35], [37], [44], [49], [51], [62]. Present occupation: Faculty member, Civil and Environmental Eng., Technion, Haifa, Israel.
2000	Mattias Nordin	Ph.D. Primary supervisor: Prof. A. Lindquist, Royal Inst. of Technology, Stockholm. Additional supervisor: Gutman. Thesis: "Nonlinear backlash compensation for speedcontrolled elastic systems". Journals: [20], [22], [34], [48]. Conferences: [22], [23], [24], [25], [30], [52]. Present occupation: VP R&D, Volvo Construction Equipment, Eskilstuna, Sweden.
2005	Gianantonio Bortolin	Ph.D. Primary supervisor: Prof. A. Lindquist, Royal Inst. of Technology, Stockholm. Additional supervisor: Gutman. Thesis: "Modelling and identification of curl and twist in paper manufacturing. Journal [47]. Conference: [79]. Present occupation: R&D, Volvo Construction Equipment – Components, Eskilstuna, Sweden.
2010	Jack Haddad	Ph.D. Primary supervisor Prof. David Mahalel, co-supervisor: Gutman. Thesis: "Optimal Control for Isolated Signalized Intersections". Paper: [70]. Conference: [90, 92, 102]. Present occupation: Post-doctoral studies in Lausanne, Switzerland.

***Theses in Progress***

2011	Arkadi Lichtsinder	Ph.D. Supervisor: Gutman. "Control for mechanical systems with backlash and friction". Conferences: [94, 101]
2012	Arie Schreiber	Ph.D. Supervisor: Gutman. Thesis: "Roll-over avoidance control for off-road vehicles".

## M.Sc. AND LICENTIATE STUDENTS

### *Completed Theses*

1995	Bnyahu Cohen	M.Sc. Primary supervisor: Gutman. Thesis: "Development of efficient algorithms and their implementation in a computer program for robust control design." Journal: [48], Conference: [23]. Present occupation: Head of R&D, MES Medical Electronic Systems, Ceasarea, Israel.
1995	Rafael Linker	M.Sc. Primary supervisor: Prof. I. Seginer. Additional supervisor: Gutman. Thesis: "Simultaneous CO2 enrichment and ventilation of greenhouses." Journals: [26], [27]. Conference: [26], [32]. Continued with Ph.D., see above.
1998		Alex Liberzon M.Sc. Primary supervisor: Dr. D. Rubinstein. Additional supervisor: Gutman. Thesis: "Adaptive suspension system of a high mobility track vehicle". Journal: [31]. Conferences: [34], [38], [39]. Present occupation: Faculty member, Tel Aviv University.
1998	Jens Pettersson	Licentiate. Primary supervisor: Prof. B. Wahlberg, Royal Inst. of Technology, Stockholm. Additional supervisor: Gutman. Thesis: "On model-based estimation of quality variables for paper manufacturing". Journal: [41]. Present occupation: R&D, ABB Corporate Research, Västerås, Sweden.
2002	Eran Horesh	M.Sc. Primary supervisor: Gutman. Additional supervisor: Dr. Rami Guetta, Faculty of Agricultural Engineering, Technion. Topic: "Control of aero-electric power station". Journal: [36]. Conference: [55]. Present occupation: R&D, Rafael Ltd, Leshem, Israel.
2002	Amit Serebrennikov	M.Sc. Primary supervisor: Dr. N. Shimkin, Faculty of Electrical Engineering, Technion. Additional supervisor: Gutman. Topic: "Navigation and guidance of a man-tracking vehicle". Conference: [47]. Present occupation: R&D, Elbit Systems, Haifa, Israel.

