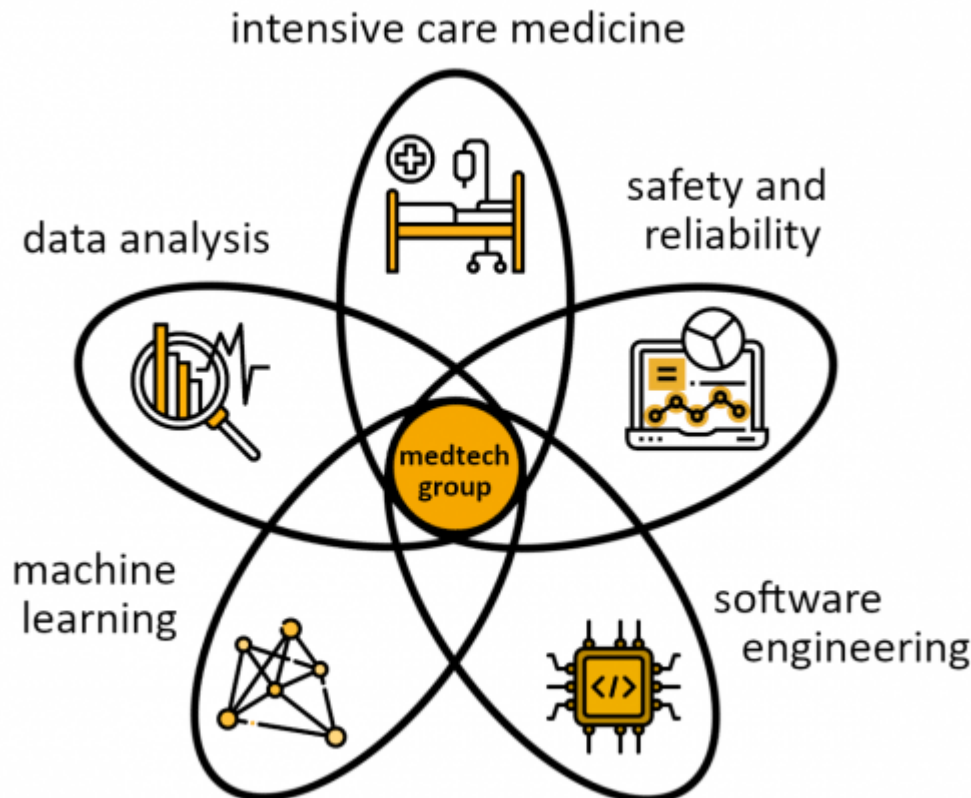


Medical Technology Group

Research

Our research in the field of medical engineering focuses on the interdisciplinary interface of intensive care medicine, data analysis, machine learning, control engineering and embedded software. Here, we are particularly interested in data-based early detection of disease patterns and device malfunctions, as well as model-based control of organ support systems.



Projects

Aix-Neo-Guard

The digitalisation of the intensive care environment enables the consolidation of patient data from diagnostics and therapy, resulting in multi-parametric, high-frequency data collections. While such databases have already been established for adults and are publicly accessible, there is a lack of data in the field of neonatal and paediatric intensive care medicine for systemically modelling a wide range of clinical pictures or using artificial intelligence (AI) methods.



The Aix-Neo-Guard project, which uses and expands the data set generated by a previous Nanni project, has the overarching goal of improving intensive care diagnostics and therapy in neonatal, paediatric and adolescent medicine by increasing treatment safety and improving medical training.

The use of AI-based algorithms enables the early detection of treatment complications and provides deeper insights into pathophysiological relationships. In addition, a physiological model for modelling pulmonary gas exchange under mechanical ventilation is being developed, which could directly support both the training of medical staff and therapy in the future.

As a first step, AI methods such as random forest or recurrent neural networks have already been applied to high-resolution time series data in order to automatically recognise patient-ventilator asynchronies.

Contact: [Camelia Oprea, M.Sc. RWTH](#)

Explainable AI

In the context of the SMITH project, as well as the project “Aix-Neo-Guard”, we also deal with the topic of explainable and interpretable artificial intelligence, or explainable and interpretable machine learning. Here, all aspects of data processing are taken into consideration: A clear and good visual representation of the available data to make it easier for physicians to work with the data; Frameworks that can extend existing machine learning methods with a selection of explainability and interpretability; Machine learning methods developed from scratch for explainability and interpretability; Extended evaluation methods for machine learning that go beyond individual values to show the capabilities and weaknesses of the methods.

Contact: [Simon Fonck, M.Sc. RWTH](#), [Alexander Kruschewsky, M.Sc. RWTH](#), [Camelia Oprea, M.Sc. RWTH](#)

SMITH

Within the [SMITH-Projektes](#), innovative IT solutions are being developed to improve medical patient care. With the help of data integration centers (DIZ) and a marketplace developed within the project, the interoperable use of data and patient-oriented research is enabled. Three use cases will be used to demonstrate the added value of this data interoperability. In the first methodological use case “Phenotype pipeline” (PheP), innovative data analytic methods and tools are developed which make medical data accessible.



With the help of two clinical use cases, the approach underlying the main objective will be demonstrated.

In the use case ASIC (Algorithmic Surveillance of ICU Patients), the data generated in intensive care units is continuously evaluated in order to automatically monitor the condition of patients to enable rapid therapeutic intervention. The main focus is on Acute Respiratory Distress Syndrome (ARDS) - acute respiratory failure. ARDS has a very high mortality rate, which is mainly due to the fact that the disease is often detected too late. Automated monitoring is intended to enable early diagnosis and consequently improve patient treatment.

The HELP clinical use case focuses on the targeted use of antibiotics to combat bacterial infections at an early stage. Innovative technologies are to be used to support infectious diseases in normal and intensive care units.

The work on Informatik 11 takes place within the framework of the use case ASIC. On this basis, we are primarily researching data plausibility and the classification of ARDS in secondary data.

[For more information, click here.](#)

Contact: [Simon Fonck, M.Sc. RWTH](#), [Alexander Kruschewsky, M.Sc. RWTH](#)

Clean Hands

The Clean Hands project is dedicated to achieving hand hygiene standards in a medical context. Inadequate hand disinfection repeatedly leads to hospital-acquired (nosocomial) infections.

The relevant hand disinfection methods are generally based on alcohol-based disinfectant solutions. During the disinfection process, this alcohol evaporates on the user's skin surface. This evaporation removes energy from the wetted skin area in the form of heat.

The evaporative cooling that occurs during a disinfection process can be measured using thermography and conclusions can be drawn from these measurements about the quality of the wetting of the hand with disinfectant.



