

## Dr. Satyajit S Ambike

Department of Health and Kinesiology, Purdue University

800 West Stadium Ave, West Lafayette, IN 47907

☎: (765) 496-0567; ✉: sambike@purdue.edu

---

### EDUCATION

2006-2012 Ph.D., Mechanical Engineering, The Ohio State University, OH, USA

2005-2006 M.S., Mechanical Engineering, The Ohio State University, OH, USA

1995-1999 B.E., Mechanical Engineering, University of Pune, India

### CURRENT POSITIONS

August 2015 - Present: **Assistant professor**  
Purdue University, West Lafayette, IN  
- Co-director: Biomechanics Lab  
- Research interests in biomechanics and control of human prehension and upper-arm movement; inter-personal behavior; psychology of movement; organization of motor control

December 2019 - Present: **Faculty Associate, Center on Aging and the Life Course**  
Purdue University, West Lafayette, IN

### PROFESSIONAL EXPERIENCE

March 2012 - August 2015: **Post doctoral researcher**  
The Pennsylvania State University, University Park, PA

### AWARDS & HONORS

- [1] Outstanding Graduate Faculty Teacher, Department of Health and Kinesiology, Purdue University, West Lafayette, IN, 2018
- [2] The Ohio State University Presidential Fellowship, Autumn 2009
  - Valued in excess of \$ 37,000
  - Awarded to about 33 students university-wide annually
  - Applicants must be nominated by their parent departments

## JOURNAL PUBLICATIONS

- [1] Cui C, Muir B, Rietdyk S, Haddad JM, van Emmerik R, **Ambike S**, 2021, "Sensitivity of the toe height to multi-joint angular changes in the lower limbs during unobstructed and obstructed gait", *J App Biomech*, 37(3):XX-XX
- [2] **Ambike S**, Penedo T, Kulkarni A, Santinelli FB, Barbieri F, 2021, "Step length synergy while crossing obstacles is weaker in patients with Parkinson's disease", *Gait Posture*, 84:340-345
- [3] Cui C, Kulkarni A, Rietdyk S, Barbieri F, **Ambike S**, 2020, "Synergies in the ground reaction forces and moments during double support in curb negotiation in young and older adults", *J Biomech*, 106:109837
- [4] Naik A, **Ambike S**, 2020, "The coordination between digit forces is altered by anticipated changes in prehensile movement patterns", *Exp Brain Res*, 238:1145–1156
- [5] Tillman M, **Ambike S**, 2020, "The influence of recent actions and anticipated actions on the stability of finger forces during a tracking task", *Mot Control*, 24:365-382
- [6] Tillman M, **Ambike S**, 2018, "Expectation of movement generates contrasting changes in multifinger synergies in young and older adults", *Exp Brain Res*, 263:2765-2780
- [7] Tillman M, **Ambike S**, 2018, "Cue-induced changes in the stability of finger force-production tasks revealed by the uncontrolled manifold analysis", *J Neurophysiol*, 119:21-32
- [8] **Ambike S**, Mattos D, Zatsiorsky VM, Latash ML, 2018, "Systematic, Unintended Drifts in the Cyclic Force Produced With the Fingertips", *Mot Control*, 22:82-99
- [9] Singh T, & **Ambike S**, 2017, "A soft-contact model for computing safety margins in human prehension", *Hum Mov Sci*, 55:307-314
- [10] **Ambike S**, Mattos D, Zatsiorsky VM, Latash ML, 2016, "Unsteady steady states: Central causes of unintentional force drifts", *Exp Brain Res*, 234:3597-3611
- [11] Parsa B, **Ambike S**, Terekhov A, Zatsiorsky VM, Latash ML, 2016, "Analytical Inverse Optimization in Two-Hand Prehensile Tasks", *J Mot Behav*, 48:424-434
- [12] **Ambike S**, Mattos D, Zatsiorsky VM, & Latash ML, 2016, "Synergies in the space of control variables within the equilibrium-point hypothesis", *Neurosci*, 315:150-161
- [13] Jo HJ, **Ambike S**, Lewis MM, Huang X, & Latash ML, 2016, "Finger force changes in the absence of visual feedback in patients with Parkinson's disease", *Clin Neurophysiol*, 127:684-692, doi:10.1016/j.clinph.2015.05.023