2002	Nahum Medlinger	M.Sc. Supervisor: Gutman. Topic: "Roll-over avoidance control for off-road vehicles". Present occupation: R&D, Rafael Ltd, Akko, Israel.
2002	Gianantonio Bortolin	Licentiate. Primary supervisor: Prof. A. Lindquist, Royal Inst. of Technology, Stockholm. Additional supervisor: Gutman. Thesis: "On modeling and estimation of curl and twist in multi-ply paper board". Journal: [39]. Conference [54]. Continued with Ph.D., see above.
2006	Ilan Selig	M.Sc. Primary supervisor: Gutman. Additional supervisor: Dr. D. Rubinstein. Topic: "Steering and stability control of off-road autonomous vehicles". Present occupation: R&D, Elbit Systems Ltd., Haifa, Israel.
2006	Christelle Gaillemard	Licentiate. Primary supervisor: Prof. A. Lindquist, Royal Inst. of Technology, Stockholm. Additional supervisor: Gutman. Thesis: "Modelling of the drying section of a paper machine". Present occupation: R&D, MathCore Ltd., Linköping, Sweden.
2006	Eyal Omer	M.Sc. Supervisor: Gutman. Thesis: "Optimal design and operation of 'Energy Tower' combined with pumped storage and desalination". Journal papers: [54], [56]. Present occupation: R&D, Tahal, Tel Aviv, Israel.
2008	Yaron Greenhut	M.Sc. Supervisor: Gutman. Thesis: "Sensor fusion of GPS with omni-directional image registration for off-road autonomous vehicle path tracking." Present occupation. Elbit, Haifa, Israel.
2008	Uri Nenner	M.Sc. Supervisor Dr. Raphael Linker, Co-supervisor: Gutman. Thesis: Control of an unmanned motorcycle robot. Journal paper: [65]. Conference: [83]. Present occupation. Elbit, Haifa, Israel.

***Theses in Progress***

2013	Eliya Shaviv	M.Sc. Primary Supervisor: Prof. Amir Landsberg, Faculty of Biomedical Engineering, Technion. Additional supervisor: Gutman. "Optimal Control of cardiac assist device".
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2013 Maksim Apanasenko M.Sc. Primary Supervisor: Prof. Leonid Mirkin, Faculty of Mechanical Engineering, Technion. Additional supervisor: Gutman. "Precision control of flexible pointing antennas".

## RESEARCH GRANTS

1990-92 "Development of a smart motion controllers for precision systems." Ministry of Industry and Trade, Jerusalem. NIS 82701. Principal investigator: Gutman.

1992-93 "Optimal control of CO<sub>2</sub>-enrichment in greenhouses for melons." MOP Arava and Ministry of Agriculture. NIS 18704. Principal investigator: Prof. Ido Seginer.

1992-94 "Development of a smart motion controllers for precision systems." French-Israeli Scientific Cooperation Program, Arc-en-Ciel. Travel grants. Principal investigators: Prof. Luc Dugard, Grenoble and Gutman.

1992-97 "Optimal environmental control for indeterminate greenhouse crops." U.S.-Israel Binational Agricultural R&D Foundation, BARD. USD 101200. Principal investigators: Prof. I. Seginer and Prof. J. Jones.

1994-95 "Optimization of air distribution in aerators for biological wastewater treatment plants". Water Research Institute. USD 10000. Principal investigators: Prof. Y. Argaman, Civil Engineering, and Gutman.

1997-98 "Optimal control methods for water allocation and recycling." Joint Hebrew University in Rehovot-Technion Research Foundation. USD 2250. Principal investigators: Gutman and Prof. E. Hochman, Rehovot.

1999 "The development of a digital controller for inertial stabilization and a system for identification of faults in the components of the controller". Research grant no 160-913, funded by RAFAEL. Principal investigators: Gutman and Dr. Moshe Idan, Aerospace Engineering, Technion.

2002 - 2003 "Development of a novel method for super-intensive fish farming by controlling pH at high ammonium levels". NIS 100000 from the Israel Ministry of Agriculture, together with Noam Mozes, and Dr. Benny Ron, National Center for Aquaculture, Eilat.

2002 - 2003 "Development of a 3D flow model for the Energy Tower and its environment for large Reynolds numbers". Israel Ministry of Infrastructure. Research grant no 150-986. Principal investigator: Prof. Dan Zaslowski. Co-principal investigator: Gutman.

2003-2007 "Adaptive Decentralized Control of Plants with Delays". Israel

Science Foundation, together with Dr. Boris Mirkin, Faculty of Civil and Environmental Engineering, Technion. Research grant no 150-004. Was awarded NIS 196000 per year. Principal investigator: Gutman.