Ansprechpartner: [Dr.-Ing. André Stollenwerk](#)

SmartLungControl

Within the DFG project SmartLungControl, a concept for a demand-adapted control and safety monitoring of a long-term artificial lung outside the intensive care unit is being researched. In a first step, an analysis of already existing retrospective patient and animal test data is performed, followed by a systematic expert survey according to the Delphi method. In the second step, a safety concept and a draft regulation of the artificial lung will be developed. For this purpose, among other things,

new sensor concepts for both reliability measures and demand-based adaptation will be investigated. Finally, the developed pilot concept will be validated and tested under different framework conditions and in defined critical operating conditions in-silico, in-vitro and in-vivo in animal experiments.

Contact: [Marc Wiartalla, M.Sc. RWTH](#)

NANNI

Within the framework of the BMBF-funded project Nanni (Neonatology Ventilator Device with Adaptive User Support), the partners Löwenstein Medical, the University Hospital Aachen and for RWTH Aachen University the Chair of Computer Science 11 have joined forces. In this project, the prototype of a new generation of early and neonatal ventilators is being developed. On this basis, we are primarily researching the regulation of arterial CO₂-partial pressure and the detection of problems in the artificial ventilation of newborns.



Contact: [Valerie Pfannschmidt, M.Sc. RWTH](#)

AutoMock

Within the framework of the BMBF project AutoMock, an automated mock loop is being developed for the long-term investigation and optimization of organ perfusion under a wide variety of circumstances. On this basis, the influence of perfusion parameters and pharmaceutical influence will be investigated. Furthermore, the test stand is also suitable for testing perfused medical devices.



[For more information, click here.](#)

Contact: [Marc Wiartalla, M.Sc. RWTH](#)

Team

Member	Position / Project
Dr.-Ing. André Stollenwerk	Group leader
Lavinia Goldermann, M.Sc. RWTH	SMITH
Simon Fonck, M.Sc. RWTH	SMITH
Alexander Kruschewsky, M.Sc. RWTH	Explainable AI
Camelia Oprea, M.Sc. RWTH	Aix-Neo-Guard
Valerie Pfannschmidt, M.Sc. RWTH	NANNI
Marc Wiartalla, M.Sc. RWTH	SmartLungControl



Theses

The currently advertised theses can be found [here](#).

If you have a general interest in writing a thesis in the field of medical engineering and cannot commit to any of the topics mentioned, you are also welcome to send your application to the entire medical engineering group: medtech-abschlussarbeiten@embedded.rwth-aachen.de

Publications

[BPS+24]

[PDF](#)[BIB](#)

Buglowski, M., Pfannschmidt, V., Stollenwerk, A., Schoberer, M., Huong Nguyen, T. B., Becker, S., and Braun, O., "Beatmungsgerät und Verfahren zur Atemgasversorgung", 2024.

Beatmungsgerät und Verfahren zur Atemgasversorgung

Bibtex entry :

```
@techreport { BPS+24,  
  author = { Buglowski, Mateusz and Pfannschmidt, Valerie and  
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https://worldwide.espacenet.com/patent/search/family/087245644/publication/DE102022117141A1?q=W0202408785 },
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[PSK24]

[PDFBIB](#)

Pfannschmidt, V., Stollenwerk, A., and Kowalewski, S., "Physiologische Regelung der künstlichen Beatmung Frühgeborener", in *Proc. [58. Regelungstechnisches Kolloquium, Boppard]*, 2024.

Physiologische Regelung der künstlichen Beatmung Frühgeborener

Bibtex entry :

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@inproceedings { PSK24,
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[BWH+23]

[PDFBIB](#)

Berg, F. J., Wiartalla, M. O., Hüllmann, M., Derks, A., Kowalewski, S., and Stollenwerk, A., "ASMO: a decentralized and verifiable interoperability platform in intensive care", *Proceedings on automation in medical engineering*, vol. 2, iss. 1, p. 2, 2023

ASMO: a decentralized and verifiable interoperability platform in intensive care

Bibtex entry :

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@article { BWH+23,

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[FFN+23]

[PDFBIB](#)

Fonck, S. A. M., Fritsch, S., Nottenk mpfer, G., and Stollenwerk, A., "Implementation of ResNet-50 for the Detection of ARDS in Chest X-Rays using transfer-learning", *Proceedings on automation in medical engineering*, vol. 2, iss. 1, p. 2, 2023

Implementation of ResNet-50 for the Detection of ARDS in Chest X-Rays using transfer-learning

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@article { FFN+23,
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[FLS+23]

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Fischbach, A., Lamberti, M., Simons, J. A., Wrede, E., Theißen, A., Winnersbach, P., Rossaint, R., Stollenwerk, A., and Bleilevens, C., "Early Blood Clot Detection Using Forward Scattering Light Measurements Is Not Superior to Delta Pressure Measurements", *Biosensors : open access journal*, vol. 13, iss. 12, p. [1]-13, 2023

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Bibtex entry :

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@article { FLS+23,
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[WBK+23]

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Bibtex entry :

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@inproceedings { WBK+23,
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[WBO+23a]

[PDFBIB](#)

Wiartalla, M. O., Berg, F. J., Ottersbach, F., Kühn, J., Buglowski, M., Kowalewski, S., and Stollenwerk, A., "A modular and verifiable software architecture for interconnected medical systems in intensive care", *Annals of computer science and information systems*, vol. 37, pp. 345-351, 2023

A modular and verifiable software architecture for interconnected medical systems in intensive care

Bibtex entry :

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@article { WB0+23a,
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[BOP+22]

[PDFBIB](#)

Becker, S., Olivier, L., Pfannschmidt, V., Buglowski, M., Hütten, M., Wienhold, M., Orlikowsky, T., Stollenwerk, A., and Schoberer, M., "Closed-Loop Kontrolle des endtidalen CO₂ im Frühgeborenen Lämmer-Modell", in *Proc. Abstracts 48. Jahrestagung der Gesellschaft für Neonatologie und Pädiatrische Intensivmedizin / Gesellschaft für Neonatologie und Pädiatrische Intensivmedizin e. V. = 1, 1, 1, Jena : Conventus Congressmanagement & Marketing GmbH, 2022,, Jena, 2022, Conventus Congressmanagement & Marketing GmbH, p. 92.*

Closed-Loop Kontrolle des endtidalen CO₂ im Frühgeborenen Lämmer-Modell

Bibtex entry :

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Teilvorhaben: Erforschung neuer Modelle zur Diagnose von
Fehlerzust{"a}nden (BMBF-13GW0292C) },
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[BOP+22]

[PDFBIB](#)

Buglowski, M., Pfannschmidt, V., Becker, S., Braun, O., Hutten, M., Ophelders, D., Oprea, C., Pattai, S., Schoberer, M., and Stollenwerk, A., "Closed-Loop Control of Arterial CO₂ in Mechanical Ventilation of Neonates", in *Proc. 44th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC) / pre-conference workshops & social events: Monday, July 11, 2022, conference dates: Tuesday, July 12-Friday, July 15, 2022 / conference chair: Christopher James (University of Warwick), conference co-chair: James Patton (University of Chicago) ; programm chair: Ron Summers (Collegium Basilea), [Piscataway, NJ], 2022, IEEE, pp. 4991-4995.*

Closed-Loop Control of Arterial CO₂ in Mechanical Ventilation of Neonates

Bibtex entry :

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@inproceedings { BPB+22,
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}

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[JSS+22]

[PDF](#)BIB

Janisch, T., Stollenwerk, A., Siekmann, U., and Kopp, R., "Treatment of children with Hyperbaric Oxygenation (HBOT) : an Europe-wide survey", *Minerva pediatrics*, vol. 74, iss. 2, pp. 116-120, 2022

Treatment of children with Hyperbaric Oxygenation (HBOT) : an Europe-wide survey

Bibtex entry :

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@article { JSS+22,
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[OBS+22]

PDFBIB

Olivier, L., Buglowski, M., Sabine, B., Hütten, M., Olikowsky, T., Stollenwerk, A., and Schoberer, M., "Work in progress: Detektion einer intensivierten invasiven Beatmung bei Neonaten mithilfe eines Fuzzylogik-Modells", in *Proc. Abstracts 48. Jahrestagung der Gesellschaft für Neonatologie und Pädiatrische Intensivmedizin / Gesellschaft für Neonatologie und Pädiatrische Intensivmedizin e. V.*, Jena, 2022, Conventus Congressmanagement & Marketing GmbH, p. 93.

Work in progress: Detektion einer intensivierten invasiven Beatmung bei Neonaten mithilfe eines Fuzzylogik-Modells

Bibtex entry :

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[WSE+22]

[PDFBIB](#)

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.pdf },
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```

[FFK+21]

[PDFBIB](#)

Fonck, S., Fritsch, S. J., Kowalewski, S., Hensen, R., and Stollenwerk, A., "Algorithmic distinction of ARDS and Heart Failure in ICU data from medical embedded systems by using a computer

model", *IFAC-PapersOnLine*, vol. 54, iss. 4, pp. 135-140, 2021

Algorithmic distinction of ARDS and Heart Failure in ICU data from medical embedded systems by using a computer model

Bibtex entry :

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@article { FFK+21,
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[LKL+21]

[PDFBIB](#)

Lamberti, M., Kopp, R., Lübke, C., Leonhardt, S., Walter, M., and Stollenwerk, A., "Safety and Automation Concepts for Artificial Impantable Lungs - SmartLungControl", *Biomedical engineering*, vol. 66, iss. s1, 2021

Safety and Automation Concepts for Artificial Impantable Lungs - SmartLungControl

Bibtex entry :

