CURRICULUM VITAE AND LIST OF PUBLICATIONS

July 2011

Personal Details

Name: **Raziel Riemer**

Date and place of birth: May 8th, 1965
Urim, Israel

Regular military service: 1984-1987

Contact Information:

Work: Department of Industrial Engineering and Management
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Education

B.Sc. 1989-1993 — Ben-Gurion University of the Negev, Be'er-Sheva, Israel
MECHANICAL ENGINEERING

M.Sc. 1995-1998 — Ben-Gurion University of the Negev
INDUSTRIAL ENGINEERING
Thesis: Evaluation of Influence Target Location on Robot Repeatability
Advisor: Yael Edan

Ph.D. 2001-2006 — University of Illinois at Urbana-Champaign, IL, USA
MECHANICAL AND INDUSTRIAL ENGINEERING
Thesis: Optimization-Based Inverse Dynamics to Reduce Errors in Estimated Joint Torques
Advisor: Elizabeth T. Hsiao-Wecksler

Employment History

Faculty position (2010-present), Ben-Gurion University of the Negev, Department of Industrial Engineering and Management

Faculty position (2009-2010), Sami Shamoon College of Engineering (SCE), Department of Mechanical Engineering

Since joining SCE, Raziel has been leading the foundation of a new robotics lab (with a budget of approximately 400,000 NIS) and has been involved in the design of two additional labs: a computer- integrated manufacturing lab and a biomechanics lab. In addition, Raziel has developed and taught two new courses on Robotics and Manufacturing Technologies.

Postdoctoral studies (2007-2009), Ben-Gurion University of the Negev, Department of Industrial Engineering and Management
Advisor: Prof. Yael Edan

In cooperation with Prof. Yael Edan, Dr. Adi Ronen, and Prof. Helman Stern, Dr. Riemer is studying the level of effort needed to perform hand gestures to control a robot using electrical activity of muscles. The importance of this study is in the design of a vocabulary of gestures for human machine interface that minimizes the effort of the musculoskeletal system involved. Further, this study investigates the relations between perceived effort and subjective physiological measurement in relation to localized exertion, an area that has received minimal study.

In addition, during his postdoctoral studies, Dr. Riemer collaborated on several additional projects: An Autonomous Field Robot for Spraying and Pollinating Date Palm Trees (with Dr. Amir Shapiro, Prof. Yael Edan, and Dr. Ohad Ben-Shahar); Developing Human Biomechanical Energy Conversion Technology (with Dr. Amir Shapiro, Prof. Yael Edan, and Dr. Itzik Melzer; funded by the Israeli Ministry of Defense); Studying the Workload during Flower Picking and Packing (with Dr. Adi Ronen and Dr. Avital Bechar); and The Effect of Ankle Muscle Fatigue on Posture Stability (with Dr. Itzik Melzer).

INTEL (Jerusalem, Israel)

- **Head of Mechanical Engineering in the Computer Chip Sorting Department (1999-2001)**

  Responsibilities: Improvement of the chip production process. This included: introducing new innovations for increased production capacity and efficiency, which required designing and conducting experiments; supervising technicians and the maintenance of different types of machines; and planning and leading the implementation of the Department's sort manufacturing floor expansion (installation of approximately 40 new machines).

- **Industrial Engineer (1997-1999)**

  Responsibilities: Designing the layout for the manufacturing floor and its workstations. This included: integrating industrial and mechanical engineering aspects in chip manufacturing through the introduction of new machines and technologies; line capacity planning; developing production line strategies.

H.R.V.A.C. Consulting Engineering Co., Ltd. (Be'er-Sheva, Israel)

- **Mechanical Engineer (1993-1994)**

  Responsibilities: Air conditioning system design and consulting.

