Cláudio Gomes

Employment

01/2022 – Present **Assistant Professor**, *Aarhus University*, Aarhus, Middle Jutland, Denmark
Supervision, teaching, and conducting research with a focus on co-simulation, digital twin engineering, and machine learning for digital twins.

01/2020 – 01/2022 **Postdoctoral Researcher**, *Aarhus University*, Aarhus, Middle Jutland, Denmark
Supervision and research with a focus on co-simulation, digital twin engineering, and machine learning for digital twins.

11/2019 – 12/2019 **Visiting Researcher**, *Carnegie Mellon University*, Greater Pittsburgh Area
Collaborated with Prof. Andre Platzer and Stefan Mitsch on runtime monitoring of co-simulations.

03/2015 – 09/2019 **FWO Fellow Phd Student**, *University of Antwerp*, Antwerp Area, Belgium
Pursued a Ph.D. in Computer Science with a focus on co-simulation.

07/2013 – 01/2015 **Software Engineer**, *Altitude Software*, Lisbon
Worked as a Front and Backend engineer on a real-time web application for telephony scripts and customer relations, specified by a Domain Specific Language.

09/2011 – 01/2013 **Assistant Lecturer**, *NOVA School of Science and Technology*, Almada
Taught practical (lab) classes involving C and Octave programming languages.

10/2009 – 07/2012 **Researcher in the SOLAR group**, *NOVA School of Science and Technology*, Almada
Participated in research focused on the methodology for prototype transformations and transformational semantics in a control system specification language.

Education

01/03/2015– 31/12/2019 **PhD**, *University of Antwerp*, Property Preservation in Co-simulation, Antwerp, Belgium
Supervisor: Prof. Hans Vangheluwe.

01/09/2011– 22/11/2013 **MSc and BSc degree, Mark: *18 (out of 20, honors)***, *New University of Lisbon*, A Framework for Efficient Model Transformations, Lisbon, Portugal
Supervisor: Prof. Vasco Amaral.

Project, Grants & Awards (Selected)

01/2024 **ROBOSAPIENS: Robotic Self Adaptation in Novel Environments**, *Horizon Europe CL4 RIA Project (Budget: 4M€, 7 Partners, AU part 1.2M€)*, Aarhus, Denmark
Role: co-coordinator, digital twin safety expert.

23/05/2023 **Runner Up Best Paper Award at ANNSIM Conference**, Ontario, Canada

11/2021 **DIGIT-BENCH: DIGItal Twin for large-scale test BENCHes for the wind industry (AU part 2.6 MDKK)**, *EUDP*, Aarhus, Denmark
Role: PI on AU-ECE side, supervision of postdoc and phd students, and DT engineering expert.

11/2021 **Demonstration of Lifetime Extension (DLTE) Concept (AU part 1.5 MDKK)**, *EUDP*, Aarhus, Denmark
Role: PI on AU-ECE side, supervision of postdoc and phd students, and co-simulation expert.

10/2020 **UPSIM Unleash Potentials in SIMulation ITEA 3 Project (Budget 19.7M€, 6MDKK AU)**, Aarhus, Denmark
Role: state of the art in co-simulation and simulation governance work packages.

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09/2020 **MADE FAST (Budget: 300MDKK, 15.6MDKK AU, 7 companies with AU)**, Aarhus, Denmark
Role: Co-supervision in Part Projects 3.01, 3.06, 4.07, 4.08, 4.09, 4.10.

06/2020 **Digit Brain Innovation Action (Budget: 8M€, 3.3MDKK AU), 36 Partners**, Aarhus, Denmark
Role: Revising AU experiments.