```
@article { LKL+21,
  author = { Lamberti, Michael and Kopp, R{"u"}diger and L{"u"}bke,
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        and Leonhardt, Steffen and Walter, Marian and Stollenwerk,
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```

[MBF+21]

[PDFBIB](#)

Marx, G., Bickenbach, J., Fritsch, S. J., Kunze, J. B., Maassen, O., Deffge, S., Kistermann, J., Haferkamp, S. D., Lutz, I., Voellm, N. K., Lowitsch, V., Polzin, R., Sharafutdinov, K., Mayer, H., Kuepfer, L., Burghaus, R., Schmitt, W., Lippert, J., Riedel, M., Barakat, C., Stollenwerk, A., Fonck, S., Putensen, C., Zenker, S., Erdfelder, F., Grigutsch, D., Kram, R., Beyer, S., Kampe, K., Gewehr, J. E., Salman, F., Juers, P., Kluge, S., Tiller, D., Wisotzki, E., Gross, S., Homeister, L., Bloos, F., Scherag, A., Ammon, D., Mueller, S., Palm, J., Simon, P., Jahn, N., Loeffler, M., Wendt, T., Schuerholz, T., Groeber, P., and Schuppert, A., "Algorithmic surveillance of ICU patients with acute respiratory distress syndrome (ASIC) : protocol for a multicentre stepped-wedge cluster randomised quality improvement strategy", *BMJ open*, vol. 11, iss. 4, pp. 1-7, 2021

Algorithmic surveillance of ICU patients with acute respiratory distress syndrome (ASIC) : protocol for a multicentre stepped-wedge cluster randomised quality improvement strategy

Bibtex entry :

```

@article { MBF+21,
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Morris and Barakat, Chadi and Stollenwerk, André and Fonck,
Simon and Putensen, Christian and Zenker, Sven and
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Beyer, Susanne and Kampe, Knut and Gewehr, Jan Erik and
Salman, Friederike and Juers, Patrick and Kluge, Stefan and
Tiller, Daniel and Wisotzki, Emilia and Gross, Sebastian and
Homeister, Lorenz and Bloos, Frank and Scherag, André and
Ammon, Danny and Mueller, Susanne and Palm, Julia and Simon,
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[PSS+21]

PDFBIB

Preuss, R., Smieschek, M., Stollenwerk, A., Kowalewski, S., and Heinrichs, T.,
 "Behälterreinigungsmaschine", 2021.

Behälterreinigungsmaschine

Bibtex entry :

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@techreport { PSS+21,
  author = { Preuss, R{\u}diger and Smieschek, Manfred and
Stollenwerk,
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https://worldwide.espacenet.com/patent/search/family/066998405/publication/DE102018120081B4?q=DE102018120081 },
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[BBF+20]

[PDFBIB](#)

Buglowski, M., Bleilevens, C., Fabry, G., Kowalewski, S., and Stollenwerk, A., "Flussgesteuerte pH-Regulierung in einem automatisierten Nierenperfusionssystem", *Proceedings on automation in medical engineering*, vol. 1, iss. 1, 2020

Flussgesteuerte pH-Regulierung in einem automatisierten Nierenperfusionssystem

Bibtex entry :

```
@article { BBF+20,
  author = { Buglowski, Mateusz and Bleilevens, Christian and Fabry,
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    (Mock Loop) - Ein k{"u}nstlicher Kreislauf als
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[KGE+20]

[PDFBIB](#)

König, G., Grochowski, M., Eckert, M., Jakobczak, F., Stollenwerk, J., Kowalewski, S., and Loosen, P., "Apparat zur automatisierten Justage optischer Systeme", *DGaO-Proceedings*, vol. 2020, 2020