- [14] **Ambike S**, Mattos D, Zatsiorsky VM, & Latash ML, 2016, "The nature of constant and cyclic force production: Unintentional force-drift characteristics", *Exp Brain Res*, 234:197-208
- [15] Singh T, & **Ambike S**, 2015, "A soft-contact and wrench-based approach to study grasp planning and execution", *J Biomech*, 48:3961-3967
- [16] **Ambike S**, Zhou T, Zatsiorsky VM, & Latash ML, 2015, "Moving a hand-held object: Reconstruction of referent coordinate and apparent stiffness trajectories", *Neurosci*, 298:335-356
- [17] **Ambike S**, Zatsiorsky VM, & Latash ML, 2015, "Processes underlying unintentional finger force changes in the absence of visual feedback", *Exp Brain Res*, 233:711-721
- [18] **Ambike S**, Paquet F, Zatsiorsky VM, & Latash ML, 2014, "Factors affecting grip force: Anatomy, mechanics, and referent configurations", *Exp Brain Res*, 232:1219-1231
- [19] Paquet F, **Ambike S**, Zatsiorsky VM, & Latash ML, 2013, "Enslaving in a serial chain: interactions between grip force and hand force in isometric tasks", *Exp Brain Res*, 232:775-787
- [20] **Ambike S**, Paquet F, Latash ML, & Zatsiorsky VM, 2013, "Grip-force modulation in multi-finger prehension during wrist flexion and extension", *Exp Brain Res*, 227:509-22
- [21] **Ambike S**, & Schmiedeler JP, 2013, "Invariant geometric characteristics of spatial arm motion", *Exp Brain Res*, 229:113-24
- [22] **Ambike S**, & Schmiedeler JP, 2013, "The leading joint hypothesis for spatial reaching arm motions", *Exp Brain Res*, 224:591-603
- [23] **Ambike S**, Schmiedeler JP, & Stanišić MM, 2011, "Trajectory Tracking Via Independent Solutions to the Geometric and Temporal Tracking Subproblems", *ASME J Mech Robotics*, 3(2):021008-1 - 021008-12
- [24] **Ambike S**, & Schmiedeler JP, 2008, "A methodology for implementing the curvature theory approach to path tracking with planar robots", *Mech Mach Theory*, 43:1225-1235
- [25] **Ambike S**, & Schmiedeler JP, 2007, "Application of geometric constraint programming to the kinematic design of three-point hitches", *Applied Engineering in Agriculture*, 23:13-21

## REFEREED CONFERENCE PUBLICATIONS (Full-length papers)

- [1] Jang S, Stuerzlinger W, **Ambike S**, Ramani K, 2017, "Modeling Cumulative Arm Fatigue in Mid-Air Interaction based on Perceived Exertion and Kinetics of Arm Motion", Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems, Denver, CO, May 6-11

- [2] **Ambike S**, Schmiedeler JP, & Stanišić MM, 2010, “Geometric, Spatial Path Tracking Using Non-Redundant Manipulators via Speed-Ratio Control”, *International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, IDETC/CIE 2010*, Montreal, Canada, August 2010
- [3] **Ambike S**, Schmiedeler JP, & Stanišić MM, 2010, “Using Redundancy in Serial Planar Mechanisms to Improve Output-Space Tracking Accuracy”, 12<sup>th</sup> International Symposium on Advances in Robot Kinematics, Piran-Portorož, Slovenia, July 2010
- [4] **Ambike S**, & Schmiedeler JP, 2008, “Time-invariant strategies in coordination of human reaching”, *Advances in Robot Kinematics: Analysis and Design*, Ed. J. Lenarcic, P. Wenger, Springer, June 2008
- [5] **Ambike S**, & Schmiedeler JP, 2007, “First-order coordination of the articulated arm sub-assembly using curvature theory”, *Proceedings of the 2007 ASME International Design Engineering Technical Conferences*, Las Vegas, September 4-7
- [6] **Ambike S**, & Schmiedeler JP, 2006, “Modeling time invariance in human arm motion coordination”, *On Advances in Robot Kinematics*, Ed. J. Lenarcic, B. Roth, Kluwer Academic Publishers, June 2006

