

# Dr. rer. nat. David Thönnessen

## Kontakt



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Büro: Raum 2301 (Gebäude H, 3. OG)

## Fachausschüsse

- [GMA Fachausschuss 7.25 - "Testen vernetzter Systeme in Industrie 4.0"](#) (seit 2015)

## Patente

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

# Abschlussarbeiten

Im Rahmen meiner Forschungstätigkeit ergeben sich kontinuierlich Themen für Abschlussarbeiten. Bei Interesse bitte ich um Kontaktaufnahme per E-Mail oder persönlich bei mir im Büro.

## Laufend

## Abgeschlossen

- 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](#)

## Lehre

| Semester             | Titel                                                                       | Art |
|----------------------|-----------------------------------------------------------------------------|-----|
| Wintersemester 14/15 | <a href="#">Praktikum Systemprogrammierung</a>                              | P   |
|                      | <a href="#">Ausgesuchte Themen zur Eingebetteten Software</a>               | S   |
| Sommersemester 15    | <a href="#">Praktikum Systemprogrammierung</a>                              | P   |
|                      | <a href="#">Dienste in der Industrie 4.0</a>                                | S   |
| Wintersemester 15/16 | <a href="#">Praktikum Systemprogrammierung</a>                              | P   |
|                      | <a href="#">Modellbasiertes Testen &amp; Analyse eingebetteter Software</a> | S   |
| Sommersemester 16    | <a href="#">Praktikum Systemprogrammierung</a>                              | P   |
|                      | <a href="#">Eingebettete Software in Medizintechnik &amp; eMobilität</a>    | S   |
| Wintersemester 16/17 | <a href="#">Praktikum Systemprogrammierung</a>                              | P   |
|                      | <a href="#">Eingebettete Software in Medizintechnik &amp; eMobilität</a>    | S   |
| Sommersemester 17    | <a href="#">Praktikum Systemprogrammierung</a>                              | P   |
|                      | <a href="#">Modellbasiertes Testen &amp; Analyse eingebetteter Software</a> | S   |
| Wintersemester 17/18 | <a href="#">Modellierungssprachen für eingebettete Systeme</a>              | PS  |
|                      | <a href="#">Modellbasiertes Testen &amp; Analyse eingebetteter Software</a> | S   |
|                      | <a href="#">Praktikum Systemprogrammierung (Versuch 1)</a>                  | P   |
| Sommersemester 18    | <a href="#">Modellbasiertes Testen &amp; Analyse eingebetteter Software</a> | S   |
|                      | <a href="#">Praktikum Systemprogrammierung (Versuch 1)</a>                  | P   |

|                      |                                                                             |    |
|----------------------|-----------------------------------------------------------------------------|----|
| Wintersemester 18/19 | <a href="#">Modellbasiertes Testen &amp; Analyse eingebetteter Software</a> | S  |
| Sommersemester 19    | <a href="#">Proseminar: Grundlagen eingebetteter Systeme</a>                | PS |
|                      | <a href="#">Seminar: Ausgesuchte Themen zur Eingebetteten Software</a>      | S  |

## Sprechstunde

Nach Vereinbarung.

## Publikationen

[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 },
  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 },
}
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[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 Thoennessen,  
    David and Derks, Andreas and Stollenwerk, André 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 = { 17. 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 },

```

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pages = { 1388-1393 },
year = { 2019 },
address = { Piscataway, NJ },
organization = { 15. International Conference on Automation Science
and
Engineering, Vancouver, BC (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 },
}
```

[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
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 },
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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 },  
  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 },  
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    Specification  
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  booktitle = { [Modellbasierte Entwicklung eingebetteter Systeme,  
    MBEES  
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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 },
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cin = { 122810 / 120000 },
url = { http://publications.rwth-aachen.de/record/752269 },
}
```

[TRR+18]

[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+18,
  author = { Th{"o}nnessen, David and Rakel, Stefan and Reinker,
Niklas
and Kowalewski, Stefan },
  title = { Matching Discrete Signals for Hardware-in-the-Loop-
Testing
of PLCs },
  journal = { IFAC-PapersOnLine },
  pages = { 229-234 },
  volume = { 51 },
  number = { 10 },
  year = { 2018 },
  address = { Laxenburg },
  issn = { 2405-8963 },
  organization = { 3. 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+18a]

[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) : 20-24 Aug. 2018 / general chair: Birgit Vogel-Heuser (Technical University of Munich) ; publisher: IEEE, 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+18a,
  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) : 20-24 Aug. 2018 / general
chair: Birgit Vogel-Heuser (Technical University of Munich)
; publisher: IEEE },
  publisher = { IEEE },
  pages = { 1197-1202 },
  year = { 2018 },
  address = { Piscataway, NJ },
  organization = { IEEE 14. 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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```

[TRR+17]

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, 2017, IEEE, p. 8.*

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

### Bibtex entry :

```
@inproceedings { TRR+17,
```

```
author = { Th{"o}nnessen, David and Reinker, Niklas and Rakel,
Stefan
    and Kowalewski, Stefan },
title = { A concept for PLC hardware-in-the-loop testing using an
extension of structured text },
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 },
year = { 2017 },
address = { Piscataway, NJ },
organization = { 22. 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 },
}
```

[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://worldwide.espacenet.com/patent/search?q=pn%3DUS20180081372A1 },
}
```

[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 { KK0+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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