Apparat zur automatisierten Justage optischer Systeme

Bibtex entry :

```
@article { KGE+20,
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f{"u}r
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}
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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 :

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@inproceedings { SRT+20,
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Final.pdf },
}

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[SS20]

[PDFBIB](#)

Stollenwerk, A. and Smieschek, M., "Eingabe und Übertragung von Instandhaltungsinformationen für das Condition Monitoring - Digitalisierung von Offline-Informationen", , Düsseldorf / Berlin, VDI/VDE 3711, 2020.

Eingabe und Übertragung von Instandhaltungsinformationen für das Condition Monitoring - Digitalisierung von Offline-Informationen

Bibtex entry :

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@techreport { SS20,
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[Sto20]

[PDFBIB](#)

Stollenwerk, A., "An Embedded Graduate Lab Course with Spirit", 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. 247-263.

An Embedded Graduate Lab Course with Spirit

Bibtex entry :

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[FDG+19]

[PDFBIB](#)

Fabry, G., Doorschodt, B. M., Grzanna, T., Boor, P., Elliott, A. R., Stollenwerk, A., Tolba, R. H., Rossaint, R., and Bleilevens, C., "Cold Preflush of Porcine Kidney Grafts Prior to Normothermic Machine Perfusion Aggravates Ischemia Reperfusion Injury", *Scientific reports*, vol. 9, p. 9, 2019

Cold Preflush of Porcine Kidney Grafts Prior to Normothermic Machine Perfusion Aggravates Ischemia Reperfusion Injury

Bibtex entry :

```
@article { FDG+19,
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          Entwicklung eines vollautomatisierten in vitro Teststands
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[KBS+19]

[PDFBIB](#)

Kühn, J., Buglowski, M., Stollenwerk, A., Kowalewski, S., Walter, M., Leonhardt, S., Petran, J., Kopp, R., Rossaint, R., and Janisch, T., "Fault Identification in a Blood Pump Using Neural Networks", in *Proc. World Congress on Medical Physics and Biomedical Engineering 2018 : June 3-8, 2018, Prague, Czech Republic (Vol.2)* / edited by Lenka Lhotska, Lucie Sukupova, Igor Lacković, Geoffrey S. Ibbott, Singapore, 2019 in IFMBE Proceedings, Springer Singapore, pp. 27-32.

Fault Identification in a Blood Pump Using Neural Networks

Bibtex entry :

```
@inproceedings { KBS+19,
  author = { K{"u}hn, Jan and Buglowski, Mateusz and Stollenwerk,
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      edited by Lenka Lhotska, Lucie Sukupova, Igor Lacković,
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[PAS+19]

[PDFBIB](#)

Pomprapa, A., Ahmed, W., Stollenwerk, A., Kowalewski, S., and Leonhardt, S., "Deep Learning of Arrhythmia Analysis Based on Convolutional Neural Network", *International journal of bioelectromagnetism : IJBEM*, vol. 21, iss. 1, pp. 48-58, 2019

Deep Learning of Arrhythmia Analysis Based on Convolutional Neural Network

Bibtex entry :

```
@article { PAS+19,
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[SKS+19]

[PDFBIB](#)

Smieschek, M., Kobsik, G., Stollenwerk, A., Kowalewski, S., Orlikowsky, T., and Schoberer, M., "Aided Hand Detection in Thermal Imaging Using RGB Stereo Vision", in *Proc. Biomedical engineering ranging from wellness to intensive care : 2019 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC) : 41st EMB Conference : July 23-27, Berlin / IEEE, EMB ; conference editorial board chair: Riccardo Barbieri, Milan, Italy, Piscataway, NJ, 2019, IEEE, pp. 6314-6317.*

Aided Hand Detection in Thermal Imaging Using RGB Stereo Vision

Bibtex entry :

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@inproceedings { SKS+19,
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}

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[KSK+18]

[PDFBIB](#)

Kühn, J., Stollenwerk, A., Kowalewski, S., Fabry, G., Grzanna, T., Doorschodt, B., Tolba, R. H., Rossaint, R., and Bleilevens, C., "A long-term setup for kidney perfusion". 2018.

A long-term setup for kidney perfusion

Bibtex entry :

```

@inproceedings { KSK+18,
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Stefan
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Christian },
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  organization = { 52. Annual Conference of the German Society for
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Entwicklung eines vollautomatisierten in vitro Teststands
(Mock Loop) - Ein k{"u"}nstlicher Kreislauf als
Ersatzmethode zur Biokompatibilit{"a"}tstestung von
Membranoxygenatoren und zur Transplantationssimulation
(BMBF-031L0134B) },

```

}

[PAS+18]

PDFBIB

Pomprapa, A., Ahmed, W., Stollenwerk, A., Kowalewski, S., Uguz, D. U., and Leonhardt, S., "Arrhythmia Analysis in a Non-contact cECG Chair using Convolutional Neural Network", in *Proc. Proceedings of the 11th International Conference on Bioelectromagnetism : 23-25 May 2018, Aachen, Germany / Organizing Committee for ICBEM 2018 in Aachen: Prof. Steffen Leonhardt, RWTH Aachen University, Germany, Prof. Jaakko Malmivuo, Technische Universität Berlin, Germany, Dr. Marian Walter, RWTH Aachen University, Germany, Benjamin Hentze, RWTH Aachen University, Germany Markus Lüken, RWTH Aachen University, Germany ; Scientific Committee for ICBEM 2018 in Aachen: Prof. Catherine Disselhorst-Klug, RWTH Aachen University, Germany [und 27 weitere], Aachen, 2018, p. 4.*

Arrhythmia Analysis in a Non-contact cECG Chair using Convolutional Neural Network