## REFEREED CONFERENCE PUBLICATIONS (Abstracts)

- [1] Naik AS, **Ambike S**, 2020, Should I stay or should I go? Stability of digit forces is lowered to enhance maneuverability when expecting to move a pinched object. *American Society of Biomechanics*, Atlanta, GA, August 4-7.
- [2] Cui C, Muir B, Rietdyk S, Haddad J, van Emmerik R, **Ambike S**, 2020, Sensitivity of Toe Height to Joint Angles of the Bipedal Linked Chain during Obstacle Crossing. *American Society of Biomechanics*, Atlanta, GA, August 4-7.
- [3] Thompson P, Cooper A, Claxton L, **Ambike S**, 2020, Structure of variance in finger forces changes with uncertainty in force tracking tasks. *American Society of Biomechanics*, Atlanta, GA, August 4-7.
- [4] Kulkarni A, Cho H, Cui C, Rietdyk S, Barbieri F, **Ambike S**, 2020, Step length synergy during adaptive gait in young adults. *American Society of Biomechanics*, Atlanta, GA, August 4-7.
- [5] Tillman M, **Ambike S**, 2019, Effects of Past and Future Motor Actions on Present Multifinger Pressing Behavior. *International Society of Biomechanics/American Society of Biomechanics*, Calgary, Canada, July 31- August 4.

- [6] Munoz-Ruiz M, Salsabili H, Tillman M, **Ambike S**, 2019, Interactions between fingers during rapid force pulse production. *International Society of Biomechanics/American Society of Biomechanics*, Calgary, Canada, July 31- August 4.
- [7] Cui C, Kulkarni A, Cho H, Rietdyk S, **Ambike S**, Barbieri F, 2019, Gait Termination After Stepping Down A Curb: Effect of Concurrent Cognitive task. *International Society of Biomechanics/American Society of Biomechanics*, Calgary, Canada, July 31- August 4.
- [8] Tillman M, **Ambike S**, 2019, Effects of Past and Future Motor Actions on Present Multifinger Pressing Behavior. *Midwest Regional American Society of Biomechanics*, Dayton, OH, February 21-22.
- [9] Munoz-Ruiz M, Salsabili H, Tillman M, **Ambike S**, 2019, Interactions between fingers during rapid force pulse production. *Midwest Regional American Society of Biomechanics*, Dayton, OH, February 21-22.
- [10] Cui C, Kulkarni A, Cho H, Rietdyk S, **Ambike S**, Barbieri F, 2019, Gait termination after stepping down from a curb: Effect of concurrent cognitive task. *Midwest Regional American Society of Biomechanics*, Dayton, OH, February 21-22.
- [11] Cui C, Muir B, Haddad JM, van Emmerik R, Rietdyk S, **Ambike S**, 2018, Lower limb joint angle variance as a function of obstacle height during obstacle crossing. *American Society of Biomechanics*, Rochester, MN, August 8-11.
- [12] Tillman M, **Ambike S**, 2018, Mechanisms of preparation for task switching in a finger pressing task. *American Society of Biomechanics*, Rochester, MN, August 8-11.
- [13] Tillman M, **Ambike S**, 2017, Reduction in stability of manual behaviour in uncertain conditions. *American Society of Biomechanics*, Boulder, CO, August 8-11.
- [14] Tillman M, **Ambike S**, 2017, Uncertain Motor Plans Lower the Stability of Current Prehensile Behavior. *Midwest American Society of Biomechanics Meeting*, Grand Rapids, MI, February 23-24

