

Keynote Presentation

Actuation of Biologically Inspired Intelligent Robotics Using Artificial Muscles

Yoseph Bar-Cohen
Jet Propulsion Laboratory/Caltech
4800 Oak Grove Drive, M/S 82-105, Pasadena, CA 91109, USA
e-mail: yosi@jpl.nasa.gov Web: <http://ndcaa.jpl.nasa.gov>

Abstract

Humans throughout history have always sought to mimic the appearance, mobility, functionality, intelligent operation, and thinking process of biological creatures. Advancements in artificial muscles, artificial intelligence, artificial vision and many other biologically inspired fields are leading to many benefits to humankind. One of the newest among these fields is the artificial muscle, which is the moniker for electroactive polymers. The potential of these materials is enormous and, as challenges are addressed and new effective materials are introduced, capabilities that were considered science fiction are becoming an engineering reality. Imagine a person walking towards you where suddenly you notice something weird about him – he is not real but rather he is a robot. Your reaction would probably be “I can’t believe it but this robot looks very much like a real human” just as you would react to an artificial flower that is a good imitation. You may even proceed and touch the robot to check if your assessment is correct but, as opposed to the flower case, the robot may be programmed to respond physical and verbally. This science fiction scenario could become a reality as the current trend continues in developing biologically inspired technologies. The presented paper will cover the current state-of-the-art and challenges to making biomimetic robots using artificial muscles. In 1999, the author posed a challenge to the worldwide research and engineering community to develop a robotic arm that is actuated by artificial muscles to win an arm wrestling match against a human opponent.

Biography

Dr. Yoseph Bar-Cohen is a physicist specializing in electroactive materials and mechanism as well as ultrasonic Nondestructive Evaluation (NDE). He is a Senior Research Scientist, and Group Leader at Jet Propulsion Laboratory (JPL) responsible for the NDE and Advanced Actuators (NDEAA) (<http://ndcaa.jpl.nasa.gov/>) Lab. He is a Fellow of SPIE and ASNT. He received his Ph. D. in Physics (1979) from the Hebrew University, Jerusalem, Israel. His notable discoveries include the leaky Lamb waves (LLW) and polar backscattering (PBS) phenomena in composite materials. He made over 240 publications, numerous presentations at national and international conferences, Chaired/CoChaired 15 Conferences, has 15-registered patents and he is the (Co)editor of 3 books, including ones on Electroactive Polymers and Biomimetic Robots. He is the initiator of the SPIE Conf. on EAP, chairing it since 1999. His scientific and engineering accomplishments have earned him the 2001 NASA Exceptional Engineering Achievement Medal, the 2001 SPIE’s NDE Life Time Achievement Award, and many other honors and awards.