

# David Thönnessen, M.Sc. RWTH

UMA Nachschubschlüssel, "Echtzeit vernetzter Systeme in Industrie 4.0" (since 2015)

## Patents

- Elektrisch angetriebene Transportvorrichtung für wenigstens eine Person sowie Research Associate Verfahren hierfür (102016217804.0, 16.09.2016)
- Transportsystem mit automatischer Folgefunktion sowie Steuerungsverfahren (102016217805.9, 16.09.2016)
- Verfahren zur Vertriebssteuerung eines dreispurigen Fahrzeugs sowie Fahrzeug (102016221367.9, 28.10.2016)
- Fahrzeug mit elektrisch angetriebenen Rädern und Verfahren zum Lenken desselben (102016221366.0, 28.10.2016)
- Aborting a Semi-Autonomous Vehicle (83866252, 03.08.2017)
- Conveying System With an Automatic Tethering Function (US20180081372A1, 14.09.2017)



## Theses

In line with my research there are always new topics for theses. If you are interested please contact me via e-Mail or come to my office.

## In Progress

## Finished

- Complete Language Support and Error Detection of Sequential Function Charts in Twistturn
- Development of a Factory Acceptance Test for Reduction of Commissioning Times of Decentral Passenger Transport Facilities
  - Development of a Prototype Vehicle Status Display and Interaction Device
    - Extending Postsimulation by a Virtual Timebase
  - Utilizing Sequential Function Charts to Specify Hardware-in-the-Loop Tests
    - Analysis and Postsimulation of Hardware-in-the-Loop Tests
- Hardware-in-the-Loop Simulation Using an Extension of PLC Programming Languages
  - Extension of Twistturn to Support Hardware-in-the-Loop Simulation
    - Balance Point dependent Vehicle Dynamics Control
    - Tethering semi-autonomous Vehicles by relative Positioning
- [Integration of the PROFINET Stack into the RTAndroid Platform](#)
- Design and Implementation of an efficient on-board Field Device Adapter for Twistturn
- [OPC UA Connectivity of Android Devices and Machine Tools](#)
- [Utilizing Bluetooth for Supporting Real-Time Wireless Communication](#)

## Teaching

Semester	Course	Type
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Winter term 14/15	Praktikum Systemprogrammierung	P
	Ausgesuchte Themen zur Eingebetteten Software	S
Summer term 15	Praktikum Systemprogrammierung	P
	Dienste in der Industrie 4.0	S
Winter term 15/16	Praktikum Systemprogrammierung	P
	Modellbasiertes Testen & Analyse eingebetteter Software	S
Summer term 16	Praktikum Systemprogrammierung	P
	Eingebettete Software in Medizintechnik & eMobilität	S
Winter term 16/17	Praktikum Systemprogrammierung	P
	Eingebettete Software in Medizintechnik & eMobilität	S
Summer term 17	Praktikum Systemprogrammierung	P
	Modellbasiertes Testen & Analyse eingebetteter Software	S
Winter term 17/18	Modellierungssprachen für eingebettete Systeme	PS
	Modellbasiertes Testen & Analyse eingebetteter Software	S
	Praktikum Systemprogrammierung (Experiment 1)	P
Summer term 18	Modellbasiertes Testen & Analyse eingebetteter Software	S
	Praktikum Systemprogrammierung (Experiment 1)	P
Winter term 18/19	Modellbasiertes Testen & Analyse eingebetteter Software	S
Summer term 19	Proseminar: Grundlagen eingebetteter Systeme	PS
	Seminar: Ausgesuchte Themen zur Eingebetteten Software	S

## Office Hours

Office hours by appointment

## Publications

[Tho21]

[PDFBIB](#)

Thönnessen, D., "Hardware-in-the-Loop testing of industrial automation systems using PLC languages", PhD Thesis, Aachen, 2021.

