

# Christian Dernehl, M.Sc.



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## Research Topics

- Autonomy for Micro Aerial Vehicles
- Static analysis of functional block diagrams
- Model checking of functional block diagrams
- Analysis of non-linear systems

## Projects

- [IMAV](#)
- [Teilnahme am Carolo Cup](#)

## Teaching

Semester	Title
Summer 2012	Hardware Programming Lab
Winter 2012/13	Introduction to Computer Engineering
Winter 2013/14	Introduction to Computer Engineering

## Publications

[Der19]

[PDFBIB](#)

Dernehl, C. M., "Verification of embedded software models by combining abstract interpretation, symbolic execution and stability analysis", PhD Thesis, Aachen, 2019.

# Verification of embedded software models by combining abstract interpretation, symbolic execution and stability analysis

## Bibtex entry :

```
@phdthesis { Der19,  
  author = { Dernehl, Christian Michael },  
  othercontributors = { Kowalewski, Stefan and Moormann, Dieter },  
  title = { Verification of embedded software models by combining  
    abstract interpretation, symbolic execution and stability  
    analysis },  
  publisher = { RWTH Aachen University, Department of Computer  
Science },  
  school = { RWTH Aachen University },  
  pages = { 1 Online-Ressource (xxiii, 156 Seiten) : Illustrationen,  
    Diagramme },  
  series = { Aachener Informatik-Berichte },  
  year = { 2019 },  
  address = { Aachen },  
  doi = { 10.18154/RWTH-2019-05178 },  
  typ = { PUB:(DE-HGF)11 },  
  reportid = { RWTH-2019-05178 },  
  cin = { 122810 / 120000 },  
  url = {  
http://publications.rwth-aachen.de/record/761850/files/761850.pdf },  
}
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[DDK+17]

PDFBIB

Dankert, J., Dernehl, C., Kusmenko, E., Eckstein, L., Kowalewski, S., and Rumpe, B., "RapidCoop - Robuste Architektur durch geeignete Paradigmen für Kooperativ Interagierende Automobile", in *Proc. AAET - Automatisiertes und Vernetztes Fahren : Beiträge zum gleichnamigen 18. Braunschweiger Symposium vom 8. und 9. Februar 2017, Stadthalle, Braunschweig / ITS automotive nord e.V. (Hrsg.)*, Braunschweig, 2017, ITS automotive nord e.V., pp. 225-244.

## RapidCoop - Robuste Architektur durch geeignete Paradigmen für Kooperativ Interagierende Automobile

## Bibtex entry :

```
@inproceedings { DDK+17,  
  author = { Dankert, Jens and Dernehl, Christian and Kusmenko,  
Evgeny  
    and Eckstein, Lutz and Kowalewski, Stefan and Rumpe,  
    Bernhard },  
  title = { RapidCoop - Robuste Architektur durch geeignete  
Paradigmen
```

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f{"u}r Kooperativ Interagierende Automobile },
booktitle = { AAET - Automatisiertes und Vernetztes Fahren :
Beitr{"a}ge
zum gleichnamigen 18. Braunschweiger Symposium vom 8. und 9.
Februar 2017, Stadthalle, Braunschweig / ITS automotive nord
e.V. (Hrsg.) },
publisher = { ITS automotive nord e.V. },
pages = { 225-244 },
year = { 2017 },
address = { Braunschweig },
organization = { 18. Braunschweiger Symposium AAET -
Automatisiertes und
Vernetztes Fahren, Braunschweig (Germany), 2017-02-08 -
2017-02-09 },
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reportid = { RWTH-2018-231931 },
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url = {
http://www.se-rwth.de/publications/RapidCoop-Robuste-Architektur-durch-
geeignete-Paradigmen-fuer-Kooperativ-Interagierende-
Automobile.pdf?PHPSESSID=eb66ba2042d9500e5135d33f6b7575af },
}

```

[DKK17]

[PDFBIB](#)

Dernehl, C., Kühn, J., and Kowalewski, S., "Case studies on automated verification with slope boundaries for block diagrams", *Computer Languages, Systems & Structures*, vol. 54, pp. 528-543, 2017

## Case studies on automated verification with slope boundaries for block diagrams

### Bibtex entry :

```

@article { DKK17,
author = { Dernehl, Christian and K{"u}hn, Jan and Kowalewski,
Stefan },
title = { Case studies on automated verification with slope
boundaries
for block diagrams },
journal = { Computer Languages, Systems & Structures },
publisher = { Elsevier Science },
pages = { 528-543 },
volume = { 54 },
year = { 2017 },
address = { Amsterdam [u.a.] },
issn = { 1477-8424 },
doi = { 10.1016/j.cl.2017.09.001 },
typ = { PUB:(DE-HGF)16 },
reportid = { RWTH-CONV-236294 },
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cin = { 122810 / 120000 },  
url = { http://publications.rwth-aachen.de/record/752271 },  
}
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[Der16]

[PDFBIB](#)

Dernehl, C., "Automatic invariant checking for discrete block diagrams using Lyapunov functions with sat modulo theory solvers", in *Proc. 2016 European Control Conference (ECC) : June 29-July 1, 2016, Aalborg, Denmark / [European Control Association (EUCA)]*, [Piscataway, NJ], 2016, IEEE, pp. 441-446.

## Automatic invariant checking for discrete block diagrams using Lyapunov functions with sat modulo theory solvers

### Bibtex entry :