10/10/2019 **FWO Travel Grant to Carnegie Mellon University**, Pittsburgh, United States

31/07/2019 **Best Paper Award at SIMULTECH conference**, Prague, Czech Republic

07/10/2016 **2nd Place ACM Student Research Competition**, Saint-malo, France

01/01/2016 **FWO PhD Fellowship**, *Scholarship for 4 years, full time researcher*, Antwerp

22/11/2013 **Merit Student**, *2nd highest grade of CS MSc*, Lisbon, Portugal

Research Leadership

Program Committees **Springsim, RIVF, and ANNSIM conferences.**

Conference Organization **CPS Track in the ANNSIM conference 2021 and 2022 editions, and co-organizer of 3 editions of CoSimCPS workshop..**

Editor **Guest editor for the SIMULATION journal, special issue on Digital Twins.**

Reviews **Reviewer for 8 different journals in the past 2 years.**

Supervision

Post Docs **1 Ongoing**

PhD Students **3 Completed, 3 Ongoing**

MSc Students **6 Completed, 2 Ongoing**

BSc Students **2 Completed**

Selected Publications

[1] Till Böttjer, Daniella Tola, Fatemeh Kakavandi, Christian R. Wewer, Devarajan Ramanujan, **Cláudio Gomes**, Peter G. Larsen, and Alexandros Iosifidis. A review of unit level digital twin applications in the manufacturing industry. *CIRP Journal of Manufacturing Science and Technology*, 45:162–189, October 2023.

[2] Farshid Naseri, Santiago Gil, Corneliu Barbu, Erdal Cetkin, Gulsah Yarimca, Anders Jensen, Peter Gorm Larsen, and **Cláudio Gomes**. Digital Twin of Electric Vehicle Battery Systems: Comprehensive Review of the Use Cases, Requirements, and Platforms. *Renewable and Sustainable Energy Reviews*, 179:113280, 2023.

[3] Simon Thrane Hansen, **Cláudio Gomes**, Masoud Najafi, Torsten Sommer, Matthias Blesken, Irina Zacharias, Oliver Kotte, Pierre R. Mai, Klaus Schuch, Karl Wernersson, Christian Bertsch, Torsten Blochwitz, and Andreas Junghanns. The FMI 3.0 Standard Interface for Clocked and Scheduled Simulations. *Electronics*, 11(21):3635, November 2022.

[4] Hao Feng, **Cláudio Gomes**, Casper Thule, Kenneth Lausdahl, Alexandros Iosifidis, and Peter Gorm Larsen. Introduction to Digital Twin Engineering. In *2021 Annual Modeling and Simulation Conference (ANNSIM)*, pages 1–12, Fairfax, VA, USA, July 2021. IEEE.

[5] Andreas Junghanns, Torsten Blochwitz, Christian Bertsch, Torsten Sommer, Karl Wernersson, Andreas Pillekeit, Irina Zacharias, Matthias Blesken, Pierre Mai, Klaus Schuch, Christian Schulze, **Cláudio Gomes**, and Masoud Najafi. The Functional Mock-up Interface 3.0 - New Features Enabling New Applications. In

Proceedings of the 14th International Modelica Conference, online, 2021. Linköping University Electronic Press, Linköpings Universitet.

[6] Christian Møldrup Legaard, Thomas Schranz, Gerald Schweiger, Ján Drgoňa, Basak Falay, **Cláudio Gomes**, Alexandros Iosifidis, Mahdi Abkar, and Peter Gorm Larsen. Constructing Neural Network-Based Models for Simulating Dynamical Systems. *ACM Computing Surveys*, page 3567591, 2021.

[7] Bentley James Oakes, **Cláudio Gomes**, Franz Rudolf Holzinger, Martin Benedikt, Joachim Denil, and Hans Vangheluwe. Hint-Based Configuration of Co-simulations with Algebraic Loops. *Simulation and Modeling Methodologies, Technologies and Applications*, 1260:1–28, 2021.

[8] Casper Thule, Kenneth Lausdahl, **Cláudio Gomes**, Gerd Meisl, and Peter Gorm Larsen. Maestro: The INTO-CPS Co-simulation Framework. *Simulation Modelling Practice and Theory*, 92(April):45–61, 2019.

[9] **Cláudio Gomes**, Benoît Legat, Raphaël Jungers, and Hans Vangheluwe. Minimally Constrained Stable Switched Systems and Application to Co-simulation. In *IEEE Conference on Decision and Control*, pages 5676–5681, Miami Beach, FL, USA, 2018.