## Hardware-in-the-Loop testing of industrial automation systems using PLC languages

### Bibtex entry :

```
@phdthesis { Tho21,
  author = { Th{"o}nnessen, David },
  othercontributors = { Kowalewski, Stefan and Fabian, Martin },
  title = { Hardware-in-the-Loop testing of industrial automation
    systems using PLC languages },
  publisher = { RWTH Aachen University },
```

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school = { RWTH Aachen University },
pages = { 1 Online-Ressource : Illustrationen, Diagramme },
series = { Aachener Informatik-Berichte },
year = { 2021 },
address = { Aachen },
doi = { 10.18154/RWTH-2021-08705 },
typ = { PUB:(DE-HGF)11 },
reportid = { RWTH-2021-08705 },
cin = { 122810 / 120000 },
url = {
http://publications.rwth-aachen.de/record/826036/files/826036.pdf },
}

```

[SRT+20]

[PDFBIB](#)

Smieschek, M., Rakel, S., Thönnessen, D., Derks, A., Stollenwerk, A., and Kowalewski, S., "A Remote Test Environment for a Large-Scale Microcontroller Laboratory Course", in *Proc. Cyber physical systems : model-based design : 9th international workshop, CyPhy 2019 and 15th international workshop, WESE 2019, New York City, NY, USA, October 17-18, 2019 : revised selected papers / Roger Chamberlain, Martin Edin Grimheden, Walid Taha (eds.)*, Cham, 2020 in *Lecture Notes in Computer Science*, Springer, pp. 231-246.

## A Remote Test Environment for a Large-Scale Microcontroller Laboratory Course

### Bibtex entry :

```

@inproceedings { SRT+20,
  author = { Smieschek, Manfred and Rakel, Stefan and Th{"o}nnessen,
    David and Derks, Andreas and Stollenwerk, Andr{e} and
    Kowalewski, Stefan },
  title = { A Remote Test Environment for a Large-Scale
Microcontroller
  Laboratory Course },
  booktitle = { Cyber physical systems : model-based design : 9th
  international workshop, CyPhy 2019 and 15th international
  workshop, WESE 2019, New York City, NY, USA, October 17-18,
  2019 : revised selected papers / Roger Chamberlain, Martin
  Edin Grimheden, Walid Taha (eds.) },
  publisher = { Springer },
  pages = { 231-246 },
  series = { Lecture Notes in Computer Science },
  year = { 2020 },
  address = { Cham },
  organization = { Workshop on Embedded Systems and Cyber-Physical
Systems
  Education, New York (USA), 2019-10-17 - 2019-10-18 },
  doi = { 10.1007/978-3-030-41131-2_11 },
  typ = { PUB:(DE-HGF)7 },
  reportid = { RWTH-2020-02344 },
}

```

```
cin = { 122810 / 120000 },
url = {
http://publications.rwth-aachen.de/record/783169/files/Remote%20Pool%20
Final.pdf },
}
```

[KTF19]

[PDFBIB](#)

Khan, A., Thönnessen, D., and Fabian, M., "On-the-fly conformance testing of safety PLC code using QuickCheck", in *Proc. 2019 IEEE 17th International Conference on Industrial Informatics (INDIN) : Aalto University, Helsinki-Espoo, Finland, 22-25 July, 2019 : proceedings / organized by: Aalto University, Finland; Tampere University, Finland; Finnish Society of Automation, Finland ; sponsored by: the Institute of Electrical and Electronics Engineers (IEEE), IEEE Industrial Electronics Society (IES), Piscataway, NJ, 2019, IEEE, pp. 419-424.*

## On-the-fly conformance testing of safety PLC code using QuickCheck

### Bibtex entry :

```
@inproceedings { KTF19,
  author = { Khan, Adnan and Th{"o"}nnessen, David and Fabian, Martin
},
  title = { On-the-fly conformance testing of safety PLC code using
QuickCheck },
  booktitle = { 2019 IEEE 17th International Conference on Industrial
Informatics (INDIN) : Aalto University, Helsinki-Espoo,
Finland, 22-25 July, 2019 : proceedings / organized by:
Aalto University, Finland; Tampere University, Finland;
Finnish Society of Automation, Finland ; sponsored by: the
Institute of Electrical and Electronics Engineers (IEEE),
IEEE Industrial Electronics Society (IES) },
  publisher = { IEEE },
  pages = { 419-424 },
  year = { 2019 },
  address = { Piscataway, NJ },
  organization = { 17th IEEE International Conference on Industrial
Informatics, Helsinki (Finland), 2019-07-22 - 2019-07-25 },
  doi = { 10.1109/INDIN41052.2019.8972277 },
  typ = { PUB:(DE-HGF)7 },
  reportid = { RWTH-2019-04271 },
  cin = { 122810 / 120000 },
  url = { http://publications.rwth-aachen.de/record/760542 },
}
```

[TSF+19]

[PDFBIB](#)

Thönnessen, D., Smallbone, N., Fabian, M., Claessen, K., and Kowalewski, S., "Testing Safety PLCs Using QuickCheck", in *Proc. 2019 IEEE 15th International Conference on Automation*

*Science and Engineering : (CASE) : August 22-26, 2019, Vancouver, BC, Canada / sponsored by IEEE Robotics and Automation Society ; CASE editorial board: editor-in-chief: Spiridon (Spyros) Reveliotis ; editors: Cappelleri, David; Dimarogonas, Dimos V.; Dotoli, Mariagrazia; Fanti, Maria Pia; LUTZ, Philippe; Seatzu, Carla; Xie, Xiaolan, Piscataway, NJ, 2019, IEEE, pp. 1388-1393.*

## Testing Safety PLCs Using QuickCheck

### Bibtex entry :