Bibtex entry :

```
@inproceedings { PAS+18,
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      Leonhardt, RWTH Aachen University, Germany, Prof. Jaakko
      Malmivuo, Technische Universit{"a"}t Berlin, Germany, Dr.
      Marian Walter, RWTH Aachen University, Germany, Benjamin
      Hentze, RWTH Aachen University, Germany Markus L{"u"}ken,
      RWTH Aachen University, Germany ; Scientific Committee for
      ICBEM 2018 in Aachen: Prof. Catherine Disselhorst-Klug, RWTH
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[PAS+18a]

[PDFBIB](#)

Pomprapa, A., Ahmed, W., Sayani, M. S., Stollenwerk, A., Kowalewski, S., and Leonhardt, S., "Classification of Obstructive Sleep Apnea Using Machine Learning", *American journal of respiratory and critical care medicine*, vol. 197, iss. Abstract Issue, p. 1, 2018

Classification of Obstructive Sleep Apnea Using Machine Learning

Bibtex entry :

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@article { PAS+18a,
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}
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[PAS+18b]

[PDFBIB](#)

Pomprapa, A., Ahmed, W., Stollenwerk, A., Kowalewski, S., Uguz, D. U., and Leonhardt, S., "Arrhythmia Analysis in a Non-contact cECG Chair using Convolutional Neural Network", *International journal of bioelectromagnetism : IJBEM*, vol. 20, iss. 1, pp. 47-50, 2018

Arrhythmia Analysis in a Non-contact cECG Chair using Convolutional Neural Network

Bibtex entry :

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@article { PAS+18b,
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author = { Pomprapa, Anake and Ahmed, Waqar and Stollenwerk, André
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[PSA+18]

[PDFBIB](#)

Pomprapa, A., Sayani, M. S., Anwar, T., Stollenwerk, A., Kowalewski, S., von Platen, P. H., and Leonhardt, S., "Apnea Detection in a Contactless Multisensor System using Deep Learning Algorithm", in *Proc. [13th Russian-German Conference on Biomedical Engineering (RGC), RGC, 2018-05-23 - 2018-05-25, Aachen, Germany]*, 2018.

Apnea Detection in a Contactless Multisensor System using Deep Learning Algorithm

Bibtex entry :

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@inproceedings { PSA+18,
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```

[SBK18]

[PDFBIB](#)

Stollenwerk, A., Buglowski, M., and Kühn, J., "Mock loop for bubble generation in a centrifugal blood pump for fault simulation", *Current Directions in Biomedical Engineering*, vol. 4, iss. 1, pp. 33-36, 2018

Mock loop for bubble generation in a centrifugal blood pump for fault simulation

Bibtex entry :

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@article { SBK18,
  author = { Stollenwerk, André and Buglowski, Mateusz and K{"u}hn,
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```

[SHS+18]

[PDFBIB](#)

Smieschek, M., Hinrichs, T., Stollenwerk, A., Kowalewski, S., and Preuß, R., "A New Condition Indicator for Slow-Rotating Roller Chains based on the Angle and Torque of the Driving Motor", 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. 642-644.*

A New Condition Indicator for Slow-Rotating Roller Chains based on the Angle and Torque of the Driving Motor

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@inproceedings { SHS+18,
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[WSA+18]

[PDFBIB](#)

Winter, A., Stäubert, S., Ammon, D., Aiche, S., Beyan, O. D., Bischoff, V., Daumke, P., Decker, S. J., Funkat, G., Gewehr, J. E., de Greiff, A., Haferkamp, S. D., Hahn, U., Henkel, A., Kirsten, T., Klöss, T., Lippert, J., Löbe, M., Lowitsch, V., Maassen, O., Maschmann, J., Meister, S., Mikolajczyk, R., Nüchter, M., Pletz, M. W., Rahm, E., Riedel, M., Saleh, K., Schuppert, A., Smers, S., Stollenwerk, A., Uhlig, S., Wendt, T., Zenker, S., Fleig, W., Marx, G., Scherag, A., and Löffler, M., "Smart Medical Information Technology for Healthcare (SMITH) : Data Integration based on Interoperability Standards", *Methods of information in medicine*, vol. 57, iss. S 01, p. e92-e105, 2018

Smart Medical Information Technology for Healthcare

(SMITH) : Data Integration based on Interoperability Standards

Bibtex entry :

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@article { WSA+18,
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[BHK+17]

[PDFBIB](#)

Brendle, C., Hackmack, K. -F., Kühn, J., Wardeh, M. N., Janisch, T., Kopp, R., Rossaint, R., Stollenwerk, A., Kowalewski, S., Leonhardt, S., Walter, M., and Misgeld, B. J. E., "Closed-loop control of extracorporeal oxygen and carbon dioxide gas transfer", *Control engineering practice*, vol. 59, pp. 173-182, 2017

Closed-loop control of extracorporeal oxygen and carbon dioxide gas transfer

Bibtex entry :

```
@article { BHK+17,
  author = { Brendle, Christian and Hackmack, K.-F. and K{"u}hn, Jan
and
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[BMK+17]

[PDFBIB](#)

Brendle, C., Mülders, T., Kühn, J., Janisch, T., Kopp, R., Rossaint, R., Stollenwerk, A., Kowalewski, S., Misgeld, B. J. E., Leonhardt, S., and Walter, M., "Physiological closed-loop control of mechanical ventilation and extracorporeal membrane oxygenation", *Biomedical engineering = Biomedizinische Technik*, vol. 62, iss. 2, pp. 199-212, 2017

Physiological closed-loop control of mechanical ventilation and extracorporeal membrane oxygenation

Bibtex entry :

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@article { BMK+17,
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[KBS+17]

[PDFBIB](#)

Kühn, J., Brendle, C., Stollenwerk, A., Schweigler, M., Kowalewski, S., Janisch, T., Rossaint, R., Leonhardt, S., Walter, M., and Kopp, R., "Decentralized safety concept for closed-loop controlled intensive care : Supervision of a blood pump during extracorporeal circulation", *Biomedical engineering = Biomedizinische Technik*, vol. 62, iss. 2, pp. 213-224, 2017

Decentralized safety concept for closed-loop controlled intensive care : Supervision of a blood pump during extracorporeal circulation

Bibtex entry :

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@article { KBS+17,
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}

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[SKS+17]

[PDFBIB](#)

Stollenwerk, A., Kopp, R., Sehl, F., and Janisch, T., "Tauchcomputerunterstützung durch vernetzte Smart Wearables", *Caisson : Mitteilungen der GTÜM e.V.*, vol. 32, iss. 4, 2017

Tauchcomputerunterstützung durch vernetzte Smart Wearables

Bibtex entry :

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@article { SKS+17,
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[SSK+17]

[PDFBIB](#)

Smieschek, M., Stollenwerk, A., Kowalewski, S., Orlikowsky, T., and Schoberer, M., "Unterstützte Handerkennung in Thermographiebildern zur Validierung der hygienischen Händedesinfektion", in *Proc. Bildverarbeitung für die Medizin 2017 : Algorithmen - Systeme - Anwendungen : Proceedings des Workshops vom 12. bis 14. März 2017 in Heidelberg / Klaus Hermann Maier-Hein, Thomas M. Deserno, Heinz Handels, Thomas Tolxdorff (Herausgeber)*, Berlin, Heidelberg, 2017 in Informatik aktuell, Springer Berlin Heidelberg, pp. 147-152.