[10] **Cláudio Gomes**, Casper Thule, David Broman, Peter Gorm Larsen, and Hans Vangheluwe. Co-simulation: A Survey. *ACM Computing Surveys*, 51(3):49:1–49:33, 2018.

Peer Reviewed Journals

[11] Till Böttjer, Daniella Tola, Fatemeh Kakavandi, Christian R. Wewer, Devarajan Ramanujan, **Cláudio Gomes**, Peter G. Larsen, and Alexandros Iosifidis. A review of unit level digital twin applications in the manufacturing industry. *CIRP Journal of Manufacturing Science and Technology*, 45:162–189, October 2023.

[12] Giuseppe Abbiati, Ecem E. Baş, **Cláudio Gomes**, and Peter Gorm Larsen. Hybrid fire testing using FMI-based co-simulation. *Fire Safety Journal*, 139:103832, August 2023.

[13] Qamar Alfalouji, Thomas Schranz, Basak Falay, Sandra Wilfling, Johannes Exenberger, Thorsten Mattausch, **Cláudio Gomes**, and Gerald Schweiger. Co-simulation for buildings and smart energy systems — A taxonomic review. *Simulation Modelling Practice and Theory*, 126:102770, July 2023.

[14] Sergiy Bogomolov, **Cláudio Gomes**, Carlos Isasa, Sadegh Soudjani, Paulius Stankaitis, and Thomas Wright. Reachability Analysis of FMI Models Using Data-Driven Dynamic Sensitivity. *SIMULATION*, page submitted, 2023.

[15] Mirgita Frasheri, Henrik Ejersbo, Casper Thule, **Cláudio Gomes**, Jakob Levisen Kvistgaard, Peter Gorm Larsen, and Lukas Esterle. Addressing Time Discrepancy between Digital and Physical Twins. *Robotics and Autonomous Systems*, Volume 161(March 2023, 104347):to appear, 2023.

[16] Fatemeh Kakavandi, **Cláudio Gomes**, Roger De Reus, Jeppe Badstue, Jakob Langdal Jensen, Peter Gorm Larsen, and Alexandros Iosifidis. Towards Developing a Digital Twin for a Manufacturing Pilot Line: An Industrial Case Study. In *Digital Twin Driven Intelligent Systems and Emerging Metaverse*, pages 39–64. Springer Nature Singapore, Singapore, 2023.

[17] Farshid Naseri, Santiago Gil, Corneliu Barbu, Erdal Cetkin, Gulsah Yarimca, Anders Jensen, Peter Gorm Larsen, and **Cláudio Gomes**. Digital Twin of Electric Vehicle Battery Systems: Comprehensive Review of the Use Cases, Requirements, and Platforms. *Renewable and Sustainable Energy Reviews*, 179:113280, 2023.

[18] Simon Thrane Hansen, Casper Thule, **Cláudio Gomes**, Jaco van de Pol, Maurizio Palmieri, Emin Oguz Inci, Frederik Madsen, Jesús Alfonso, José Ángel Castellanos, and José Manuel Rodriguez. Verification

and synthesis of co-simulation algorithms subject to algebraic loops and adaptive steps. *International Journal on Software Tools for Technology Transfer*, 24(6):999–1024, December 2022.

[19] Simon Thrane Hansen, **Cláudio Gomes**, Masoud Najafi, Torsten Sommer, Matthias Blesken, Irina Zacharias, Oliver Kotte, Pierre R. Mai, Klaus Schuch, Karl Wernersson, Christian Bertsch, Torsten Blochwitz, and Andreas Junghanns. The FMI 3.0 Standard Interface for Clocked and Scheduled Simulations. *Electronics*, 11(21):3635, November 2022.

[20] Christian Møldrup Legaard, Thomas Schranz, Gerald Schweiger, Ján Drgoňa, Basak Falay, **Cláudio Gomes**, Alexandros Iosifidis, Mahdi Abkar, and Peter Gorm Larsen. Constructing Neural Network-Based Models for Simulating Dynamical Systems. *ACM Computing Surveys*, page 3567591, 2021.