- 2003 –2004 “Design and development of the control system for the aero-electric power station”. Israel Ministry of Infrastructure. Research grant no 1004-787, 2003-511. Principal investigator: Prof. Dan Zaslowski. Co-principal investigator: Gutman. NIS 165000 per year.
- 2004 - 2005 “Off-road telerobotic vehicles”., Ministry of Defence - Mafat. Research grant no 100-5129. NIS 200000. Principal investigator: Prof. Itzhak Shmulevich Faculty of Civil and Environmental Engineering, Technion. Co-principal investigator: Gutman.
- 2004 -2005 "Stabilization and control of the seeker for an inexpensive flying platform". In co-operation with Rafael Ltd. Keren Deborah. Research grant no 1002-949. USD 25641. Principal investigator: Gutman.
- 2007-2009 "Investigation of Tracking Alternatives for the Mempile Optical Disk" In co-operation with Mempile Ltd, Neve Ilan, Israel. TRDF Research grant no 2008793. USD 28000 + VAT. Principal investigator: Gutman.
- 2007-2010 “Variable Structure Adaptive coordinated control of non-linear delayed systems (short title: Adaptive coordinated control with Variable Structure Systems/Sliding Mode Control.)” United-States-Israel Binational Science foundation, together with Prof. Yuri Shtessel, University of Alabama-Huntsville, and Dr. Boris Mirkin, Faculty of Civil and Environmental Engineering, Technion. Research grant no 2008-471. Was awarded USD 26500 per year.
- 2007-2011 “Coordination in adaptive decentralized control.” Israel Science Foundation, together with Dr. Boris Mirkin, Faculty of Civil and Environmental Engineering, Technion. Research grant no 2008-114. Was awarded NIS 206000 per year. Principal investigator: Gutman.
- 2008-2009 “MicroBAT stabilized payload.” In co-operation with Bental Industries Ltd., Kibbutz Merom Golan, Israel. TRDF Research grant no 2011132. USD 51000 + VAT. Principal investigator: Gutman.
- 2008-2009 “Signal processing and control for spectral derivatives.” In co-operation with Derivatives - Limited Partnership, Tel-Aviv, Israel. TRDF Research grant no 2011136. USD 50000 + VAT. Principal investigator: Gutman.
- 2009 "Access control for the Fast Lane". In co-operation with Netivei Ayalon Ltd., Tel Aviv, Israel. NIS 99000+VAT. Principal investigator: Gutman.

2009- "Advanced Stabilization and Pointing of Mobile Antennas for Satellite Communication" Israel Ministry of Industry, Trade and Labor (Magnetron) in cooperation with Orbit Ltd., Natanya. TRDF Research Grant no 2012537. NIS 337348 + VAT. Principal investigators: Prof. L. L. Mirkin, Technion and Gutman.

## **SIGNIFICANT PROFESSIONAL PROJECTS**

- 1984-88 Development of adaptive prediction for target tracking at El-Op Electro-Optics Industries, Rehovot. Project manager: Tuvia Sprecher.
- 1985-86 Robust and adaptive control design for a beam deflector at El-Op Electro Optics Industries, Rehovot. The beam deflector got to be produced in large numbers. Project manager: Tuvia Sprecher.
- 1986-87 Digital control design for an optical wedge system at El-Op Electro-Optics Industries, Rehovot. Project manager: Avraham Huppert.
- 1987-90 Development of stabilized platform for line-of-sight stabilization, at El-Op Electro-Optics Industries, Rehovot. Project manager: Dr. Linda Neumann.
- 1989-98 Development of state-of-the-art fire control system, at El-Op Electro-Optics Industries, Rehovot. Project manager: Moshe Ilan.
- 1990-2000 Development of methods to control electro-mechanical systems with friction and backlash. Research and development at the Technion and the Royal Institute of Technology, in co-operation with various industries. Scientific project leader: Gutman.
- 1990-2006 Modelling of quality variables for paper board manufacturing. . Research and development at the Royal Institute of Technology, in co-operation with Assi-Dom7n Carton Board Ltd, Fr3vi, Sweden. Scientific project leader: Gutman.
- 1995-96 Development of the computer program "Qsyn — the Toolbox for Robust Control Systems Design for use with Matlab," for El-Op Electro-Optics Industries, Rehovot. Project manager: Dr. Linda Neumann.
- 1997- 2001 Development of control system for optical storage, at Zen Research Ltd, Ramat Gan. Project manager: Michael Naor.

## PUBLICATIONS

### THESES

Gutman, P-O, Olsson, R: "Dynamic models for wastewater treatment plants" (in Swedish: Dynamiska modeller for vattenreningsverk). Report RE-136. Undergraduate thesis, Dept. of Automatic Control, Lund Inst. Techn., Lund, Sweden, March 1974.

