ISMET HANDŽIĆ

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EDUCATION

University of South Florida *August 2014*
Ph.D. in Mechanical Engineering (Advisor: Dr. Kyle B. Reed)
· Thesis: *Analysis and Application of Passive Gait Rehabilitation Methods*
· Member of ASME, IEEE, CARRT and SASE
· Overall GPA: 3.5

University of South Florida *May 2011*
M.S. in Mechanical Engineering (Advisor: Dr. Kyle B. Reed)
· Thesis: *Design and Testing of a Motion Controlled Gait Enhancing Mobile Shoe*
· Member of ASME and IEEE
· Overall GPA: 3.5

University of Kentucky / Western Kentucky University *May 2009*
B.S. in Mechanical Engineering
· Senior Design: *Passive Residential Roof Cooling*
· Minor in Mathematics
· Minor in Entrepreneurship
· Member of ASME and ASHRAE
· Overall GPA: 3.3

RESEARCH EXPERIENCE

Kinetic Shapes 2012-2013
University of South Florida

I developed kinetic shapes (KS), which are irregularly shaped objects that when placed on a flat surface exert predicted ground reaction forces when a known weight is applied at the axle rotation point. 2D and 3D kinetic shapes can be applied to a broad range of applications including gait manipulation, robotics, force manipulation, mechanical self-stabilization, or musical mechanics.

Passive Dynamic Synchronization of Uncoupled and Dissimilar Systems 2013
University of South Florida

I developed a generalized passive synchronization technique, which enables two dynamic systems to generate the same motion without any physical interaction or mediating control laws. Given identical degrees of freedom, initial conditions, and applied force, two or more dissimilar uncoupled systems can be derived to synchronize.

Passive Dynamic Walking 2012-2013
University of South Florida

A PDW is an entirely mechanical device that is able to exhibit a human-like steady and stable gait down a decline purely due to gravitational forces and no other energy input. PDWs can be used for gait analysis and gait manipulation methods. I derived a passive dynamic walker (PDW) model with unique variable curve foot model in order to predict human walking parameters including the most efficient human foot and prosthetic foot roll-over shapes.

Gait Enhancing Mobile Shoe 2009-2011

University of South Florida

Hemiparesis is a frequent and disabling consequence of stroke and can lead to asymmetric and inefficient walking patterns. I am a co-inventor of the Gait Enhancing Mobile Shoe, a device that mimics the actions of the split-belt treadmill, can be used during overground walking, thus enabling long-term training and gait rehabilitation.

PUBLICATIONS

[1] **Ismet Handžić**, 2014 (1 Year Delayed Release). "Analysis and application of passive gait rehabilitation methods". PhD thesis, University of South Florida.

[2] **Ismet Handžić**, and Reed, K. B., 2014. "Uncanny gait in biped walking". *Frontiers in Psychology*, p. (Under Review).

[3] **Ismet Handžić**, and Reed, K. B., 2014. "The musical kinetic shape: A variable tension string instrument". *Applied Acoustics,* **85**, pp. 143–149.

[4] **Ismet Handžić**, Muratagić, H., and Reed, K. B., 2014. "Passive kinematic synchronization of uncoupled rotating systems". *Physica D: NonLinear Phenomena*, p. (Under Review).

[5] **Ismet Handžić**, and Reed, K. B., 2014. "Kinetic shapes: Analysis, verification, and applications". *ASME Journal of Mechanical Design,* **136**(6), p. 061005.

[6] **Ismet Handžić**, and Reed, K. B., 2014. "The 'chopstick' illusion: A simply demonstrated tactile illusion". In 2014 World Haptics Symposium.

[7] Reed, K. B., **Ismet Handžić**, and McAmis, S., 2014. *Home-based Rehabilitation: Enabling Frequent and Effective Training*, Vol. 2 of *Neuro-robotics: From brain machine interfaces to rehabilitation robotics, Trends in Augmentation of Human Performance*. Springer. ISBN: 978-9-4017-8931-8.

