

Mathias Thor - Curriculum Vitae

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Summary

Mathias Thor is currently pursuing a PhD degree with SDU Biorobotics at the University of Southern Denmark. The primary aim of his research is to develop a generic, adaptive, versatile locomotion control framework that is able to recognize and adapt to different robot bodies and unknown environments. The framework is formed by an integration of bio-inspired control mechanisms and a reinforcement-based machine learning framework. During his PhD, he has won several awards including EliteForsk travel grant from the Ministry of Higher Education and Science of Denmark. He has published many scientific papers in machine learning and robotics journals (e.g., IEEE Transactions on Neural Networks and Learning Systems, IEEE Robotics and Automation Letters).



Education

- 2017 - 2021 4+4 Ph.D., University of Southern Denmark [mathias@mmmi.sdu.dk]
Address: Odense, Denmark
Project title: Neurorobotic Technology for Advanced Robot Motor Control
Supervisor: Prof. Dr. Poramate Manoonpong
- 2019 (Oct.) Visiting Researcher, Vidyasirimedhi Institute of Science and Technology
Address: Rayong, Thailand
Institute: Bio-Inspired Robotics & Neural Engineering (BRAIN-LAB)
Collaborator: Dr. Theerawit Wilairasitporn & Dr. Nat Dilokthanakul
- 2019 (July-Sept.) Visiting Researcher, Nanjing University of Aeronautics and Astronautics
Address: Nanjing, China
Institute: Bio-inspired Structure and Surface Engineering (IBSS)
Collaborator: Prof. Zhengdong Dai
- 2016 - 2019 Master of Science in Robotics, University of Southern Denmark
Danish weighted average master grade average of 12.0 (w/o master thesis)
Project title: Modular Legged-Robotic System
Supervisor: Prof. Dr. Poramate Manoonpong
Master thesis grade: 12
- 2013 - 2016 Bachelor of Science in Robotics, University of Southern Denmark
Danish weighted average bachelor grade average of 10.9 (w/o bachelor thesis)
Project title: Embodied control of a dung beetle inspired hexapod
Supervisor: Prof. Dr. Poramate Manoonpong
Bachelor thesis grade: 12
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Experience

- 2019 Guest talk on Robotics, Neural Control and Reinforcement Learning
BRAIN-LAB - Vidyasirimedhi Institute of Science and Technology, Thailand
- 2019 Teaching "Adaptive embodied locomotion control systems"
9-semester Robot Systems, University of Southern Denmark

- 2018 Teaching “Adaptive embodied locomotion control systems”
9-semester Robot Systems, University of Southern Denmark
- 2018 Teaching the course “Underactuated Robotics”
6-semester Robot Systems, University of Southern Denmark
- 2017 - 2018 Teaching assistant on the course ”Mathematical methods in programming”
1-semester Physics and Technology, University of Southern Denmark
- 2015 - 2017 Part-time programmer at Universal Robots
Odense, Denmark
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Supervision

Master Students

- 2019 - 2020 Jens Troels Nielsen - “Compliance controller for a legged robot system”
40 ECTS - 10-semester Robot Systems, University of Southern Denmark
- 2019 - 2020 Christian Quist Nielsen - “Legged robot locomotion control using proprioceptive sensory feedback”
40 ECTS - 10-semester Robot Systems, University of Southern Denmark
- 2018 Florentijn Degroote - “Neural control of a compliant gummi arm robot”
20 ECTS - 10-semester Robot Systems, KU Leuven / University of Southern Denmark
Co-supervisor
- 2018 Salman Taj - “Modeling, Simulation, and Control of a Millipede Inspired Robot”
30 ECTS - 10-semester Robot Systems, University of Southern Denmark
Co-supervisor

Bachelor Students

- 2019 Bjarke Larsen - “Adaptive gait generation for a hexapod robot in unstructured environments”
15 ECTS - 6-semester Robot Systems, University of Southern Denmark
- 2018 Jeppe Langaa - “Modeling, Simulation, and Control of a pipe inspection robot”
15 ECTS - 6-semester Robot Systems, University of Southern Denmark
- 2018 Jens Troels Nielsen - “Modeling, Simulation, and Control of a pipe inspection robot”
15 ECTS - 6-semester Robot Systems, University of Southern Denmark
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Conference contributions