Unterstützte Handerkennung in Thermographiebildern zur Validierung der hygienischen Händedesinfektion

Bibtex entry :

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@inproceedings { SSK+17,

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[SSM+17]

[PDFBIB](#)

Stollenwerk, A., Sehl, F., Marx, G., Kowalewski, S., and Janisch, T., "Enrichment of a diving computer with body sensor network data", in *Proc. 2017 IEEE 14th International Conference on Wearable and Implantable Body Sensor Networks (BSN) : 9-12 May 2017 / sponsors: IEEE, EMB*, Piscataway, NJ, 2017, IEEE, pp. 169-172.

Enrichment of a diving computer with body sensor network data

Bibtex entry :

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@inproceedings { SSM+17,
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[BHK+16]

[PDFBIB](#)

Brendle, C., Hackmack, K. -F., Kühn, J., Wardeh, M. N., Janisch, T., Kopp, R., Rossaint, R., Stollenwerk, A., Kowalewski, S., Misgeld, B. J. E., Leonhardt, S., and Walter, M., "Continuous gas transfer monitoring during extracorporeal membrane oxygenation", *Biomedical signal processing and control*, vol. 31, pp. 321-330, 2016

Continuous gas transfer monitoring during extracorporeal membrane oxygenation

Bibtex entry :

```

@article { BHK+16,
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[KBS+16]

PDFBIB

Kopp, R., Bensberg, R., Stollenwerk, A., Arens, J., Grottke, O., Walter, M., and Rossaint, R., "Automatic Control of Veno-Venous Extracorporeal Lung Assist : Presented in part at the 13th Congress of DIVI held December 4-6, 2013 in Leipzig, Germany", *Artificial organs*, vol. 40, iss. 10, pp. 992-998, 2016

Automatic Control of Veno-Venous Extracorporeal Lung Assist : Presented in part at the 13th Congress of DIVI held December 4-6, 2013 in Leipzig, Germany

Bibtex entry :

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@article { KBS+16,
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[KSB+16]

PDFBIB

Kühn, J., Stollenwerk, A., Brendle, C., Janisch, T., Walter, M., Rossaint, R., Leonhardt, S., Kowalewski, S., and Kopp, R., "Sensor Supervision and Control Value Limitations in Networked Intensive Care", in *Proc. [Gemeinsamer Tagungsband der Workshops der Tagung Software Engineering 2016 (SE-WS 2016), Wien, 23.-26. Februar 2016 / Edited by: Wolf Zimmermann, Lukas Alperowitz, Bernd Brügge, Jörn Fahsel, Andrea Herrmann, Anne Hoffmann, Andreas Krall, Dieter Landes, Horst Lichter, Dirk Riehle, Ina Schaefer, Constantin Scheuermann, Alexander Schlaefer, Sibylle Schupp, Andreas Seitz, Andreas Steffens, André Stollenwerk, Rüdiger Weißbach]*, Aachen, Germany, 2016 in CEUR Workshop Proceedings, RWTH Aachen, pp. 187-194.

Sensor Supervision and Control Value Limitations in Networked Intensive Care

Bibtex entry :

```
@inproceedings { KSB+16,
  author = { K{"u}hn, Jan and Stollenwerk, Andr  and Brendle,
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R{"u}dger },
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  booktitle = { [Gemeinsamer Tagungsband der Workshops der Tagung
Software
Engineering 2016 (SE-WS 2016), Wien, 23.-26. Februar 2016 /
Edited by: Wolf Zimmermann, Lukas Alperowitz, Bernd
Br{"u}gge, J{"o}rn Fahsel, Andrea Herrmann, Anne Hoffmann,
Andreas Krall, Dieter Landes, Horst Lichter, Dirk Riehle,
Ina Schaefer, Constantin Scheuermann, Alexander Schlaefer,
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[KVS+16]

[PDFBIB](#)

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  author = { K{"u}hn, Jan and Vaitl, Lorenz and Stollenwerk, André
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[SSJ+16]

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[SSS16a]

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[WBK+16]

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[ZAB+16]

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[BHK+15]

[PDFBIB](#)

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[dMK+15]

[PDFBIB](#)

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[KSB+15]

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[KSS+15]

[PDFBIB](#)

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[KWS+15]

[PDFBIB](#)

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[SKW+15]

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Bibtex entry :

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[SLR+15]

[PDFBIB](#)

Stollenwerk, A., Leonhardt, S., Rossaint, R., and Kowalewski, S., "Advancing Intensive Care by Networked Medical Systems", in *Proc. [Proceedings of the 11th German-Russian-Conference on Biomedical Engineering, GRC, 17.06.2015-19.06.2015, Aachen, Germany]*, 2015, pp. 211-213.

Advancing Intensive Care by Networked Medical Systems

Bibtex entry :

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@inproceedings { SLR+15,
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[SKB+14]

[PDFBIB](#)

Stollenwerk, A., Kühn, J., Brendle, C., Walter, M., Arens, J., Wardeh, M. N., Kowalewski, S., and Kopp, R., "Model-based supervision of a blood pump", in *Proc. Proceedings of the 19th World Congress of the International Federation of Automatic Control, Cape Town, South Africa, 2014, 24-29 August 2014 : Promoting automatic control for the benefit of humankind*, Laxenburg, 2014 in IFAC-PapersOnLine, IFAC, pp. 6593-6598.

Model-based supervision of a blood pump

Bibtex entry :

```
@inproceedings { SKB+14,
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[PMS+13]

[PDFBIB](#)

Pomprapa, A., Misgeld, B., Sorgato, V., Stollenwerk, A., Walter, M., and Leonhardt, S., "Robust Control of End-Tidal CO₂ using the H_∞ Loop-Shaping Approach", *Acta polytechnica = Journal of advanced engineering*, vol. 53, pp. 895-900, 2013

Robust Control of End-Tidal CO₂ using the H_∞ Loop-Shaping Approach

Bibtex entry :

```
@article { PMS+13,
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journal = { Acta polytechnica = Journal of advanced engineering },
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http://publications.rwth-aachen.de/record/231825/files/231825.pdf },
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```

[Sto13]

[PDFBIB](#)

Stollenwerk, A., "Ein modellbasiertes Sicherheitskonzept für die extrakorporale Lungenunterstützung", PhD Thesis, Aachen, 2013.

Ein modellbasiertes Sicherheitskonzept für die extrakorporale Lungenunterstützung

Bibtex entry :

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@phdthesis { Sto13,
  author = { Stollenwerk, André },
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[WBS+13]

[PDFBIB](#)

Walter, M., Brendle, C., Stollenwerk, A., Kopp, R., Arens, J., Bensberg, R., and Leonhardt, S., "Patient oriented closed loop control of extracorporeal lung assist", in *Proc. Journal of critical care*, New York, NY, 2013, vol. 28, Elsevier, p. e8-e9.