[8] **Ismet Handžić**, and Reed, K. B., 2013. "Comparison of the passive dynamics of walking on ground, tied-belt and split-belt treadmills, and via the gait enhancing mobile shoe (GEMS)". In IEEE Int. Conf. Rehabilitation Robotics (ICORR), Seattle, USA.

[9] **Ismet Handžić**, and Reed, K. B., 2013. "Validation of a passive dynamic walker model for human gait analysis". In Intl. Conf. of the IEEE Engineering in Medicine and Biology Society (EMBC). Osaka, Japan.

[10] **Ismet Handžić**, Vasudevan, E., and Reed, K. B., May 2012. "Developing a gait enhancing mobile shoe to alter over-ground walking coordination". In IEEE In. Conf. Robotic Automation (ICRA), pp. 4142–4129.

[11] **Ismet Handžić**, and Reed, K. B., 2011. "Motion controlled gait enhancing mobile shoe for rehabilitation". In IEEE Int. Conf. Rehabilitation Robotics (ICORR), pp. 583–588.

[12] **Ismet Handžić**, Barno, E., Vasudevan, E. V., and Reed, K. B., 2011. "Design and pilot study of a gait enhancing mobile shoe". *J. of Behavioral Robotics,* **2**(4), pp. 193–201.

[13] **Ismet Handžić**, 2011. "Design and testing of a motion controlled gait enhancing mobile shoe (GEMS) for rehabilitation". Master's thesis, University of South Florida.

GRANTS AND FUNDING

National Science Fundation (NSF) Innovation Corps July 2014
Walking Crutch/Cane for Enhanced Walking Dynamics
Role: Entrepreneurial Lead
Grant Amount: $50,000
Grant Number: 1449772

- I was one of three authors for this grant proposal.
- My role as the entrepreneurial lead for this grant is to try to research and bring my patented walking assistance device (see patent section) to the market by engaging and working with potential users.

PROFESSIONAL EXPERIENCE

University of South Florida Tampa, FL
Teaching Assistant *August 2009 - Present*

- Organized and give lectures for a mechanical laboratory (dynamics, thermo-fluids, data acquisition).
- Directed, edited, and produced laboratory instructional videos for students.
- Rewrote and reorganized the entire laboratory class manual.
- Taught students to use Matlab, LaTeX, Solidworks FEA Simulation, and MS Office.
- Project, homework, report, and exam grading. Actively interacting and helping students.

Southern Kentucky Soccer Club Bowling Green, KY
Head Soccer Coach *May 2007 - August 2009*

- Managed team, created training plans, supervised assistant coaches, and scheduled games.

General Motors Corvette/XLR Assembly Bowling Green, KY
Engineering Support/Intern *May 2006 - August 2009*

- Designed and supervised the construction of various significant assembly line components for Central Engineering with little or no supervision.
- Individually designed and supervised the construction of a 'skuk' wash chassis lifting device.
- Individually developed a call center VBA Program for the quality department which saved $2800/year.
- Redesigned a limit switch sensor used detect a chassis dropped by a conveyor.
- Conducted manufacturing plant tours to visiting tourists at least once a week.

Advance Auto Parts Bowling Green, KY
Sales and Delivery *July 2006 - August 2007*

- Sold various after-market auto parts to individuals and business.
- Installed auto parts for customers.
- Delivered auto parts to car repair shops.

Pan-Oston, Inc Bowling Green, KY
Manufacturing Engineering Support *March 2005 - August 2005*

- Process time study. Developed formulas that predicted manufacturing process time for machinery. These formulas were used in production cost estimation analyses.