```
@inproceedings { Der16,  
  author = { Dernehl, Christian },  
  title = { Automatic invariant checking for discrete block diagrams  
    using Lyapunov functions with sat modulo theory solvers },  
  booktitle = { 2016 European Control Conference (ECC) : June 29-July  
1,  
    2016, Aalborg, Denmark / [European Control Association  
    (EUCA)] },  
  publisher = { IEEE },  
  pages = { 441-446 },  
  year = { 2016 },  
  address = { [Piscataway, NJ] },  
  organization = { 2016 European Control Conference, Aalborg  
(Denmark),  
    2016-06-29 - 2016-07-01 },  
  doi = { 10.1109/ECC.2016.7810324 },  
  typ = { PUB:(DE-HGF)7 },  
  reportid = { RWTH-2017-06691 },  
  cin = { 122810 / 120000 },  
  url = { http://publications.rwth-aachen.de/record/696194 },  
}
```

[DHK16]

[PDFBIB](#)

Dernehl, C., Hansen, N., and Kowalewski, S., "Abstract Interpretation of MATLAB Code with Interval Sets", in *Proc. Critical systems: formal methods and automated verification : Joint 21st International Workshop on Formal Methods for Industrial Critical Systems and 16th International Workshop on Automated Verification of Critical Systems, FMICS-AVoCS 2016, Pisa, Italy, September 26-28, 2016 : proceedings / Maurice H. ter Beek, Stefania Gnesi, Alexander Knapp (eds.)*, Cham, 2016 in Lecture Notes in Computer Science, Springer International Publishing, pp. 25-38.

# Abstract Interpretation of MATLAB Code with Interval Sets

## Bibtex entry :

```
@inproceedings { DHK16,  
  author = { Dernehl, Christian and Hansen, Norman and Kowalewski,  
Stefan },  
  title = { Abstract Interpretation of MATLAB Code with Interval Sets  
},  
  booktitle = { Critical systems: formal methods and automated  
verification  
: Joint 21st International Workshop on Formal Methods for  
Industrial Critical Systems and 16th International Workshop  
on Automated Verification of Critical Systems, FMICS-AVoCS  
2016, Pisa, Italy, September 26-28, 2016 : proceedings /  
Maurice H. ter Beek, Stefania Gnesi, Alexander Knapp (eds.) },  
  publisher = { Springer International Publishing },  
  pages = { 25-38 },  
  series = { Lecture Notes in Computer Science },  
  year = { 2016 },  
  address = { Cham },  
  organization = { 21st International Workshop on Formal Methods for  
Industrial  
Critical Systems, Pisa (Italy), 2016-09-26 - 2016-09-28 },  
  doi = { 10.1007/978-3-319-45943-1 },  
  typ = { PUB:(DE-HGF)7 },  
  reportid = { RWTH-2016-12021 },  
  cin = { 122810 / 120000 },  
  url = { http://publications.rwth-aachen.de/record/680837 },  
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```

[DHK16a]

[PDFBIB](#)

Dernehl, C., Hansen, N., and Kowalewski, S., "Combining Abstract Interpretation with Symbolic Execution for a Static Value Range Analysis of Block Diagrams", in *Proc. Software engineering and formal methods : 14th international conference, SEFM 2016, held as part of STAF 2016, Vienna, Austria, July 4-8, 2016 : proceedings / Rocco De Nicola, Eva Kühn (eds.)*, Cham, 2016 in *Lecture Notes in Computer Science*, Springer International Publishing, pp. 137-154.