```
@inproceedings { TSF+19,
  author = { Th{"o}nnessen, David and Smallbone, Nick and Fabian,
  Martin
    and Claessen, Koen and Kowalewski, Stefan },
  title = { Testing Safety PLCs Using QuickCheck },
  booktitle = { 2019 IEEE 15th International Conference on Automation
  Science and Engineering : (CASE) : August 22-26, 2019,
  Vancouver, BC, Canada / sponsored by IEEE Robotics and
  Automation Society ; CASE editorial board: editor-in-chief:
  Spiridon (Spyros) Reveliotis ; editors: Cappelleri, David;
  Dimarogonas, Dimos V.; Dotoli, Mariagrazia; Fanti, Maria
  Pia; LUTZ, Philippe; Seatzu, Carla; Xie, Xiaolan },
  publisher = { IEEE },
  pages = { 1388-1393 },
  year = { 2019 },
  address = { Piscataway, NJ },
  organization = { 15th International Conference on Automation
  Science and
    Engineering, Vancouver (Canada), 2019-08-22 - 2019-08-26 },
  doi = { 10.1109/COASE.2019.8843227 },
  typ = { PUB:(DE-HGF)7 },
  reportid = { RWTH-2019-04632 },
  cin = { 122810 / 120000 },
  url = { http://publications.rwth-aachen.de/record/761173 },
}
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[BFH+18]

[PDFBIB](#)

Bordasch, M., Facchi, C., Heidepriem, S., Jähnert, J., Jung, T., Köllner, C., Kraas, A., Krause, J., Krüning, K., Kugler, A., Maschler, B., Schleicher, C., Siegrist, D., Simon, H., Störmer, C., Thönnessen, D., Wassermann, E., Weyrich, M., Wimmer, T., and Zeller, A., "VDI Status Report Testing of Networked Systems for Industrie 4.0", 2018.

## VDI Status Report Testing of Networked Systems for Industrie 4.0

### Bibtex entry :

```
@techreport { BFH+18,
  author = { Bordasch, Manuel and Facchi, Christian and Heidepriem,
  Sebastian and J{"a}hnert, J{"u}rger and Jung, Tobias and
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K{"o}llner, Christian and Kraas, Alexander and Krause, Jan
and Kr{"u}ning, Kai and Kugler, Alexander and Maschler,
Benjamin and Schleicher, Christian and Siegrist, Daniel and
Simon, Hendrik and St{"o}rmer, Christoph and
Th{"o}nnessen, David and Wassermann, Erik and Weyrich,
Michael and Wimmer, Thomas and Zeller, Andreas },
title = { VDI Status Report Testing of Networked Systems for
Industrie
4.0 },
pages = { 1-20 },
year = { 2018 },
typ = { PUB:(DE-HGF)29 },
reportid = { RWTH-CONV-236295 },
cin = { 122810 / 120000 },
url = {
https://www.vdi.de/ueber-uns/presse/publikationen/details?tx\_vdipublications\_publicationdetails%5Bpublication%5D=19&cHash=e6b4c230eafa31d95ceb75395274c78c },
}
```

[TK18]

PDFBIB

Thönnessen, D. and Kowalewski, S., "Agiles Testen von cyber-physischen Produktionssystemen : Einsatz von SPS-Sprachen zur Testfallbeschreibung", *Atp-Edition : automatisierungstechnische Praxis*, vol. 60, iss. 3, pp. 46-55, 2018