[21] Bentley James Oakes, **Cláudio Gomes**, Franz Rudolf Holzinger, Martin Benedikt, Joachim Denil, and Hans Vangheluwe. Hint-Based Configuration of Co-simulations with Algebraic Loops. *Simulation and Modeling Methodologies, Technologies and Applications*, 1260:1–28, 2021.

[22] Gerald Schweiger, **Cláudio Gomes**, Georg Engel, Irene Hafner, Josef-Peter Schoeggl, Alfred Posch, and Thierry Nouidui. An empirical survey on co-simulation: Promising standards, challenges and research needs. *Simulation Modelling Practice and Theory*, 95:148–163, 2019.

[23] Casper Thule, Kenneth Lausdahl, **Cláudio Gomes**, Gerd Meisl, and Peter Gorm Larsen. Maestro: The INTO-CPS Co-simulation Framework. *Simulation Modelling Practice and Theory*, 92(April):45–61, 2019.

[24] **Cláudio Gomes**, Bart Meyers, Joachim Denil, Casper Thule, Kenneth Lausdahl, Hans Vangheluwe, and Paul De Meulenaere. Semantic Adaptation for FMI Co-simulation with Hierarchical Simulators. *SIMULATION*, 95(3):1–29, 2018.

[25] **Cláudio Gomes**, Casper Thule, David Broman, Peter Gorm Larsen, and Hans Vangheluwe. Co-simulation: A Survey. *ACM Computing Surveys*, 51(3):49:1–49:33, 2018.

Peer Reviewed Conferences

[26] Prasad Talasila, **Cláudio Gomes**, Peter Høgh Mikkelsen, Santiago Gil Arboleda, Eduard Kamburjan, and Peter Gorm Larsen. Digital Twin as a Service (DTaaS): A Platform for Digital Twin Developers and Users. In *Digital Twin 2023*, page to appear, June 2023.

[27] Aaron John Buhagiar, Rikke Fanøe, Peter Gorm Larsen, William E. Scott, Leo Freitas, Thomas Nielsen, and **Cláudio Gomes**. Understanding Pancreas-Machine Interactions during Preservation: A Mathematical Approach. 2023.

[28] Simon Thrane Hansen, **Cláudio Gomes**, and Zahra Kazemi. Synthesizing Orchestration Algorithms for FMI 3.0. In *2023 Annual Modeling and Simulation Conference*, pages 184–195, Ontario, Canada, 2023.

[29] Emin Oguz Inci, **Cláudio Gomes**, Jan Croes, and Wim Desmet. Error Estimators for Adaptive Scheduling Algorithm for Serial Co-simulation. In *Annual Modelling and Simulation Conference*, pages 73–83, Ontario, Canada, 2023.

[30] Bentley Oakes, **Cláudio Gomes**, Peter Gorm Larsen, Joachim Denil, Julien DeAntoni, João Cambeiro, and John Fitzgerald. Examining Model Qualities and Their Impact on Digital Twins. In *Annual Modelling and Simulation Conference*, pages 220–232, Ontario, Canada, 2023.

[31] Lukas Esterle, Henrik Ejersbo, Mirgita Frasheri, **Cláudio Gomes**, Hugo Daniel Macedo, and Peter Gorm Larsen. Digital Twins for Autonomous Intelligent Systems: From Development to Deployment. In *2022 IEEE International Conference on Autonomic Computing and Self-Organizing Systems Companion (ACSOS-C)*, pages 53–54, CA, USA, September 2022. IEEE.

[32] Hao Feng, **Cláudio Gomes**, Santiago Gil, Peter H. Mikkelsen, Daniella Tola, Peter Gorm Larsen, and Michael Sandberg. Integration Of The Mape-K Loop In Digital Twins. In *2022 Annual Modeling and Simulation Conference (ANNSIM)*, pages 102–113, San Diego, CA, USA, July 2022. IEEE.

[33] Fatemeh Kakavandi, Roger De Reus, **Cláudio Gomes**, Negar Heidari, Alexandros Iosifidis, and Peter Gorm Larsen. Product Quality Control in Assembly Machine under Data Restricted Settings. In *2022 IEEE 20th International Conference on Industrial Informatics (INDIN)*, pages 735–741, Perth, Australia, July 2022. IEEE.