Patient oriented closed loop control of extracorporeal lung assist

Bibtex entry :

```
@inproceedings { WBS+13,
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[WSB+13]

[PDFBIB](#)

Walter, M., Stollenwerk, A., Bensberg, R., Kopp, R., and Leonhardt, S., "Smart ECLA—closed loop control of O2 and CO2 for management of extracorporeal lung assist", *Journal of critical care*, vol. 28, p. e41-e42, 2013

Smart ECLA—closed loop control of O2 and CO2 for management of extracorporeal lung assist

Bibtex entry :

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@article { WBS+13,
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[KRS12]

[PDFBIB](#)

Kowalewski, S., Rumpe, B., and Stollenwerk, A., "Cyber-Physical Systems - eine Herausforderung an die Automatisierungstechnik?", in *Proc. Automation 2012 : der 13. Branchentreff der Mess- und Automatisierungstechnik / VDI/VDE-Gesellschaft Mess- und Automatisierungstechnik ; Kongress 'Automation 2012' ; 13 (Baden-Baden) ; 2011.06.13-14 Branchentreff der Mess- und Automatisierungstechnik*, Düsseldorf, 2012 in VDI-Berichte, VDI-Verl., pp. 113-116.

Cyber-Physical Systems - eine Herausforderung an die Automatisierungstechnik?

Bibtex entry :

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@inproceedings { KRS12,
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[WBB+12]

[PDFBIB](#)

Walter, M., Brendle, C., Bensberg, R., Kopp, R., Arens, J., Stollenwerk, A., and Leonhardt, S.,

"Closed loop physiological ECMO control", in *Proc. 5th European Conference of the International Federation for Medical and Biological Engineering : 14 - 18 September 2011, Budapest, Hungary ; [EMBEC] / Ákos Jobbágy (ed.)*, [Berlin], 2012 in IFMBE Proceedings, Springer, pp. 319-322.

Closed loop physiological ECMO control

Bibtex entry :

```
@inproceedings { WBB+12,
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[WBS+12]

[PDFBIB](#)

Walter, M., Brendle, C., Stollenwerk, A., Kopp, R., Arens, J., Bensberg, R., and Leonhardt, S., "Patient oriented closed loop control of extracorporeal lung assist", in *Proc. 11th International Conference on Complexity in Acute Illness (ICCAI)*, Ottawa, Canada, September 6 - 9, 2012, 2012, pp. 51-51.

Patient oriented closed loop control of extracorporeal lung assist

Bibtex entry :

```
@inproceedings { WBS+12,
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http://www.scai-med.org/meetings/2012Iccai/2012iccaiprogram.pdf },
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[BBS+11]

[PDFBIB](#)

Beckschulze, E., Brauer, J., Stollenwerk, A., and Kowalewski, S., "Analyzing Embedded Systems Code for Mixed-Critical Systems Using Hybrid Memory Representations", in *Proc. 2011 14th IEEE International Symposium on Object/Component/Service-Oriented Real-Time Distributed Computing workshops (ISORCW) : 28 - 31 March 2011, Newport Beach, California, USA ; proceedings*, Piscataway, NJ, 2011, IEEE, pp. 33-40.

Analyzing Embedded Systems Code for Mixed-Critical Systems Using Hybrid Memory Representations

Bibtex entry :

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@inproceedings { BBS+11,
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[BBS+11a]

[PDF](#)BIB

Brendle, C., Bensberg, R., Stollenwerk, A., Arens, J., and Walter, M., "Patient Orientated Automation of the Therapy with the Extracorporeal Membrane Oxygenation (ECMO)", in *Proc. 45. Jahrestagung der Deutschen Gesellschaft für Biomedizinische Technik*, 2011, DGBMT.

Patient Orientated Automation of the Therapy with the Extracorporeal Membrane Oxygenation (ECMO)

Bibtex entry :

```
@inproceedings { BBS+11a,
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[KBW+11]

[PDF](#)BIB

Kopp, R., Bensberg, R., Walter, M., Arens, J., Rossaint, R., and Stollenwerk, A., "Automation of extracorporeal membrane oxygenation using a combined safety and control concept", in *Proc. Intensive care medicine*, Berlin [u.a.], 2011, vol. 37, Springer, pp. 230-230.

Automation of extracorporeal membrane oxygenation using a combined safety and control concept

Bibtex entry :

```
@inproceedings { KBW+11,
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[KS11]

[PDFBIB](#)

Kowalewski, S. and Stollenwerk, A., "Supporting Evolving Requirements in CPS by Abstraction Layers in the Architecture", in *Proc. Workshop on Architectures for Cyber-Physical Systems, Chicago, IL, USA, 2011*.

Supporting Evolving Requirements in CPS by Abstraction Layers in the Architecture

Bibtex entry :

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@conference { KS11,
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[SGA+11]

[PDFBIB](#)

Stollenwerk, A., Gathmann, F., Arens, J., Bensberg, R., Walter, M., Kopp, R., and Kowalewski, S., "Safety Aware Pump-Control for a Rotary ECMO Blood Pump", in *Proc. The international journal of artificial organs*, Milano [u.a.], 2011, vol. 34, Wichtig, pp. 617-617.

Safety Aware Pump-Control for a Rotary ECMO Blood Pump

Bibtex entry :

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@inproceedings { SGA+11,
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[SGB+11]

[PDFBIB](#)

Stollenwerk, A., Gathmann, F., Bensberg, R., Walter, M., Arens, J., Kopp, R., and Kowalewski, S., "A model-based safety concept for a rotary blood pump", *Biomedizinische Technik = Biomedical engineering*, vol. 56, iss. S1, 2011

A model-based safety concept for a rotary blood pump

Bibtex entry :

```
@article { SGB+11,
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[SGW+11]

[PDFBIB](#)

Stollenwerk, A., Göbe, F., Walter, M., Arens, J., Kopp, R., and Kowalewski, S., "Smart Data Provisioning for Model-Based Generated Code in an Intensive Care Application", in *Proc. 3rd Joint Workshop On High Confidence Medical Devices, Software, and Systems & Medical Device Plug-and-Play Interoperability : HCMDSS/MDPnP 2011 ; in conjunction with CPSweek 2011 ; April 11, 2011 Chicago, USA*, Chicago, 2011, HCMDSS/MDPnP 2011 ; in conjunction with CPSweek 2011 ; April 11, 2011 Chicago, USA, p. 8.

Smart Data Provisioning for Model-Based Generated Code in an Intensive Care Application

Bibtex entry :

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@inproceedings { SGW+11,
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[WBA+11]

[PDFBIB](#)

Walter, M., Brendle, C., Arens, J., Stollenwerk, A., Kopp, R., Bensberg, R., and Leonhardt, S., "Physiological target control in long term extracorporeal oxygenation", in *Proc. The international journal of artificial organs*, Milano [u.a.], 2011, vol. 34 in 2011, Wichtig, pp. 625-625.