## Agiles Testen von cyber-physischen Produktionssystemen : Einsatz von SPS-Sprachen zur Testfallbeschreibung

**Bibtex entry :**

```
@article { TK18,
author = { Th{"o}nnessen, David and Kowalewski, Stefan },
title = { Agiles Testen von cyber-physischen Produktionssystemen :
Einsatz von SPS-Sprachen zur Testfallbeschreibung },
journal = { Atp-Edition : automatisierungstechnische Praxis },
publisher = { DIV Dt. Industrieverl. },
pages = { 46-55 },
volume = { 60 },
number = { 3 },
year = { 2018 },
address = { M{"u}nchen },
issn = { 2364-3137 },
doi = { 10.17560/atp.v58i03.1917 },
typ = { PUB:(DE-HGF)16 },
reportid = { RWTH-2018-225395 },
cin = { 122810 / 120000 },
}
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```
url = { http://publications.rwth-aachen.de/record/727012 },
}
```

[TK18a]

[PDFBIB](#)

Thönnessen, D. and Kowalewski, S., "Using PLC Programming Languages for Test-Case Specification of Hardware-in-the-loop Tests", in *Proc. [Modellbasierte Entwicklung eingebetteter Systeme, MBEES 2018, 2018-04-16 - 2018-04-18, Hamburg, Germany]*, 2018, fortiss Technischer Bericht, pp. 41-50.

## Using PLC Programming Languages for Test-Case Specification of Hardware-in-the-loop Tests

### Bibtex entry :

```
@inproceedings { TK18a,
  author = { Th{"o}nnessen, David and Kowalewski, Stefan },
  title = { Using PLC Programming Languages for Test-Case
  Specification
  of Hardware-in-the-loop Tests },
  booktitle = { [Modellbasierte Entwicklung eingebetteter Systeme,
  MBEES
  2018, 2018-04-16 - 2018-04-18, Hamburg, Germany] },
  publisher = { fortiss Technischer Bericht },
  pages = { 41-50 },
  year = { 2018 },
  organization = { Modellbasierte Entwicklung eingebetteter Systeme,
  Hamburg
  (Germany), 2018-04-16 - 2018-04-18 },
  typ = { PUB:(DE-HGF)8 },
  reportid = { RWTH-CONV-236290 },
  cin = { 122810 / 120000 },
  url = { http://publications.rwth-aachen.de/record/752269 },
}
```

[TRR+18]

[PDFBIB](#)

Thönnessen, D., Reinker, N., Rakel, S., and Kowalewski, S., "A concept for PLC hardware-in-the-loop testing using an extension of structured text", in *Proc. 2017 22nd IEEE International Conference on Emerging Technologies and Factory Automation : September 12-15, 2017, Limassol, Cyprus / ABB, IEEE, IES, University of Cyprus, [Piscataway, NJ]*, 2018 in IEEE International Conference on Emerging Technologies and Factory Automation-ETFA, IEEE, p. 8.

## A concept for PLC hardware-in-the-loop testing using an extension of structured text

### Bibtex entry :

```
@inproceedings { TRR+18,
  author = { Th{"o}nnessen, David and Reinker, Niklas and Rakel,
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Stefan
    and Kowalewski, Stefan },
    title = { A concept for PLC hardware-in-the-loop testing using an
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    booktitle = { 2017 22nd IEEE International Conference on Emerging
                  Technologies and Factory Automation : September 12-15, 2017,
                  Limassol, Cyprus / ABB, IEEE, IES, University of Cyprus },
    publisher = { IEEE },
    pages = { 8 Seiten },
    series = { IEEE International Conference on Emerging Technologies
and
              Factory Automation-ETFA },
    year = { 2018 },
    address = { [Piscataway, NJ] },
    organization = { 22nd IEEE International Conference on Emerging
Technologies
                  and Factory Automation, Limassol (Cyprus), 2017-09-12 -
                  2017-09-15 },
    doi = { 10.1109/ETFA.2017.8247580 },
    typ = { PUB:(DE-HGF)7 },
    reportid = { RWTH-2018-223452 },
    cin = { 122810 / 120000 },
    url = { http://publications.rwth-aachen.de/record/722218 },
}
```

[TRR+18a]

[PDFBIB](#)

Thönnessen, D., Rakel, S., Reinker, N., and Kowalewski, S., "Matching Discrete Signals for Hardware-in-the-Loop-Testing of PLCs", *IFAC-PapersOnLine*, vol. 51, iss. 10, pp. 229-234, 2018

## Matching Discrete Signals for Hardware-in-the-Loop-Testing of PLCs

### Bibtex entry :

```
@article { TRR+18a,
    author = { Th{"o}nnessen, David and Rakel, Stefan and Reinker,
              Niklas
              and Kowalewski, Stefan },
    title = { Matching Discrete Signals for Hardware-in-the-Loop-
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              of PLCs },
    journal = { IFAC-PapersOnLine },
    pages = { 229-234 },
    volume = { 51 },
    number = { 10 },
    year = { 2018 },
    address = { Laxenburg },
```