[34] Emil Madsen, Daniella Tola, Carlos Hansen, **Cláudio Gomes**, and Peter Gorm Larsen. AURT: A Tool for Dynamics Calibration of Robot Manipulators. In *2022 IEEE/SICE International Symposium on System Integration (SII)*, pages 190–195, Narvik, Norway, January 2022. IEEE.

[35] Daniella Tola, Emil Madsen, **Cláudio Gomes**, Lukas Esterle, Christian Schlette, Casper Hansen, and Peter Gorm Larsen. Towards Easy Robot System Integration: Challenges and Future Directions. In *2022 IEEE/SICE International Symposium on System Integration (SII)*, pages 77–82, Narvik, Norway, January 2022. IEEE.

[36] Tomas Kulik, **Cláudio Gomes**, Hugo Daniel Macedo, Stefan Hallerstede, and Peter Gorm Larsen. Towards Secure Digital Twins. In Tiziana Margaria and Bernhard Steffen, editors, *Leveraging Applications of Formal Methods, Verification and Validation. Practice*, volume 13704, pages 159–176, Cham, 2022. Springer Nature Switzerland.

[37] Thomas Wright, **Cláudio Gomes**, and Jim Woodcock. Formally Verified Self-adaptation of an Incubator Digital Twin. In *Leveraging Applications of Formal Methods, Verification and Validation. Practice*, volume 13704, pages 89–109, Cham, 2022. Springer Nature Switzerland.

[38] Hao Feng, **Cláudio Gomes**, Casper Thule, Kenneth Lausdahl, Alexandros Iosifidis, and Peter Gorm Larsen. Introduction to Digital Twin Engineering. In *2021 Annual Modeling and Simulation Conference (ANNSIM)*, pages 1–12, Fairfax, VA, USA, July 2021. IEEE.

[39] Simon Thrane Hansen, **Cláudio Gomes**, Peter Gorm Larsen, and Jaco Van de Pol. Synthesizing Co-Simulation Algorithms with Step Negotiation and Algebraic Loop Handling. In *2021 Annual Modeling and Simulation Conference (ANNSIM)*, pages 1–12, Fairfax, VA, USA, July 2021. IEEE.

[40] Emin Oguz Inci, Jan Croes, Wim Desmet, **Cláudio Gomes**, Casper Thule, Kenneth Lausdahl, and Peter Gorm Larsen. The Effect and Selection of Solution Sequence in Co-Simulation. In *2021 Annual Modeling and Simulation Conference (ANNSIM)*, pages 1–12, Fairfax, VA, USA, July 2021. IEEE.

[41] Till Böttjer, Georg Ørnskov Rønsch, **Cláudio Gomes**, Devarajan Ramanujan, Alexandros Iosifidis, and Peter Gorm Larsen. Data-Driven Identification of Remaining Useful Life for Plastic Injection Moulds. In *Towards Sustainable Customization: Bridging Smart Products and Manufacturing Systems*, pages 431–439, Cham, 2021. Springer International Publishing.

[42] **Cláudio Gomes**, Giuseppe Abbiati, and Peter Gorm Larsen. Seismic Hybrid Testing using FMI-based Co-Simulation. In *Proceedings of the 14th International Modelica Conference*, online, 2021. Linköping University Electronic Press, Linköpings Universitet.

[43] **Cláudio Gomes**, Masoud Najafi, Torsten Sommer, Matthias Blesken, Irina Zacharias, Oliver Kotte, Pierre Mai, Klaus Schuch, Karl Wernersson, Christian Bertsch, Torsten Blochwitz, and Andreas Junghanns. The FMI 3.0 Standard Interface for Clocked and Scheduled Simulations. In *Proceedings of the 14th International Modelica Conference*, online, 2021. Linköping University Electronic Press, Linköpings Universitet.

[44] Simon Thrane Hansen, **Cláudio Gomes**, Maurizio Palmieri, Casper Thule, Jaco van de Pol, and Jim Woodcock. Verification of Co-simulation Algorithms Subject to Algebraic Loops and Adaptive Steps. In

Alberto Lluch Lafuente and Anastasia Mavridou, editors, *Formal Methods for Industrial Critical Systems*, volume 12863, pages 3–20, Cham, 2021. Springer International Publishing.