Professional Activities

(a) Professional Consulting

ZOOZ Medical – R&D consultant (regarding their ***AdvanStep*** product: a novel exercising platform for fall prevention)

Pointgrab – biomechanical analysis and consulting for a design of a computer based pointing device for laptops (virtual mouse)

(b) Membership in Professional/Scientific Societies

2002- Present – American Society of Biomechanics

Educational Activities

(a) Courses Taught

Ben-Gurion University of the Negev (Be'er-Sheva, Israel) (2007-Present)
Lecturer (Department of Industrial Engineering)

- "Introduction of Mechanical Engineering and Manufacturing Processes", Department of Industrial Engineering and Management
- "Automation" (jointly with Yael Edan)

Sami Shamoon College of Engineering (Be'er-Sheva, Israel) (2009), Lecturer (Department of Mechanical Engineering)

- "Manufacturing Processes"
- "Introduction to Robotics"

University of Illinois, Urbana-Champaign (USA) (2001-2006)
Teaching Assistant (Department of Mechanical Engineering)

- "Senior design projects"
- "Mechanical Design I"
- "Mechanical Design II"
- "Dynamic Modeling of Mechanical Components and Systems"

Ben-Gurion University of the Negev (Be'er-Sheva, Israel) (1994-2000)
Lecturer (1995-2000) (Departments of Mechanical Engineering and Industrial Engineering and Management)

- "Computer-Integrated Manufacturing"

Teaching Assistant (1994)

- "Fundamentals of Robotics in Manufacturing Systems"
- "Intelligent Automation"

Awards, Citations, Honors, Fellowships

(a) Honors, Citation Awards

- (2005) Alwin Schaller Award, awarded for Conference Presentation (at the ISB XXth Congress)
- (2004) George W. Harper Award, awarded for an Outstanding Student in the area of Safety Engineering, University of Illinois
- (2004) American Society of Biomechanics Travel Award, awarded for Conference Presentation (at the ASB 28th Annual Meeting)
- (2004) Alwin Schaller Award, awarded for Conference Presentation (at the ASB 28th Annual Meeting)
- (1992) Certificate of Excellence, in Recognition of Scholastic Achievement, Ben-Gurion University of the Negev
- (1992) Jacob's Award for High Achievement in Courses Related to Machine Design, Ben-Gurion University of the Negev
- (1987) Academic and Athletic Scholarship from Clarion University of Pennsylvania.

(b) Fellowships

1. 2008-2009 Fellowship from Ministry of Immigrant Absorption (~$17,000)

2. 2006-2008 Fellowship from VATAT – Planning and Budgeting Committee of the Israel Council for Higher Education (~$32,000)

Scientific Publications

(a) Published

1. Gimmon, Y., **Riemer, R**., Oddsson, T., Melzer., L., 2011 The effect of plantar flexor muscle fatigue on postural control, Journal of Electromyography and Kinesiology Vol. 21, Issue 6, 922-928.
2. **Riemer, R.,** Shapiro, A. 2011, Biomechanical energy harvesting from human motion: theory, state of the art, design guidelines, and future directions , Journal of NeuroEngineering and Rehabilitation. Vol. 8, 22
3. Shapiro, A., Korkidi, E., Demri, A., **Riemer, R**., Edan, Y. Ben-Shahar, O. 2009,Toward Elevated Agrobotics: An Autonomous Field Robot for Spraying and Pollinating Date Palm Trees. *Journal of Field Robotics,* Vol. 26, Issue June/July, 572-590.
4. **Riemer, R**., Hsiao-Wecksler, E. 2009. Improving Net Joint Torque Calculations through a Two-Step Optimization Method for Estimating Body Segment Parameters. *Journal of Biomechanical Engineering,* Vol. 131. 11071-11077.

5. **Riemer, R.**, Hsiao-Wecksler, E. 2008. Optimization-Based Inverse Dynamics to Reduce Errors in the Estimated Joint Torque by Finding Optimal Segment Angle Profiles. *Journal of Biomechanics*, Vol. 41, Issue 7, 1503-1509.
6. **Riemer, R.**, Hsiao-Wecksler, E., Zhang, X. 2008. An Analysis of Uncertainties in Inverse Dynamics Solutions Using 2D Model. *Gait and Posture*, Vol. 27, Issue 4, 578-588.
7. **Riemer, R.**, Edan, Y. 2000. Evaluation of Influence of Target Location Robot Repeatability. *Robotica*, Vol. 18, 443-449.
8. **Riemer, R.**, Edan, Y. 1999. Evaluation of Robot Performance, *Machines and Industry*, Vol. 60, 71-74. (in Hebrew)

(b) Classified Articles and Reports

1. **Riemer, R**., Shapiro, A., Ben-Yaacov, S. 2011. Human Biomechanical Energy Conversion Technology, second phase report (Aug 2011) for Administration of Research and Development of Weapons and Infrastructure Technology, Israel.