- 2019 Presenting a paper at the IROS 2019 conference
The Venetian, Macau
- 2018 Media Operation and Session Chair at the IYCBE 2018 conference
University of Southern Denmark
- 2018 Presenting a paper at the IYCBE 2018 conference
University of Southern Denmark
- 2017 Presenting a paper at the SWARM 2017 conference
Kyoto University, Japan
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Publication list

2020

IJ4) **Generic Neural Locomotion Control Framework for Legged Robots**

M. Thor, T. Kulvicius, and P. Manoonpong

IEEE Transactions on Neural Networks and Learning Systems 2020 (Journal paper - under review)

2019

IJ3: **A Fast Online Frequency Adaptation Mechanism for CPG-Based Robot Motion Control**

M. Thor, and P. Manoonpong

IEEE Robotics and Automation Letters 2019 (Journal paper)

DOI: 10.1109/LRA.2019.2926660

IJ2: **Error-Based Learning Mechanism for Fast Online Adaptation in Robot Motor Control**

M. Thor, and P. Manoonpong

IEEE Transactions on Neural Networks and Learning Systems 2019 (Journal paper)

DOI: 10.1109/TNNLS.2019.2927737

IC6: **CPG Driven RBF Network Control with Reinforcement Learning for Gait Optimization of a Dung Beetle-Like Robot**

Matheshwaran Pitchai, Xiaofeng Xiong, Mathias Thor, Peter Billeschou, Peter Lukas Mailänder, Binggwong Leung, Tomas Kulvicius, and Poramate Manoonpong

In Artificial Neural Networks and Machine Learning – ICANN 2019 (Conference paper)

DOI: 10.1007/978-3-030-30487-4_53

IC5: **Modular Neural Control for Dung Beetle-like Leg Movements of a Dung Beetle-like Robot**

Binggwong Leung, Mathias Thor, and Poramate Manoonpong

In the 9th International Symposium on Adaptive Motion of Animals and Machines (Conference paper)

DOI: 10.5075/epfl-BIOROB-AMAM2019-12

2018

IC4: **MORF - Modular Robot Framework (Best Student Paper Award)**

Mathias Thor, Jørgen Christian Larsen, and Poramate Manoonpong

In The 2nd International Youth Conference of Bionic Engineering - IYCBE2018 (Conference abstract)

ISBN: 978-2-88945-585-0

IJ1: **A dung beetle-inspired robotic model and its distributed sensor-driven control for walking and ball rolling**

M. Thor, T. Strøm-Hansen, L. B. Larsen, A. Kovalev, S. N. Gorb, E. Baird, and P. Manoonpong

Artificial Life and Robotics 2018 (Journal paper)

DOI: 10.1007/s10015-018-0456-8

IC3: **Modular neural control for bio-inspired walking and ball rolling of a dung beetle-like robot**

Binggwong Leung, Mathias Thor, and Poramate Manoonpong

In ALife 2018 (Conference paper)

DOI: 10.1162/isal_a_00064

2017

IC2: **Advantages of using a biologically plausible embodied kinematic model for enhancement of speed and multifunctionality of a walking robot (Best Student Paper Award)**

Mathias Thor, Theis Strøm-Hansen, and Leon Bonde Larsen

In Proceedings of the 2nd International Symposium on Swarm Behavior and Bio-Inspired Robotics - SWARM2017 (Conference paper)

IC1: Distributed Sensor-Driven Control for Bio-Inspired Walking and Ball Rolling of a Dung Beetle-Like Robot

Theis Strøm-Hansen, [Mathias Thor](#), Leon Bonde Larsen, Emily Baird, and Poramate Manoonpong

In Proceedings of the 2nd International Symposium on Swarm Behavior and Bio-Inspired Robotics - SWARM2017 (Conference paper)

Fundings

EliteForsk-Travel Grant 2019

Funding Agency: Ministry of Education and Research (Copenhagen)

Amount: DKK 200.000

Grant period: 2019-01 to 2020-12

Foundation Idella Study Travel Grant 2018

Funding Agency: Foundation Idella

Amount: DKK 20.000

Grant period: 2018-08 to 2019-06

International partners

Prof. Zhendong Dai: Nanjing University of Aeronautics and Astronautics, China. Collaboration on robot control and bio-inspired movement.

Prof. Stanislav Gorb: Kiel University, Germany. Collaboration on the modelling of insects and their movement.

Prof. Emily Baird: Lund University, Sweden. Collaboration on the modelling of insects and their movement.

Dr. Theerawit Wilaiprasitporn & Dr. Nat Dilokthanakul: Vidyasirimedhi Institute of Science and Technology, Thailand. Collaboration neural control.