## JURIED CONFERENCE EXHIBITS

- [1] Tillman MA, **Ambike S**, 2019, The stability of the current motor state is influenced by expected movement: Do cognitive events during the inter-stimulus interval of choice reaction-time tasks have a motor counterpart? *Society for Neuroscience*, Chicago, IL, October 19-23.
- [2] Naik AS, Kulkarni A, **Ambike S**, 2019, Prehensile synergies are robust to expectations of rapid upcoming movement changes. *Society for Neuroscience*, Chicago, IL, October 19-23.

- [3] Barbieri FA, Cui C, Kulkarni A, Cho H, **Ambike S**, Rietdyk S, 2019, Strategies by older adults to terminate gait unexpectedly after stepping down from a curb. *Progress in Motor Control XII*, Amsterdam, The Netherlands, July 7-11.
- [4] Kulkarni A, Cho H, Cui C, Rietdyk S, **Ambike S**, Barbieri FA, 2019, Joint angle variance in the bipedal linked chain during curb negotiation. *World Congress of the International Society for Gait and Posture Research*, Edinburgh, Scotland, June 30-July 4.
- [5] Cui C, Cho H, Kulkarni A, Rietdyk S, Barbieri FA, **Ambike S**, 2019, Synergistic ground reaction forces during double support while negotiating a curb. *World Congress of the International Society for Gait and Posture Research*, Edinburgh, Scotland, June 30-July 4.
- [6] Huber J, **Ambike S**, 2018, Uncontrolled manifold analysis reveals structure of variability in lip-jaw kinematics during speech production. *Neural Control of Movement*, Santa Fe, NM, May 1-4.
- [7] Tillman M, **Ambike S**, 2017, Uncertain motor plans lead to reduced stability of the current state in young but not in older adults. *Progress in Motor Control*, Miami, FL, July 19-21
- [8] Cui C, Rietdyk S, **Ambike S**, 2017, Lower-limb joints stabilize trailing toe height during repeated obstacle crossing. *International Society of Posture & Gait Research World Congress*, Fort Lauderdale, FL, June 25-29
- [9] Liddy J, Haddad J, **Ambike S**, 2017, Increasing the Precision Demands of a Finger Force Production Task Leads to Reductions in Task-Relevant Motor Variability. *North American Society for Psychology of Sport and Physical Activity*, San Diego, CA, June 4-7
- [10] **Ambike S**, Mattos D, Zatsiorsky VM, & Latash ML, 2015, "Synergy in a space of control variables during a finger force production task", *Society for Neuroscience - Neuroscience-2015*, Chicago, USA, October 17-21
- [11] **Ambike S**, Zhou T, Zatsiorsky VM, & Latash ML, 2014, "Reconstruction of hand and grip referent trajectories during vertical oscillation of a hand-held object", *Society for Neuroscience - Neuroscience-2014*, Washington DC, USA, November 15-19
- [12] Solnik S, **Ambike S**, Wu Y-H, Reschechtko S, Latash ML, 2014, "Performance-stabilizing synergies in motor tasks involving two actors", *Society for Neuroscience - Neuroscience-2014*, Washington DC, USA, November 15-19
- [13] Reschechtko S, **Ambike S**, Qiao M, Solnik S, Zhou T, Latash ML, 2014, "Violations of equifinality under transient perturbations: The back-coupling hypothesis", *Society for Neuroscience - Neuroscience-2014*, Washington DC, USA, November 15-19