2. **Riemer, R**., Edan, Y., Shapiro, A., Melzer, I. 2010. Human Biomechanical Energy Conversion Technology, second phase report (Aug 2010) for Administration of Research and Development of Weapons and Infrastructure Technology, Israel.

3. **Riemer, R**., Edan, Y., Shapiro, A., Melzer, I. 2009. Human Biomechanical Energy Conversion Technology, first phase report (March 2009) for Administration of Research and Development of Weapons and Infrastructure Technology, Israel.

Lectures and Presentations at Meetings and Invited Seminars

(a) Presentation and Papers at Conferences/Meetings

Scherzter, E., **Riemer, R**., (2011) Meta-analysis to predict metabolic cost as a function of walking speed and added mass at different Body locations**,** Proceedings of *ASB 35 Annual Meeting*, long beach, CA, August.

Riemer, R., Shapiro, A. (2010). Choosing optimal gear and a generator for a knee biomechanical energy harvester. *Proceedings of the Israeli Conference of Robotics*, Herzlia, Israel.

Riemer, R., Shapiro, A., & Azar, S. (2010). Optimal Gear and Generator Selection for a Knee Biomechanical Energy Harvester. *Proceedings of the 1st International Conference on Applied Bionics and Biomechanics*, Venice, Italy, October.

Riemer, R. (2010). Is subjects' joint torque variability related to joint torque error? Proceedings of *ASB 34 Annual Meeting*, Providence, RI, August.

Riemer, R., Ronen, A., Stern, H., Melzer, I., Edan, Y. (2008). Evaluation of physical stress during hand gestures for controlling robots using subjective and objective measurements, *Proceedings of the Israeli Conference of Robotics*, Herzlia, Israel.

Riemer, R., Ronen, A., Stern, H., Edan, Y. (2008). Evaluation of Physical Stress During Hand Gestures for Human Machine Interaction, *Proceedings of the North American Congress on Biomechanics,* Ann Arbor, Michigan, August.

Riemer, R., Hsiao-Wecksler, E. (2007). Reducing Errors in Inverse Dynamics-Based Joint Torques through Optimized Body Segments Parameters and Segments Motion, *Proceedings of the ASB 31 Annual Meeting,* Stanford, CA, August.

Riemer, R., Hsiao-Wecksler, E. (2007). Optimization-Based Inverse Dynamics to Reduce Errors in the Estimated Joint Torque by Finding Optimal Segment Angle Profiles, *Proceedings of the SES 2007 Annual Meeting*, College Station, Texas**,** October.

Riemer, R., Hsiao-Wecksler, E. (2007). Optimization-Based Inverse Dynamics to Reduce Effect of Errors in the Segments Kinmatics on Joint Torque Estimation, *Proceedings of the Computational Motor Control Workshop* Ben-Gurion University of the Negev.

Riemer, R., Hsiao-Wecksler, E., Zhang, X. (2005). An Analysis of Uncertainties in Full Body Inverse Dynamics Solutions, *Proceedings of the ISB XXth Congress*, Cleveland, Ohio**,** August.

Riemer, R., Lee, S., Zhang, X. (2004). Full Body Inverse Dynamics Solution: An Error Analysis and a Hybrid Approach, *Proceedings of the ASB 28 Annual Meeting*, Portland, Oregon**,** September.

Niu, P., Chapman, P**., Riemer, R**., Zhang X. (2004). Evaluation of Motions and Actuation Methods for Biomechanical Energy Harvesting, *Proceedings of the IEEE Power Electronic Specialists Conference,* Berlin, Germany**,** June.

Riemer, R., Edan Y. (1998). 3-D Evaluation of Robot Repeatability, *Proceedings of the 27th Israel Conference on Mechanical Engineering*, Haifa, May, 580-582.

(a) Seminar Presentations at Universities and Institutions

Human and Robotic Movements, Department of Mechanical Science & Engineering, University of Illinois at Urbana-Champaign, 2010

Methods for Human Motion Analysis and Energy Harvesting Application, Dept of Mechanical Engineering, Tel Aviv University, 2009

Methods for Human Motion Analysis and Application, Department of Biomedical Engineering, Ben-Gurion University of the Negev, 2008

Methods and Equipment for Human Motion Analysis and Application, Medical School, Ben-Gurion University of the Negev, 2008

Optimization–Based Inverse Dynamics to Reduce Errors in Estimated Joint Torques, Intelligent Systems Seminar, Ben-Gurion University of the Negev, 2007