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    issn = { 2405-8963 },
    organization = { 3rd IFAC Conference on Embedded Systems,
Computational
        Intelligence and Telematics in Control },
    doi = { 10.1016/j.ifacol.2018.06.267 },
    typ = { PUB:(DE-HGF)16 },
    reportid = { RWTH-2018-227582 },
    cin = { 122810 / 110000 / 120000 },
    url = { http://publications.rwth-aachen.de/record/731576 },
}

```

[TRR+18b]

[PDFBIB](#)

Thönnessen, D., Reinker, N., Rakel, S., Svetlakov, A., and Kowalewski, S., "Correctness Properties and Exemplified Applicability of a Signal Matching Algorithm with Multidimensional Tolerance Specifications", in *Proc. 2018 IEEE 14th International Conference on Automation Science and Engineering (CASE) : Munich, Germany, August 20-24, 2018*, Piscataway, NJ, 2018, IEEE, pp. 1197-1202.

## Correctness Properties and Exemplified Applicability of a Signal Matching Algorithm with Multidimensional Tolerance Specifications

### Bibtex entry :

```

@inproceedings { TRR+18b,
    author = { Th{"o}nnessen, David and Reinker, Niklas and Rakel,
Stefan
        and Svetlakov, Andrei and Kowalewski, Stefan },
    title = { Correctness Properties and Exemplified Applicability of a
Signal Matching Algorithm with Multidimensional Tolerance
Specifications },
    booktitle = { 2018 IEEE 14th International Conference on Automation
Science and Engineering (CASE) : Munich, Germany, August
20-24, 2018 },
    publisher = { IEEE },
    pages = { 1197-1202 },
    year = { 2018 },
    address = { Piscataway, NJ },
    organization = { 2018 IEEE 14th International Conference on
Automation
        Science and Engineering, Munich (Germany), 2018-08-20 -
2018-08-24 },
    doi = { 10.1109/COASE.2018.8560407 },
    typ = { PUB:(DE-HGF)7 },
    reportid = { RWTH-2019-00319 },
    cin = { 122810 / 120000 },
    url = {
http://publications.rwth-aachen.de/record/752982/files/752982.pdf },
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[TSN+16]

[PDFBIB](#)

Thönnessen, D., Schweigler, M., Ney, O., and Kugelmeier, M., "Conveying system with an automatic tethering function", 2016.

## Conveying system with an automatic tethering function

### Bibtex entry :

```
@techreport { TSN+16,
  author = { Th{"o}nnessen, David and Schweigler, Martin and Ney,
  Oliver
    and Kugelmeier, Mirko },
  title = { Conveying system with an automatic tethering function },
  pages = { 1-7 },
  year = { 2016 },
  typ = { PUB:(DE-HGF)23 },
  reportid = { RWTH-CONV-236287 },
  url = {
https://depatisnet.dpma.de/DepatisNet/depatisnet?action=bibdat&docid=US020180081372A1 },
}
```

[KKO+15]

[PDFBIB](#)

Kowalewski, S., Kalkov, I., Obster, M., and Thönnessen, D., "Echtzeiterweiterung für Android: SPS inside", *IEE - Elektrische Automatisierung + Antriebstechnik*, pp. 58-61, 2015

## Echtzeiterweiterung für Android: SPS inside

### Bibtex entry :

```
@article { KKO+15,
  author = { Kowalewski, Stefan and Kalkov, Igor and Obster, Mathias
  and
    Th{"o}nnessen, David },
  title = { Echtzeiterweiterung f{"u}r Android: SPS inside },
  journal = { IEE - Elektrische Automatisierung + Antriebstechnik },
  publisher = { IEE },
  pages = { 58-61 },
  year = { 2015 },
  issn = { 1434-2898 },
  typ = { PUB:(DE-HGF)16 },
  reportid = { RWTH-CONV-236305 },
  cin = { 122810 / 120000 },
  url = { http://publications.rwth-aachen.de/record/752275 },
}
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<https://www.embedded.rwth-aachen.de/> - **Informatik 11 - Embedded Software**

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<https://www.embedded.rwth-aachen.de/doku.php?id=en:lehrstuhl:mitarbeiter:thoennessen>Last update: **2019/05/08 12:08**