- [14] **Ambike S**, Paquet F, Latash ML, & Zatsiorsky VM, 2014, "Hand-wrist Action: Control with Referent Configurations Implemented by Complex Anatomy", *World Congress of Biomechanics*, Boston, USA, July 6-11
- [15] **Ambike S**, Paquet F, Latash ML, & Zatsiorsky VM, 2013, "Grip Force Modulation with Wrist Flexion and Extension", *Progress in Motor Control*, Montreal, Canada, July 13-16
- [16] Paquet F, **Ambike S**, Latash ML, & Zatsiorsky VM, 2013, "Interactions between Wrist Force Production and Internal Grip Force", *Progress in Motor Control*, Montreal, Canada, July 13-16
- [17] **Ambike S**, & Schmiedeler JP, 2008, "A time-invariant model for human arm motion", *Proceedings of the Fourth International Symposium on Adaptive Motion of Animals and Machines*, Cleveland, OH, June 1-6

## INVITED TALKS

- [1] "On the dynamic control of fingertip forces" At the workshop on Sensory Motor Control of Animals and Robots at the Mathematical Biosciences Institute, The Ohio State University, OH, November 13-17, 2017
- [2] "Age-related changes in the modulation of the stability of manual action" Feinberg School of Medicine, Northwestern University, IL, October 19, 2017
- [3] "The stability of manual action. Can we, should we stabilize fingertip forces?" Center for Cognition, Action and Perception, University of Cincinnati, OH, March 3, 2017
- [4] "The stability of manual action. Can we, should we stabilize fingertip forces?", at Purdue University, Department of Health and Kinesiology, West Lafayette, IN, December 7, 2016
- [5] "What does hand behavior reveal about motor control?", at Purdue University, Department of Mechanical Engineering, West Lafayette, IN, October 21, 2016
- [6] "Characteristics of Grip Force and Wrist Action in Humans", at University of Notre Dame, Department of Aerospace and Mechanical Engineering, South Bend, IN, September 2, 2014
- [7] "How Bizarre We Are!", A three-day lecture series on human biomechanics at Noumenon Multi-Physics, Pune, India, June 11-13, 2014
- [8] "Factors affecting grip force and wrist action", at Movement Lab, Department of Mechanical and Aerospace Engineering, The Ohio State University, Columbus, OH, March 8, 2014
- [9] "Mechanics of the Human Arm", at Indian Institute of Science and Education Research, Pune, India, February 16, 2012

## INVITED TALKS ON LOCAL CAMPUS

- [1] "Manual Synergy Measurement", Technological Innovations for Optimal Aging, Center on Aging and the Life Course (CALC), Purdue University, West Lafayette, IN, September 28, 2018
- [2] "Studying Motor Function", Biology Freshman Honors Seminar, Department of Biological Sciences, Purdue University, West Lafayette, IN, September 25, 2018
- [3] "Influence of aging on stability of manual action", Purdue Institute of Integrative Neuroscience (PIIN), Purdue University, IN, June 6, 2018
- [4] "Reconstruction of referent trajectories: The case of object manipulation with the whole arm", The Motor Control Lab, Department of Kinesiology, The Pennsylvania State University, University Park, PA, September 23, 2014
- [5] "Factors affecting grip force and wrist action", at The Penn State Action Club, Department of Kinesiology, The Pennsylvania State University, University Park, PA, February 28, 2014
- [6] "Factors affecting blind, isometric, force production", at The Motor Control Lab, Department of Kinesiology, The Pennsylvania State University, University Park, PA, February 16, 2014
- [7] "An investigation into grip-force modulation during wrist flexion & extension", at The Motor Control Lab, Department of Kinesiology, The Pennsylvania State University, University Park, PA, September 17, 2013

## TEACHING EXPERIENCE

### PURDUE UNIVERSITY

#### **Courses instructed:**

Biomechanical Foundations of Motor Skill - Spring 2016, 2020, Autumn 2020

Advanced Topics in Kinesiology - Autumn 2016

Analysis of Human Motion - Spring 2017, 2018

Computational Methods in Biomechanics and Motor Control - Autumn 2017, 2018

Matlab for Behavior Scientists - Spring 2019, Autumn 2020

THE OHIO STATE UNIVERSITY, MECHANICAL ENGINEERING

**Instructor:**

Handled all responsibilities of instruction for the following subjects:

Application of Computer Graphics to Kinematic Synthesis and Analysis - Winter 2010  
Graduate course focusing on advanced methods for mechanism design and analysis focusing on Burmester Theory and Curvature Theory. Class strength: 6

Kinematics and Dynamics of Machinery - Winter 2008 & Autumn 2011  
Undergraduate course aiming to develop visualization and technical skills useful for the kinematic design of machinery. Class strength: 51 & 68

**Teaching Assistant:**

Conducted recitation sections and lab sessions for the following subjects:

Statics , Strength of Materials - Winter 2005

System Dynamics - Spring 2005, Autumn 2005, Winter 2006, Spring 2006

Principles of Automatic Control - Winter 2006

Dynamics - Spring 2011

UNIVERSITY OF PUNE, VISHWAKARMA INSTITUTE OF TECHNOLOGY, MECHANICAL ENGG.

**Lecturer:**

Handled all responsibilities of instruction from 2002 to 2004 for the following subjects:

Strength of Materials. Class strength: 70

Mechanical Design (design of machine components, clutches and gear box assemblies). Class strength: 30

Engineering Graphics (manual drawing and CAD systems.) Class strength: 70

ACADEMIC SERVICE

Provided guidance to undergraduate students in Kinesiology at PSU in conducting experiments involving human subjects, 2013

Served as a graduate student representative for Design on a panel for reviewing the syllabi in the Mechanical Engineering Department at OSU. The objective was to come up with recommendations based on graduate student feedback to assist the faculty in revamping the course structure for a quarter-to-semester switch undertaken by the University, 2011

Served on the OSU Mechanical Engineering faculty hiring panel, 2009. The responsibilities were to interview candidates and provide input on the candidate's proposed research and the compatibility of the individual with the work culture at OSU

Conducted presentations and lab walk-throughs for high school students, 2007

Worked as Executive Assistant in the International Cell of Vishwakarma Institute of Technology, 2004. The responsibility was to facilitate the integration of international undergraduate students with the local community.

## PROFESSIONAL ACTIVITIES

### GRANT REVIEWS

Served on the grant Review Panel for Clinical and Translational Sciences Institute (CTSI), Indiana, for the Surgical Instruments Small Grant, June 2018

### REFEREEING

Human Movement Science

Royal Society Open Science

Motor Control

Medicine & Science in Sports & Exercise

IEEE transactions on Haptics

PLOS One

Journal of Motor Behavior

Journal of Biomechanics

Acta Psychologica

Journal of Applied Biomechanics

Experimental Brain Research

ASME Journal of Mechanisms and Robotics

ASME Journal of Machine Design

Transactions of the Canadian Society of Mechanical Engineers

Biosystems Engineering

IEEE International Conference on Robotics and Automation, 2014

Progress in Motor Control, Montreal, July 2013

ARK, 12<sup>th</sup> International Symposium on Advances in Robot Kinematics, January 2010

ASME Dynamic Systems and Control Conference, October 2008

#### PROFESSIONAL MEMBERSHIPS

Society for Neuroscience

International Society of Posture and Gait Research

The International Society of Motor Control

Society for the Neural Control of Movement

American Society of Biomechanics

#### INDUSTRY EXPERIENCE

##### LARSEN & TOUBRO LTD., MUMBAI, INDIA

Design Engineer: Design of heat exchangers using the ASME Boiler and Pressure Vessel Code, 2000 - 2001

Manufacturing Engineer: Shop floor engineer at a heat-exchanger manufacturing shop, 1999 - 2000

#### MISCELLANEOUS

##### COMMUNITY OUTREACH

Participated in the *Steps to Safety 5K* run for the Centre County Women's Resource Center, October 5, 2014, State College, PA

Represented India in a UN Day Dinner hosted by the United Nations Association of Centre County, October 20, 2013, State College, PA

Volunteered for the International Friendship Picnic organized by Global Connections at Penn State to welcome international scholars, September 22, 2013, State College, PA

---

Last updated: Thursday 14<sup>th</sup> January, 2021