[45] Andreas Junghanns, Torsten Blochwitz, Christian Bertsch, Torsten Sommer, Karl Wernersson, Andreas Pillekeit, Irina Zacharias, Matthias Blesken, Pierre Mai, Klaus Schuch, Christian Schulze, **Cláudio Gomes**, and Masoud Najafi. The Functional Mock-up Interface 3.0 - New Features Enabling New Applications. In *Proceedings of the 14th International Modelica Conference*, online, 2021. Linköping University Electronic Press, Linköpings Universitet.

[46] Daniella Tola, **Cláudio Gomes**, Carl Schultz, Christian Schlette, Casper Hansen, and Lukas Esterle. RoboCIM: Towards a Domain Model for Industrial Robot System Configurators despite Tribal Knowledge. In *5th International Joint Conference on Rules and Reasoning*, Leuven, Belgium, 2021.

[47] Jim Woodcock, **Cláudio Gomes**, Hugo Daniel Macedo, and Peter Gorm Larsen. Uncertainty Quantification and Runtime Monitoring Using Environment-Aware Digital Twins. In *Leveraging Applications of Formal Methods, Verification and Validation: Tools and Trends*, volume 12479 of *Lecture Notes in Computer Science*, pages 72–87. Springer International Publishing, 2021.

[48] Benoit Legat, **Cláudio Gomes**, Paschalis Karalis, Raphael M. Jungers, Eva M. Navarro-Lopez, and Hans Vangheluwe. Stability of Planar Switched Systems under Delayed Event Detection. In *2020 59th IEEE Conference on Decision and Control (CDC)*, pages 5792–5797, Jeju, Korea (South), December 2020. IEEE.

[49] **Cláudio Gomes**, Romain Franceschini, Nick Battle, Casper Thule, Kenneth Lausdahl, Hans Vangheluwe, and Peter Gorm Larsen. Application of Model-Based Testing to Dynamic Evaluation of Functional Mockup Units. In *Proceedings of the American Modelica Conference*, pages 149–158, Boulder, Colorado, USA, 2020. Linköping University Electronic Press, Linköpings Universitet.

[50] Christian Møldrup Legaard, **Cláudio Gomes**, Peter Gorm Larsen, and Frederik F. Foldager. Rapid Prototyping of Self-Adaptive-Systems using Python Functional Mockup Units. In *Proceedings of the 2020 Summer Simulation Conference*, SummerSim '20, pages 1–12, Virtual Event, Spain, 2020. Society for Computer Simulation International, San Diego, CA, United States.

[51] Casper Thule, **Cláudio Gomes**, and Kenneth Lausdahl. Formally Verified FMI Enabled Data Broker: RabbitMQ FMU. In *Proceedings of the 2020 Summer Simulation Conference*, SummerSim '20, pages Pages 1–12, Virtual event, 2020. Society for Computer Simulation International.

[52] **Cláudio Gomes**, Bentley James Oakes, Mehrdad Moradi, Alejandro Torres Gamiz, Juan Carlos Mendo, Stefan Dutre, Joachim Denil, and Hans Vangheluwe. HintCO - Hint-Based Configuration of Co-Simulations. In *International Conference on Simulation and Modeling Methodologies, Technologies and Applications*, pages 57–68, Prague, Czech Republic, 2019.

[53] Mehrdad Moradi, **Cláudio Gomes**, Bentley James Oakes, and Joachim Denil. Optimizing Fault Injection in FMI Co-simulation. In *Proceedings of the 2019 Summer Simulation Conference*, page 12, Berlin, Germany, 2019. Society for Computer Simulation International.

[54] **Cláudio Gomes**, Benoît Legat, Raphaël Jungers, and Hans Vangheluwe. Minimally Constrained Stable Switched Systems and Application to Co-simulation. In *IEEE Conference on Decision and Control*, pages 5676–5681, Miami Beach, FL, USA, 2018.