Physiological target control in long term extracorporeal oxygenation

Bibtex entry :

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@inproceedings { WBA+11,
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[AdM+10]

[PDFBIB](#)

Arens, J., de Brouwer, P., Mager, I., Kopp, R., Walter, M., Stollenwerk, A., Schmitz-Rode, T., and Steinseifer, U., "A dynamic study on the hemolytic effect of negative pressure on blood", in *Proc. ASAIO journal*, Hagerstown, Md., 2010, vol. 56, Lippincott, pp. 96-96.

A dynamic study on the hemolytic effect of negative pressure on blood

Bibtex entry :

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@inproceedings { AdM+10,
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[SDK10]

[PDFBIB](#)

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Bibtex entry :

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@inproceedings { SDK10,
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  booktitle = { Proceedings / 2010 Workshop on Embedded Systems
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pages = { 48-54 },
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[SJA+10]

[PDFBIB](#)

Stollenwerk, A., Jörgens, J., Arens, J., Walter, M., Kopp, R., and Kowalewski, S., "Model Based Diagnosis for Extracorporeal Membrane Oxygenation", in *Proc. The international journal of artificial organs*, Milano [u.a.], 2010, vol. 33, Wichtig Ed., pp. 447-447.

Model Based Diagnosis for Extracorporeal Membrane Oxygenation

Bibtex entry :

```

@inproceedings { SJA+10,
author = { Stollenwerk, André and J{"o"}rgens, J{"o"}rg and Arens,
Jutta and Walter, Marian and Kopp, R{"u"}dger and
Kowalewski, Stefan },
title = { Model Based Diagnosis for Extracorporeal Membrane
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[SJW+10]

[PDFBIB](#)

Stollenwerk, A., Jörgens, J., Walter, M., Arens, J., Kopp, R., and Kowalewski, S., "Modellbasierte Fehlerdiagnose eines Membranoxygenators", *Proceedings : Jahrestagung der Deutschen Gesellschaft für Biomedizinische Technik (DGBMT) im VDE*, vol. 55, iss. S 1, pp. 174-177, 2010

Modellbasierte Fehlerdiagnose eines Membranoxygenators

Bibtex entry :

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@article { SJW+10,  
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[SLW+10]

[PDFBIB](#)

Stollenwerk, A., Lang, M., Walter, M., Arens, J., Kopp, R., and Kowalewski, S.,
"Sicherheitskonzept für eine intensivmedizinische Anwendung am Beispiel der EMCO", in *Proc.
Entwurf komplexer Automatisierungssysteme : EKA 2010 ; Beschreibungsmittel, Methoden,
Werkzeuge und Anwendungen ; 11. Fachtagung mit Tutorium, 25. bis 27. Mai 2010 in
Magdeburg, Denkfabrik im Wissenschaftshafen / ifak, Institut für Automation und
Kommunikation e.V., Magdeburg; Otto-von-Guericke-Universität Magdeburg, Institut für
Automatisierungstechnik. [Hrsg.: Ulrich Jumar, Eckehard Schnieder, Christian Diedrich],
Magdeburg, 2010, ifak, pp. 65-74.*

Sicherheitskonzept für eine intensivmedizinische Anwendung am Beispiel der EMCO

Bibtex entry :

```
@inproceedings { SLW+10,  
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[WLK+10]

[PDFBIB](#)

Walter, M., Leonhardt, S., Kopp, R., Wartzek, T., Arens, J., and Stollenwerk, A., "Automatisierung und Fehlerdiagnose bei der extrakorporalen Membranoxygenierung", *Automatisierungstechnik : at*, vol. 58, iss. 5, pp. 277-285, 2010

Automatisierung und Fehlerdiagnose bei der extrakorporalen Membranoxygenierung

Bibtex entry :

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@article { WLK+10,
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[WLK+10a]

[PDFBIB](#)

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A physiological model for extracorporeal oxygenation controller design

Bibtex entry :

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@article { WLK+10a,
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  url = { http://publications.rwth-aachen.de/record/169533 },
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[KWA+09]

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Bibtex entry :

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@article { KWA+09,
  author = { Kopp, R{"u}dger and Walter, Marian and Arens, Jutta and
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[LWW+09]

[PDFBIB](#)

Leonhardt, S., Walter, M., Wartzek, T., Kashefi, A., Stollenwerk, A., and Kopp, R., "Regelung des Gasaustauschs für die extrakorporale Oxygenierung", in *Proc. Automation 2009 : der Automatisierungskongress in Deutschland ; Kongress Baden-Baden, 16. und 17. Juni 2009 ; [10. Branchentreff der Mess- und Automatisierungstechnik] / VDI/VDE-Gesellschaft Mess- und Automatisierungstechnik. - 2067, Düsseldorf, 2009 in VDI-Berichte, VDI-Verl., pp. 281-285.*

Regelung des Gasaustauschs für die extrakorporale Oxygenierung

Bibtex entry :

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@inproceedings { LWW+09,
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[SJK09]

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An undergraduate embedded software laboratory for the masses

Bibtex entry :

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@inproceedings { SJK09,
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    url = { http://publications.rwth-aachen.de/record/100434 },
}

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[SL09]

[PDFBIB](#)

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Proc. ArtistDesign Workshop on Embedded Systems in Healthcare, Eindhoven - The Netherlands, 2009.

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Bibtex entry :

```
@conference { SL09,  
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[SWW+09]

[PDF](#)BIB

Stollenwerk, A., Walter, M., Wartzek, T., Kopp, R., Arens, J., and Kowalewski, S., "A safety and control concept for extracorporeal membrane oxygenation", *The international journal of artificial organs*, vol. 32, iss. 7, pp. 428-428, 2009

A safety and control concept for extracorporeal membrane oxygenation

Bibtex entry :

```
@article { SWW+09,  
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Tobias  
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[WLK+09]

PDFBIB

Walter, M., Leonhardt, S., Kopp, R., Kashefi, A., Wartzek, T., and Stollenwerk, A., "Automation of long term extracorporeal oxygenation systems", in *Proc. ECC 09 : Proceedings of the European Control Conference 2009 ; the 10th in the EUCA Series ; 23-26 August 2009, Budapest, Hungary / General Chair: László Keviczky ...*, Budapest, 2009, EUCA.

Automation of long term extracorporeal oxygenation systems

Bibtex entry :

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@inproceedings { WLK+09,
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[WWS+09]

PDFBIB

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Bibtex entry :

```
@inproceedings { WWS+09,  
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