Jumana M. Abu-Khalaf

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Education

UNIVERSITY OF UTAH   Salt Lake City, UT, USA
Ph.D. in Mechanical Engineering - Robotics Track   May 2012
Dissertation Title: Optimization of Stretchable Fingernail Sensor
Design for Fingertip Force Direction Estimation. (GPA: 3.775/4.0)
Advisor: Dr. Stephen Mascaro

UNIVERSITY OF JORDAN   Amman, Jordan
B.Sc. in Mechatronic Engineering   Feb 2005
Senior Design Project Title: Axis Control for SCARA Type Robot.
(GPA: 3.21/4.0)
Advisors: Dr. Khaldoun Tahboub and Dr. Musa Abdullah

ROSARY COLLEGE   Amman, Jordan
General Secondary Examination (Tawjihi average: 92.3%)   2000

Awards and Honors

The University of Utah's Biocentric Robotics NSF IGERT   Aug 2007- Aug 2009
Fellowship.

Experience

German Jordanian University   Madaba, Jordan
Department of Mechatronics Engineering   Sep 2012- current

Assistant Professor

Teaching: Instrumentation & Measurements, and Introduction to Robotics.

University of Utah   Salt Lake City, UT, USA
Department of Mechanical Engineering   Aug 2005- Jan 2012

Graduate Research Assistant- BioRobotics Lab

Designed a stretchable fingernail sensor prototype which optimizes the detection of fingertip touch force direction using optical reflectance photoplethysmography. Experimentally determined the optimal optical parameters for the transmittance of light through the human fingernail bed. Constructed a physically-based optical model that describes light transmittance between the sensor's optoelectronics in the fingernail area. Analyzed a photographic catalog of average human fingernail coloration patterns which resulted in an optimal optoelectronic configuration. Implemented a force direction classifier which validated the sensor's optimal design configuration. Built the stretchable fingernail sensor prototype using novel fabrication techniques. Conducted a finite element analysis to optimize the functionality of the stretchable sensor in relation to its design parameters.

Graduate Teaching Assistant   Aug 2005- Dec 2006
    o Advanced Modeling and Control   Fall '05 and Fall '06
    o State Space Methods   Spring '06

Responsibilities included setting up and supervising laboratories, and grading.

Vaasa Polytechnic   Vaasa, Finland
Mechanical and Production Engineering Department   Aug 2004- Oct 2004

Summer Intern (through IAESTE) - Technobothnia Lab

Publications and Patents

Abu-Khalaf, J. and Mascaro S., 2012, "Effects of Wavelength and Optical Path Length in Design of Fingernail Touch Force Sensing," *IEEE Sensors Journal*, vol. 13, issue 2, pp. 807-815.

Abu-Khalaf, J. and Mascaro, S., 2011, "Optimization of Fingernail Sensing Technique Based on Optical Experimentation and Modeling," *Proceedings of the IEEE Sensors Applications Symposium (SAS)*, pp. 283-288.

Abu-Khalaf, J. and Mascaro, S., 2010, "Optimization of Fingernail Sensor Design Based on Fingernail Imaging," *Proceedings of the SPIE Novel Optical Systems Design and Optimization XIII,* vol. 7787, 8 pages.

Abu-Khalaf, J., Park, J., Mascaro, D., and Mascaro, S., 2009, "Stretchable Fingernail Sensors for Measurement of Fingertip Force," *Proceedings of the World Haptics Conference*, pp. 625-626.

Mascaro, S., Mascaro, D., Abu-Khalaf, J., and Park, J., "Method for Fabricating a Stretchable Electronic Circuit With Embedded Optoelectronic Devices," US Patent No. 12/728,814, Filed March 2010.

Professional Services

Reviewer:
- o IEEE/RSJ International Conference on Intelligent Robots and Systems
- o IEEE Conference on Automation Science and Engineering
- o SPIE Optical Engineering Journal

Currently participating in the development of an international M.Sc. degree and long life learning framework in Mechatronics, through JIM2L TEMPUS project.

Outreach Activities

Co-instructor:
- o University of Utah's IGERT Robotics Summer Camp   Jul 2009
  for TRIO-Upward Bound Students
- o University of Utah's Youth Robotics Summer Camp   Aug 2008

Skills

Matlab data analysis, Simulink, data acquisition using LabVIEW interface software, and Finite Element Analysis (FEA) using COMSOL software.

Affiliations

Institute of Electrical and Electronic Engineering (IEEE)   April 2006-Present
IEEE Women in Engineering (WIE)   Jan 2007-Present

Research Interests

Robotics and mechatronics, bio-instrumentation, sensors and actuators, and haptics.

Languages

Excellent command of Arabic and English, and basic command of French and Turkish.