[55] **Cláudio Gomes**, Casper Thule, Julien DeAntoni, Peter Gorm Larsen, and Hans Vangheluwe. Co-simulation: The Past, Future, and Open Challenges. In *Symposium On Leveraging Applications of Formal Methods, Verification and Validation*, volume 11246 of *Lecture Notes in Computer Science*, Limassol, Cyprus, 2018. Springer Verlag.

[56] Gerald Schweiger, **Cláudio Gomes**, Georg Engel, Irene Hafner, Josef Schoeggl, Alfred Posch, and Thierry Nouidui. Functional Mock-up Interface: An empirical survey identifies research challenges and current

barriers. In *Proceedings of the American Modelica Conference*, pages 138–146, Cambridge, MA, USA, 2018. Linköping University Electronic Press, Linköpings Universitet.

[57] **Cláudio Gomes**, Benoît Legat, Raphaël M. Jungers, and Hans Vangheluwe. Stable Adaptive Co-simulation: A Switched Systems Approach. In *IUTAM Symposium on Co-Simulation and Solver Coupling*, volume 35, pages 81–97, Darmstadt, Germany, 2017. Springer, Cham.

[58] **Cláudio Gomes**, Yentl Van Tendeloo, Joachim Denil, Paul De Meulenaere, and Hans Vangheluwe. Hybrid System Modelling and Simulation with Dirac Deltas. In *Proceedings of the Symposium on Theory of Modeling & Simulation: DEVS Integrative M&S Symposium*, page Article No. 7, Virginia Beach, Virginia, USA, 2017. Society for Computer Simulation International.

[59] Sadaf Mustafiz, **Cláudio Gomes**, Bruno Barroca, and Hans Vangheluwe. Modular Design of Hybrid Languages by Explicit Modeling of Semantic Adaptation. In *Proceedings of the Symposium on Theory of Modeling & Simulation: DEVS Integrative M&S Symposium*, pages 29:1–29:8, Pasadena, California, April 2016. IEEE.

[60] David P. Y. Lawrence, **Cláudio Gomes**, Joachim Denil, Hans Vangheluwe, and Didier Buchs. Coupling Petri nets with Deterministic Formalisms Using Co-simulation. In *Symposium on Theory of Modeling & Simulation: DEVS Integrative M&S Symposium*, pages 6:1–6:8, Pasadena, CA, USA, 2016.

[61] Levi Lúcio, Bentley James Oakes, **Cláudio Gomes**, Gehan Selim, Juergen Dingel, James R. Cordy, and Hans Vangheluwe. SyVOLT: Full Model Transformation Verification Using Contracts. In *8th International Conference on Model Driven Engineering Languages and Systems - Demo*, pages 6019–635, Ottawa, Canada, September 2015. Springer International Publishing.

[62] **Cláudio Gomes**, Bruno Barroca, and Vasco Amaral. Classification of Model Transformation Tools: Pattern Matching Techniques. In Juergen Dingel, Wolfram Schulte, Isidro Ramos, Silvia Abrahão, and Emilio Insfran, editors, *Model-Driven Engineering Languages and Systems*, volume 8767 of *Lecture Notes in Computer Science*. Springer International Publishing, 2014.

Peer Reviewed Workshops

[63] Hao Feng, **Cláudio Gomes**, Michael Sandberg, Hugo Daniel Macedo, and Peter Gorm Larsen. Under What Conditions Does a Digital Shadow Track a Periodic Linear Physical System? In *Software Engineering and Formal Methods. SEFM 2021 Collocated Workshops*, volume 13230, pages 143–155, Cham, 2022. Springer International Publishing.

[64] Lukas Esterle, **Cláudio Gomes**, Mirgita Frasheri, Henrik Ejersbo, Sven Tomforde, and Peter G. Larsen. Digital twins for collaboration and self-integration. In *2021 IEEE International Conference on Autonomic Computing and Self-Organizing Systems Companion (ACSOS-C)*, pages 172–177, DC, USA, September 2021. IEEE.