Gutman, P-O: "Controllers for Bilinear and Constrained Linear Systems". CODEN: LUTFD2/(TFRT-1022)/1-133/(1982). Ph.D. thesis, Dept.of Automatic Control, Lund Inst. Techn., Lund, Sweden, Feb. 1982.

### REFEREED PAPERS IN PROFESSIONAL JOURNALS: PUBLISHED PAPERS

1. GUTMAN, P-O: "STABILIZING CONTROLLERS FOR BILINEAR SYSTEMS". *IEEE Trans. Aut Contr.*, vol. 26, pp. 917-922, 1981.
2. Gutman, P-O, Mannerfelt, C-F, Molander, P: "Contributions to the model reduction problem". *IEEE Trans. Aut. Contr.*, vol.27, pp.454-455, April, 1982.
3. GUTMAN, P-O, HAGANDER, P. "A NEW DESIGN OF CONSTRAINED CONTROLLERS FOR LINEAR SYSTEMS". *IEEE TRANS. AUT. CONTR.*, VOL. 30, PP. 22-33, Jan. 1985.
4. Gutman, P-O, Gutman, S: "A note on the control of uncertain linear dynamical systems with constrained control input". *IEEE Trans. Aut. Contr.*, vol. 30, pp. 484-486, May, 1985.
5. GUTMAN, P-O, CWIKEL, M: "Admissible sets and feedback control for discrete time linear systems with bounded controls and states". *IEEE Trans. Aut. Contr.*, vol. 31, pp 373-376, April, 1986.
6. Cwikel, M., Gutman, P-O: "Convergence of an algorithm to find maximal state constraint sets for discrete time linear systems with bounded controls and states". *IEEE Trans. Aut. Contr.*, vol. 31, pp. 457-459, May, 1986.
7. Gutman, P-O: "A linear programming regulator applied to hydroelectric reservoir level control". *Automatica*, vol.22, No.5, pp. 533-541, Sept.1986.
8. Gutman, P-O, Cwikel, M: "An algorithm to find maximal state constraint sets for discrete time linear systems with bounded controls and states". *IEEE Trans. Aut. Contr.*, vol. 32, No. 3, pp. 252-254, March, 1987.



9. Gutman, P-O., Levin H, Neumann L, Sprecher T, Venezia E: "Robust and adaptive control of a beam deflector". *IEEE Trans. Aut. Contr.*, vol. 33 (7): 610-619, 1988.
10. Yaniv, O., Gutman, P-O, Neumann, L: "An algorithm for the adaptation of a robust controller to reduced plant uncertainty". *Automatica*, vol. 26 (4): 709-720, 1990.
11. Gutman, P-O, Velger M: "Tracking targets using adaptive Kalman filtering". *IEEE Trans. Aerospace Electr. Syst.*, 26 (5): 691-699, September 1990.
12. Ben-Hanan U., Peleg K., Gutman P-O: "Classification of fruits by a Boltzmann perceptron neural network". *Automatica*, 28 (5): 961- 968, 1992.
13. Gutman P-O, Lindberg P-O, Ioslovich I Seginer I: "A non-linear optimal greenhouse control problem solved by linear programming". *J. AGR. ENG. RES.*, VOL. 55, NO. 4, 335-351, 1993.
14. Gutman P-O: "On-line parameter interval estimation using Recursive Least Squares". *International J. Adaptive Control & Signal Processing*, vol. 8, 61-72, 1994.
15. Oldak S, Baril C, Gutman P-O: "Quantitative design of a class of non-linear systems with parameter uncertainty". *Int. J. Robust & Nonlinear Control*, vol 4, 101-117, 1994.
16. Gutman P-O, Baril C, Neumann L: "An algorithm for computing value sets of uncertain transfer functions in factored real form". *IEEE Trans. Aut. Contr.*, vol. 39, no. 6, 1268-73, 1994.
17. Gutman P-O, Peleg K, Ben-Hanan U: "Classification by varying features with an erring sensor". *Automatica*, 30(12), 1943-48, 1994.
18. Ioslovich I, Seginer I, Gutman P-O, Borshchevsky M: "Suboptimal CO<sub>2</sub>-enrichment in greenhouses". *J. Agr. Eng. Research*, vol. 60, no. 2, 117-136, 1995.
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4. Gutman, P-O: "Tracking algorithm concepts: the predictor". Internal reports, El-Op, Israel Electro-Optics Industries, Rehovot, Israel, 1984, 1985.
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## OTHER PUBLICATIONS