## Combining Abstract Interpretation with Symbolic Execution for a Static Value Range Analysis of Block Diagrams

## Bibtex entry :

```
@inproceedings { DHK16a,  
  author = { Dernehl, Christian and Hansen, Norman and Kowalewski,  
Stefan },
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title = { Combining Abstract Interpretation with Symbolic Execution
for a Static Value Range Analysis of Block Diagrams },
booktitle = { Software engineering and formal methods : 14th
international
conference, SEFM 2016, held as part of STAF 2016, Vienna,
Austria, July 4-8, 2016 : proceedings / Rocco De Nicola, Eva
K{"u}hn (eds.) },
publisher = { Springer International Publishing },
pages = { 137-154 },
series = { Lecture Notes in Computer Science },
year = { 2016 },
address = { Cham },
organization = { Software Engineering and Formal Methods : 14th
International
Conference, Vienna (Austria), 2016-07-04 - 2016-07-08 },
doi = { 10.1007/978-3-319-41591-8 },
typ = { PUB:(DE-HGF)7 },
reportid = { RWTH-2016-12037 },
cin = { 122810 / 120000 },
url = { http://publications.rwth-aachen.de/record/680854 },
}
```

[DKK16]

[PDFBIB](#)

Dernehl, C., Kühn, J., and Kowalewski, S., "Abstract Interpretation for Block Diagrams - Two Case Studies", in *Proc. MoDeVva 2016 : Model-Driven Engineering, Verification and Validation : proceedings of the 13th Workshop on Model-Driven Engineering, Verification and Validation co-located with ACM/IEEE 19th International Conference on Model Driven Engineering Languages and Systems (MODELS 2016) : Saint-Malo, France, October 3, 2016 / edited by Michalis Famelis, Daniel Ratiu, Gehan M. K. Selim*, [Erscheinungsort nicht ermittelbar], 2016 in CEUR workshop proceedings, [Verlag nicht ermittelbar], pp. 20-29.

## Abstract Interpretation for Block Diagrams - Two Case Studies

### Bibtex entry :

```
@inproceedings { DKK16,
author = { Dernehl, Christian and K{"u}hn, Jan and Kowalewski,
Stefan },
title = { Abstract Interpretation for Block Diagrams - Two Case
Studies },
booktitle = { MoDeVva 2016 : Model-Driven Engineering, Verification
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Validation : proceedings of the 13th Workshop on
Model-Driven Engineering, Verification and Validation
co-located with ACM/IEEE 19th International Conference on
Model Driven Engineering Languages and Systems (MODELS 2016)
: Saint-Malo, France, October 3, 2016 / edited by Michalis
Famelis, Daniel Ratiu, Gehan M. K. Selim },
```

```

publisher = { [Verlag nicht ermittelbar] },
pages = { 20-29 },
series = { CEUR workshop proceedings },
year = { 2016 },
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organization = { 13th Workshop on Model Design, Verification and
Validation,
    Saint-Malo (France), 2016-10-03 - 2016-10-03 },
typ = { PUB:(DE-HGF)7 },
reportid = { RWTH-2017-00640 },
cin = { 122810 / 120000 },
url = { http://ceur-ws.org/Vol-1713/MoDeVWa_2016_paper_3.pdf },
}

```

[GHD+16]

[PDFBIB](#)

Gerlitz, T., Hansen, N., Dernehl, C., and Kowalewski, S., "Artshop: A Continuous Integration and Quality Assessment Framework for Model-Based Software Artifacts", in *Proc. [12. Dagstuhl-Workshop Modelbasierte Entwicklung eingebetteter Systeme (MBEES) / Michaela Huhn (Ostfalia Hochschule - Wolfenbüttel, DE), Matthias Riebisch (Universität Hamburg, DE), Bernhard Schätz (fortiss GmbH - München, DE)]*, 2016, fortiss Technischer Bericht, pp. 13-22.

## artshop: A Continuous Integration and Quality Assessment Framework for Model-Based Software Artifacts

### Bibtex entry :

```

@inproceedings { GHD+16,
  author = { Gerlitz, Thomas and Hansen, Norman and Dernehl,
Christian
    and Kowalewski, Stefan },
  title = { artshop: A Continuous Integration and Quality Assessment
Framework for Model-Based Software Artifacts },
  booktitle = { [12. Dagstuhl-Workshop Modelbasierte Entwicklung
eingebetteter Systeme (MBEES) / Michaela Huhn (Ostfalia
Hochschule – Wolfenb{"u}ttel, DE), Matthias Riebisch
(Universit{"a}t Hamburg, DE), Bernhard Sch{"a}tz (fortiss
GmbH – M{"u}nchen, DE)] },
  publisher = { fortiss Technischer Bericht },
  pages = { 13-22 },
  year = { 2016 },
  organization = { Modellbasierte Entwicklung eingebetteter Systeme,
Dagstuhl
    (Germany), 2016-03-30 - 2016-04-01 },
  typ = { PUB:(DE-HGF)8 },
  reportid = { RWTH-CONV-207908 },
  cin = { 122810 / 120000 },
  url = { http://publications.rwth-aachen.de/record/573828 },
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}
```

[DHG+15]

[PDFBIB](#)

Dernehl, C., Hansen, N., Gerlitz, T., and Kowalewski, S., "Static Value Range Analysis for Matlab/Simulink-Models"[Bonn]: Ges. für Informatik, 2015, vol. 246, pp. 1649-1660.