[65] Hao Feng, **Cláudio Gomes**, Michael Sandberg, Casper Thule, Kenneth Lausdahl, and Peter Gorm Larsen. Developing a Physical and Digital Twin: A Process Model. In *2021 ACM/IEEE International Conference on Model Driven Engineering Languages and Systems Companion (MODELS-C)*, Fukuoka, Japan, 2021. IEEE.

[66] Simon Thrane Hansen, Casper Thule, and **Cláudio Gomes**. An FMI-Based initialization plugin for INTO-CPS maestro 2. In Loek Cleophas and Mieke Massink, editors, *Software Engineering and Formal Methods. SEFM 2020 Collocated Workshops*, pages 295–310, Virtual event, 2021. Springer International Publishing.

[67] Randy Paredis, **Cláudio Gomes**, and Hans Vangheluwe. Towards a Family of Digital Model/Shadow/Twin Workflows and Architectures. In *Proceedings of the 2nd International Conference on Innovative Intelligent*

Industrial Production and Logistics, pages 174–182, Online Streaming, 2021. SCITEPRESS - Science and Technology Publications.

[68] **Cláudio Gomes**, Casper Thule, Levi Lúcio, Hans Vangheluwe, and Peter Gorm Larsen. Generation of Co-simulation Algorithms Subject to Simulator Contracts. In Javier Camara and Martin Steffen, editors, *Software Engineering and Formal Methods*, volume 12226 of *Lecture Notes in Computer Science*, pages 34–49, Oslo, Norway, 2020. Springer International Publishing.

[69] Peter Gorm Larsen, Hugo Daniel Macedo, **Cláudio Gomes**, Lukas Esterle, Casper Thule, John Fitzgerald, and Kenneth Pierce. Collaborative Modelling and Co-simulation in Engineering and Computing Curricula. In *Frontiers in Software Engineering Education*, volume 12271 of *Lecture Notes in Computer Science*, pages 196–213, Cham, 2020. Springer International Publishing.

[70] Casper Thule, Maurizio Palmieri, **Cláudio Gomes**, Kenneth Lausdahl, Hugo Daniel Macedo, Nick Battle, and Peter Gorm Larsen. Towards Reuse of Synchronization Algorithms in Co-simulation Frameworks. In *Software Engineering and Formal Methods*, volume 12226 of *Lecture Notes in Computer Science*, pages 50–66, Oslo, Norway, 2020. Springer International Publishing.

[71] **Cláudio Gomes**, Levi Lucio, and Hans Vangheluwe. Semantics of Co-simulation Algorithms with Simulator Contracts. In *2019 ACM/IEEE 22nd International Conference on Model Driven Engineering Languages and Systems Companion (MODELS-C)*, pages 784–789, Munich, Germany, 2019. IEEE.

[72] **Cláudio Gomes**, Casper Thule, Kenneth Lausdahl, Peter Gorm Larsen, and Hans Vangheluwe. Stabilization Technique in INTO-CPS. In *2nd Workshop on Formal Co-Simulation of Cyber-Physical Systems*, volume 11176, Toulouse, France, 2018. Springer, Cham.

[73] Gerald Schweiger, Georg Engel, Josef Schoeggl, Irene Hafner, **Cláudio Gomes**, and Thierry Nouidui. Co-Simulation - an Empirical Survey: Applications, Recent Developments and Future Challenges. In *Proceedings of the MATHMOD 2018*, pages 125–126, Vienna, Austria, 2018. ARGESIM Publisher Vienna.

[74] Casper Thule, **Cláudio Gomes**, Julien Deantoni, Peter Gorm Larsen, Jörg Brauer, and Hans Vangheluwe. Towards Verification of Hybrid Co-simulation Algorithms. In *Workshop on Formal Co-Simulation of Cyber-Physical Systems*, Toulouse, France, 2018. Springer, Cham.

[75] **Cláudio Gomes**, Paschalis Karalis, Eva M. Navarro-López, and Hans Vangheluwe. Approximated Stability Analysis of Bi-modal Hybrid Co-simulation Scenarios. In *1st Workshop on Formal Co-Simulation of Cyber-Physical Systems*, pages 345–360, Trento, Italy, 2017. Springer, Cham.

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