Synopsis of Research

My expertise in analysis, modeling and simulation combined with my professional experience can contribute significantly to research in manufacturing engineering, specifically in intelligent automation, sensors, computer manufacturing, and process engineering. I have a strong combined experimental and applied research orientation focused on systems engineering and analysis. In the areas of biomechanics and robotics, my work centers on analysis, modeling, and simulation of human movement. I take a multi-method approach, and integrate theoretical and experimental methods in my research. The theoretical methods used in my studies include: simulation, models of rigid body dynamics, and optimization (e.g., Riemer and Hsiao- Wecksler, 2008). The experimental work I have performed includes the measurement of motion parameters and its relation to movement under various conditions (e.g., Riemer and Edan, 2000; Riemer, Hsiao-Wecksler, and Zhang, 2008).

In the area of robotics, my research deals with robot development, focusing on systems engineering (including: optimal system design and analysis of system performance (e.g., Riemer and Edan, 2000), and indentifying bottlenecks that limit the system performance (e.g. Shapiro, Korkidi, Demri, Riemer, Edan, and Ben-Shahar, 2009). In addition, I am working on research and development of

legged robots (including various approaches for locomotion, development of motion algorithms, and combining sensor information and control). These studies use simulation, sensitivity analysis, and system and experimental design (Shapira and Riemer; grant). Other studies in the area of robotics (Shapiro, Korkidi, Demri, Riemer, Edan, and Ben-Shahar, 2009) deal with developing agricultural robots (for vineyards and palm tree spraying), as well as legged robots that have a wide range of applications.

In the area of biomechanics, I focus on understanding human movement and applying these insights in applicable contexts. One of my main projects in this area deals with using human movement for energy harvesting–energy which can eventually be utilized to power electrical devices (Niu, Chapman, Riemer, and Zhang, 2004).. This project has attracted much interest and has been funded by the Administration of Research and Development of Weapons and Infrastructure Technology (MAFAT grant).

My research has implications for ergonomics (e.g., Riemer, Ronen, Stern, Melzer, and Edan, 2008), robotics (e.g., Riemer and Edan, 2000), and biomechanical energy harvesting (e.g., Niu, Chapman, Riemer, and Zhang, 2004). The studies in the area of new methods for biomechanics motion analysis can help improve the estimated accuracy of the joint torques (e.g., Riemer, Hsiao-Wecksler, and Zhang, 2008; Riemer and Hsiao-Wecksler, 2008, 2009). These torques are used to understand the loads on humans. In addition, this knowledge is important in designing physical human-machine interfaces (MAFAT grant).

Advisory and Guidance of Students

Name	For degree	With	
Eliran Scherzter	MSc. In IE		Biomechanical Energy Conversion
Iris Shalit	MSc. In IE		Walking quadruped robot
Sarai, Mizrachi	MSc. In IE		Biomechanical Energy Conversion
Zeev Rubinshtein	MSc. In EE	S. Ben-Yaakov	Biomechanical Energy Conversion
Eddie Zisser	MSc. In ME	Amir Shapiro	Pneumatic quadruped robot

Present Academic Activities

Research in Progress

Development of a biomechanical energy conversion device.
Other participants: Amir Shapiro, and Itzik Melzer
Expected date of completion: 2011
I originated this concept (Niu, Chapman, Riemer, and Zhang, 2004)), initiated and wrote the proposal for it, handled all correspondence with MAFAT, and am the research project leader.

Development of a walking robot: Locomotion algorithms and systems engineering
Other participants: Amir Shapiro
Expected date of completion: 2011
In this project, I focus on the locomotion (walking, running) algorithms, and in addition, I am also heavily involved in the systems engineering.

An autonomous field robot for spraying and pollinating date palm trees
Other participants: Amir Shapiro, Yael Edan, Ohad Ben-Shahar
Expected date of completion: 2011
I am responsible for the systems engineering of this project and was involved in simulation analysis and experiments.

Contributors for workload during vegetable picking, packing, and work flow analysis.
Other participants: Avital Bechar.
Expected date of completion: 2011
I contribute to the experimental design, data analysis, development of a mathematical model (including simulation) to predict the output of the workers and the production operations as a function of environmental condition (e.g., temperature, radiation) and other factors, such as time of day, rest, etc.
Further in this project we are evaluating the biomechanical work load.