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9. Gutman, P-O, Neumann, L: "HORPAC V1, User's guide, Preliminary version 1985-11-19". Internal report, El-Op, Israel Electro-Optics Industries, Rehovot, Israel, 1985.
10. Gutman, P-O: "Identification of an error model". Internal report, El-Op, Israel Electro-Optics Industries, Rehovot, Israel, 1986.
11. Gutman, P-O: "Automatic gain and level control for video signals". Internal report, El-Op, Israel Electro-Optics Industries, Rehovot, 1986.
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20. Weiss, I., Gutman, P-O: "Preliminary design of the control system for the Infrared Zoom". Internal report, El-Op, Israel Electro-Optics Industries, Rehovot, Israel, 1988.
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25. Gutman P.-O., Ioslovich I., Optimal Control of Water Allocation and Reuse, Faculty of Agricultural Engineering, Technion, Research Report No 152-892, 1998. Foundation for joint work of the Faculty of Agricultural Engineering, Technion and the Faculty of Agriculture, Hebrew University.

## CONFERENCES

### PLENARY OR INVITED TALKS

1. *1st European Control Conference*, Grenoble, France, July 2-5, 1991. Invited speaker: Gutman.
2. *9th IFAC/IFORS Symposium on Identification and System Parameter Estimation*, Budapest, Hungary, July 8-13, 1991. Invited speaker: Gutman.
3. *European Research Network on System Identification Symposium*, Stockholm, Sweden, 8 - 10 Sept., 1997. Speaker: Gutman.
4. *Robustness in Identification and Control RIC' 98*, Certosa di Pontignano, Siena, Italy, 30 July - 2 August, 1998. Gutman was meant to give an invited talk but a bicycle accident on 23 July in Haifa prevented his participation.
5. *Reglermöte 2000*. The bi-annual meeting of the Swedish Control Society. Uppsala, June 2000. Invited plenary speaker: Gutman.

6. *Robust Control Workshop*, Newcastle, Australia, December 2000. Invited speaker: Gutman.
7. *5th International Symposium on Quantitative Feedback Theory and Robust Frequency Domain Methods*, Pamplona, August 2001. Invited plenary speaker: Gutman.
8. *2003 XXX CIOSTA/CIGR V Conference on Management and technology applications to empower agriculture and agro-food systems*, 22-24 September 2003, University of Torino, Italy. Invited speaker: Gutman.
9. *Workshop on Dynamical Systems and Control. Center for Mathematical Sciences, Technion*, Haifa. 20-22 June 2004. Invited speaker: Gutman.
10. *MECHATRONICS 2006 - 4th IFAC-Symposium on Mechatronic Systems*, Heidelberg, Germany, 12-14 September 2006. Invited speaker: Gutman.

#### **REFEREED PAPERS IN CONFERENCE PROCEEDINGS**

1. Gutman, P-O. "Stabilizing controllers for bilinear systems". *Joint American Control Conference*, San Francisco, June, 1980.
2. Gutman, P-O. "On line use of a linear programming controller". *3rd IFAC/IFIP Symposium of Software for Computer Control*, Madrid, 5-8 Oct. 1982.
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9. Yaniv O, Gutman P-O, Neumann L: "An algorithm for adaptation of a robust controller to reduced plant uncertainty". *2nd IFAC Workshop on Adaptive Systems in Control and Signal Processing*, Lund, Sweden, July 1-3, 1986.
10. Gutman, P-O: "Robust certainty equivalence - a new principle for adaptive control". *1988 IFAC Workshop on Robust Adaptive Control*, pp. 113-118, Newcastle, Australia, August 22-24, 1988.
11. Gutman P-O, Velger M: "An adaptive Kalman filter for tracking targets with unknown process noise covariance". *27th IEEE Conf. on Decision and Control*, Austin, TX, 13-15 Dec., 1988.
12. Gutman P-O, Neumann L., Åström KJ: "Incorporation of unstructured uncertainty into the Horowitz robust design method". *IEEE Int. Conference on Control and Applications, ICCON '89*, Jerusalem, 3-6 April, 1989.
13. Gutman P-O, Baril C, Neumann L: "An image processing approach for computing value sets of uncertain transfer functions". *29th IEEE Conference on Decision and Control*, Honolulu, Hawaii, Dec. 5-7, 1990.
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16. Gutman P-O: "On-line identification of transfer function value sets". *9th IFAC/IFORS Symposium on Identification and System Parameter Estimation*, Budapest, Hungary, July 8-13, 1991. Invited paper.
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99. Mirkin B, Gutman P-O, Shtessel Y, "Adaptive Continuous Control with Sliding Mode for Plants under Nonlinear Perturbations, External Disturbances

and Actuator Failures," pp. 250-255, *11th IEEE Workshop on Variable Structure Systems*, pp. 410-415, Mexico City. Mexico, June 26-28, 2010.