## Static Value Range Analysis for Matlab/Simulink-Models

### Bibtex entry :

```
@inbook { DHG+15,
  author = { Dernehl, Christian and Hansen, Norman and Gerlitz,
Thomas
  and Kowalewski, Stefan },
  title = { Static Value Range Analysis for Matlab/Simulink-Models },
  booktitle = { Informatik 2015 : Tagung vom 28. September – 02.
Oktober
  2015 in Cottbus / Douglas W. Cunningham ... (Hrsg.) },
  publisher = { Ges. f{"u}r Informatik },
  pages = { 1649-1660 },
  volume = { 246 },
  series = { GI-Edition : lecture notes in informatics },
  year = { 2015 },
  address = { [Bonn] },
  organization = { 45. Jahrestagung der Gesellschaft f{"u}r
Informatik,
  Cottbus (Germany), 2015-09-28 - 2015-10-02 },
  typ = { PUB:(DE-HGF)8 },
  reportid = { RWTH-CONV-207913 },
  cin = { 122810 / 120000 },
  url = { http://publications.rwth-aachen.de/record/573834 },
}
```

[SDK13]

[PDFBIB](#)

Schellen, J., Dernehl, C., and Kowalewski, S., "Optimizing Image Processing on OMAP3 with driver-level frame buering and color space conversion", in *Proc. International Micro Air Vehicle Conference and Flight Competition (IMAV)*, 2013, IMAV, pp. 1-8.

## Optimizing Image Processing on OMAP3 with driver-level frame buering and color space conversion

### Bibtex entry :

```
@inproceedings { SDK13,
  author = { Schellen, Johannes and Dernehl, Christian and
Kowalewski,
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  title = { Optimizing Image Processing on OMAP3 with driver-level
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frame
  buering and color space conversion },
booktitle = { International Micro Air Vehicle Conference and Flight
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year = { 2013 },
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reportid = { RWTH-CONV-204138 },
cin = { 120000 / 122810 },
url = { http://www.youtube.com/watch?v=4HUwtUy-mFc },
}

```

[GDF+12]

[PDFBIB](#)

Gathmann, F., Dernehl, C., Franke, D., and Kowalewski, S., "An integrated vision aided GPS/INS Navigation System for ultra-low-cost MAVs", in *Proc. International Micro Air Vehicle Conference (IMAV)*, 2012, IMAV, pp. 1-8.

## An integrated vision aided GPS/INS Navigation System for ultra-low-cost MAVs

### Bibtex entry :

```

@inproceedings { GDF+12,
  author = { Gathmann, Felix and Dernehl, Christian and Franke,
  Dominik
    and Kowalewski, Stefan },
  title = { An integrated vision aided GPS/INS Navigation System for
  ultra-low-cost MAVs },
  booktitle = { International Micro Air Vehicle Conference (IMAV) },
  publisher = { IMAV },
  pages = { 1-8 },
  year = { 2012 },
  typ = { PUB:(DE-HGF)8 },
  reportid = { RWTH-CONV-236329 },
  cin = { 122810 / 120000 },
  url = { http://publications.rwth-aachen.de/record/752304 },
}

```

[DFD+11]

[PDFBIB](#)

Dernehl, C., Franke, D., Diab, H., and Kowalewski, S., "An Architecture with Integrated Image Processing for Autonomous Micro Aerial Vehicles", in *Proc. International Micro Air Vehicle conference and competitions 2011 (IMAV 2011)*, 't Harde, The Netherlands, September 12-15, 2011, 2011, IMAV, pp. 138-145.

## An Architecture with Integrated Image Processing for

# Autonomous Micro Aerial Vehicles

## Bibtex entry :

```
@inproceedings { DFD+11,  
  author = { Dernehl, Christian and Franke, Dominik and Diab, Hilal  
and  
  Kowalewski, Stefan },  
  title = { An Architecture with Integrated Image Processing for  
Autonomous Micro Aerial Vehicles },  
  booktitle = { International Micro Air Vehicle conference and  
competitions  
2011 (IMAV 2011), 't Harde, The Netherlands, September  
12-15, 2011 },  
  publisher = { IMAV },  
  pages = { 138-145 },  
  year = { 2011 },  
  doi = { 10.4233/uuid:19adedb6-e3d9-4cff-8ebc-6497b026adfe },  
  typ = { PUB:(DE-HGF)8 },  
  reportid = { RWTH-CONV-198392 },  
  cin = { 122810 / 120000 },  
  url = { http://publications.rwth-aachen.de/record/128268 },  
}
```

## Office Hours

By appointment

From:

<https://www.embedded.rwth-aachen.de/> - **Lehrstuhl Informatik 11 - Embedded Software  
Laboratory**

Permanent link:

<https://www.embedded.rwth-aachen.de/doku.php?id=en:lehrstuhl:mitarbeiter:dernehl>

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