SKILLS

Computer Languages	Matlab/Simulink, C/C++, Visual Basic, VBA, Lua LaTeX, PLC Ladder Logic, LabView, Motek D-Flow
Mathematical Tools	Mathematica, MathCAD, Working Model
CAD Tools	SolidWorks, AutoCAD, SketchUp, Inkscape
Mechanical Tools	Drill press, lathe, mill (CNC), misc. machine shop tools, pneumatics, arc welding, gas welding, MIG welding, plasma cutting, vehicle mechanics
Motion Analysis Tools	VICON Nexus Motion and Force Analysis
Electrical Tools	Soldering, basic circuit design, Phidgets
Languages	Fluent in English, German, Bosnian (Serbo-Croatian)

CERTIFICATIONS

Fundementals of Engineering (FE/EIT) - Fl. Board of Prof. Engineers (#1100015184)
Responsible Conduct of Research (W) - Research Admin. Improvement Network, TRAIN
Certified SolidWorks Associate (CSWA) - Dassault Systemes (Solidworks) (C-SB3QWF696H)

PATENTS

Gait Altering Shoe February 2012
*United States - Patent Pending, Utility (**Licenced to Moterum, Inc.**)*

· This invention is a shoe that is able to mimic a split-belt treadmill used for gait rehabilitation, correcting the walking pattern for individuals with central nervous system damage such as stroke.

Systems and Methods for Designing Kinetic Shapes January 2014
*United States - Provisional, Utility (**Licenced to Moterum, Inc.**)*

· This invention describes the techniques to derive kinetic shapes. Among other applicaitons, 2D and 3D kinetic shapes can be utilized in robotics, gait rehabilitation, or fluid flow control.

Passive Kinematic Sync. of Dissimilar and Uncoupled Rotating Systems May 2014
United States - Provisional, Utility

· This invention describes the techniques to model and passively synchronize multiple dissimilar rotating system. Applications include dynamic system model simplification, limb movement manipulation for rehabilitation, and prosthetic kinematics manipulation.

String Vibration Frequency Altering Shape June 2014
United States - Provisional, Utility

· This invention describes the method to actively and purely mechanically change the tension of a string to change its free vibration frequency. Application of this invention is in musical acoustics and force/strain sensing through vibration analysis.

Walking Assistance Device Incld. a Curved Tip Having a Non-Constant Radius July 2014
United States - Provisional, Utility

· This invention describes a crutch or cane with a kinetic shape roll-over tip. This design can generate controlled rolling assistance or resistance depending on the passive or active crutch/cane tip definition. This invention allows users to more efficiently propagate uphill or more decent down a decline in a controlled manor.

ADVISING EXPERIENCE

Doctoral Students		
Tyagi Ramakrishnan	Altered Knee Location and Roll-over Shape Prosthetic	2014
Nellie Bonilla	Physical Passive Dynamic Walker Design	2014
Masters Students		
Phillip Hatzitheodorou	Physical Asymmetric Passive Dynamic Walker Design	2013-2014
Tyagi Ramakrishnan	Prosthetic Design Based on an Altered Knee Location	2013-2014
Jian Tao	Prosthetic Design Based on an Altered Knee Location	2012
Kevin Liu	Physical Passive Dynamic Walker Design	2012
Undergraduate Students		
Haris Muratagić	Dynamics Synchronization	2012-2014
Neven Budesa	Kinetic Shape Transport	2013-2014
Ben Matlack	Gait Efficiency Enhancing Shoe	2012
Wuthipat Brink	Gait Enhancing Mobile Shoe	2012
Laura Carpp	Gait Enhancing Mobile Shoe	2009-2010
High School Students		
Ethan Huber	Robot-Assisted Balance Trainer	2010
Kyle Dunn	Robot-Assisted Balance Trainer	2010

INVITED REVIEWER

IEEE BioRob 2012	2012
IEEE RAS Haptics Symposium 2014	2013
Robotica Journal (Cambridge Press)	2013

OUTREACH

Lab tour to pre-college Biomedical Engineering High School Program	July 2014
Lab tour to Girl Scouts Minds for Design Camp (STEM Learning)	July 2014
Lab tour to 30 Girl Scouts	July 2013
Lab tour to Chiles Elementary School	May 2012
Lab tour to 40 Girl Scouts	June 2011
Help setup and give a lab tour to 60 5th graders from Robles Elementary School	April 2011
Haptics demonstrations to two classes of 5th graders at Robles Elementary School	April 2011
Lab tour to high school students from Plant High School	July 2010

References available upon request.

Last Updated: August 12, 2014