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101. Lichtsinder A, Gutman P-O: "Limit cycle existence condition in control systems with backlash and friction." *8th IFAC Symposium on Nonlinear Control Systems (NOLCOS)*, WeP04.3, Bologna, Italy, September 1-3 2010.
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106. Mirkin B, Gutman P-O, Shtessel Y, " Continuous Decentralized MRAC with Sliding Mode of Nonlinear Delayed Dynamic Systems." Submitted to the 18th IFAC World Congress, 2011.
107. Ioslovich, I., Gutman P.-O., " On optimal irrigation scheduling". Submitted to the 18th IFAC World Congress, 2011.
108. Nguyen HN, Gutman P-O, Olaru S, Hovd M, "Explicit constraint control based on interpolation techniques for time-varying and uncertain linear discrete-time systems." Submitted to the 18th IFAC World Congress, 2011.

## **PARTICIPATION IN ORGANIZING CONFERENCES**

- 1993 Organized the special session, "Control of systems with non-differentiable non-linearities", International Conference on Control Theory and its Applications. Jerusalem, Israel, 18-21 Oct. 1993.
- 1996 Organized (with X. Hu) the session: "Industrial Applications of Non-linear Control Theory" at The International Symposium on the Mathematical Theory of Networks and Systems, MTNS-96, St. Louis, Missouri, USA, 24-28 June 1996.
- 1997 Member of international program committee of the International Symposium on Quantitative Feedback Theory and Robust Frequency Domain Methods and Applications, University of Strathclyde, Glasgow, 21-22 August, 1997.
- 1998 Organized (with X. Hu) the session: "Industrial Applications of Non-linear Control Theory" at the International Symposium on the Mathematical Theory of Networks and Systems, MTNS-98, Padova, Italy, June 1998.
- 1997-1999 Member of the Organizing Committee of the 7th IEEE Mediterranean Conference on Control and Automation, Haifa, 28-30 June, 1999.
- 1998-1999 Member of international program committee of the Fourth International Symposium on Quantitative Feedback Theory and Robust Frequency Domain Methods, University of Natal, Durban, South Africa, August 1999.
- 1999-2001 Chair of the Organizing Committee of the IMACS/IFAC 4th International Symposium on Mathematical Modelling and Simulation in Agricultural and Bio-Industries, Haifa, 12-14 June, 2001.
- 1999-2001 Member of international program committee of the Fifth International Symposium on Quantitative Feedback Theory and Robust Frequency Domain Methods, Public University of Navarra, Pamplona, Spain, August 2001.
- 2004 Member of the organizing committee of the First Swedish-Israeli Control Workshop, Royal Institute of Technology, Stockholm, Sweden, 27-28 September, 2004.

- 2006 Co-organized 2-day workshop on clutch control at Università del Sannio, Benevento, Italy, 25-26 May 2006.
- 2006-2007 Chair of the international program committee of the IFAC Conference Agricontrol 2007 in Croatia, 3-6 Sept 2007.
- 2006–2007 General chair of the Eighth International Symposium on Quantitative Feedback Theory and Robust Frequency Domain Methods, the Weizmann Institute, Rehovot, Israel 17-19 July 2007.
- 2008 – 2009 Member of the National Organizing Committee for the 6th IFAC Symposium on Robust Control Design – ROCOND 2009, Haifa, Israel, 16-18 June 2009.
- 2009– 2010 Member of the International Program Committee of the 7th IFAC Symposium on Intelligent Autonomous Vehicles (IAV 2010) Lecce, Italy, September 6-8, 2010.
- 2010 Member of the organizing committee of the Informal Workshop on - Wo-man-Robot Interaction, held at CEA, LIST DIASI/ Interactive Robotics Laboratory, Fontenay-aux-Roses, France, 13-14 Sept. 2010.