

Prof. Dipl.-Ing. Dr. Karl Kunisch  
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## CURRICULUM VITÆ

### Personal Data

Date and place of birth: September 16, 1952, Linz, Austria  
Marital status: Married (August 27, 1977, to Mag. Dr. Brigitte Almhofer)  
Children: Daughters Katharina, Elisabeth, and Anna  
Citizenship: Austrian

### Education

“Diploma” degree from Technical University of Graz, 1975.

Master degree from Northwestern University, Evanston, Illinois, USA, 1975.

Ph. D. degree from Technical University of Graz, 1978 (Advisor: Prof. F. Kappel).

Habilitation at Technical University of Graz, 1980.

### Professional Appointments

#### Long Term

*September 1976–March 1986:* Assistant at Institute of Mathematics, Technical University of Graz, Austria.  
*March 1986–October 1993:* Professor of Mathematics at the Technical University of Graz, Austria.  
*November 1993–October 1996:* Professor of Mathematics (C4) at Technical University Berlin.  
*November 1996–present:* Full Professor of Mathematics at University of Graz, Austria.

## Short Term

<i>September 1979–July 1980:</i>	Visiting Assistant Professor, Lefschetz Center for Dynamical Systems, Division of Applied Mathematics, Brown University, Providence, RI, USA.
<i>Academic years 1978/79 and 1981/82:</i>	Joint appointment at the University of Graz, Austria.
<i>September 1982–June 1983:</i>	Visiting Associate Professor at Brown University, RI, and at the University of Oklahoma, Norman, OK, USA.
<i>January 1985–July 1985:</i>	Visiting Associate Professor, Lefschetz Center for Dynamical Systems, Division of Applied Mathematics, Brown University, Providence, RI, USA.
<i>March 1985–February 1987:</i>	Consultant at the Institute for Computer Applications in Science and Engineering at NASA Langley, Virginia, USA, (part-time).
<i>February 1989–July 1989:</i>	Visiting Professor, Division of Applied Mathematics, Brown University, Providence, RI, USA.
<i>September 1991– March 1992:</i>	Visiting Professor at Institute de Recherche en Informatique et en Automatique (INRIA), Rocquencourt, France.
<i>January 1994:</i>	Visiting Professor at Paris IX (Université de Paris–Dauphine).
<i>March 1994:</i>	Visiting Professor at Institute de Recherche en Informatique et en Automatique (INRIA), Rocquencourt, France.

## Offers

- 1985: C3-Professorship at University of Erlangen, Germany.
- 1992: C4-Professorship at TU-Berlin, accepted.  
Chair at University of Veterinary Medicine, Vienna.
- 1996: Chair at the University of Graz, accepted.
- 1998: C4-Professorship at University of Munich.
- 2003: C4-Professorship at the University of Stuttgart.
- 2012: Offer of the directorship at Johann Radon Institute for Computational and Applied Mathematics, Austrian Academy of Sciences, Linz.
- 2014: Offer of the directorship of the Center for Computational and Data-Intensive Science and Engineering at Skoltech, Moscow.

## Academic Honors and Awards

- Pro Scientia-Scholarship 1974–1977.
- Research Award of Theodor-Körner-Fonds, Vienna, April 1979.
- Fulbright Travel Scholarship in academic years 1979/80, 1985.

Max Kade Scholarship 1982/83.

Fellowship of the Japanese Society for the Promotion of Science, March 1990.

Award of *Christian Doppler Laboratory*, April 1992.

Member of Senate of Christian Doppler Forschungsgesellschaft, since February 2002.

Vice Chairman of Scientific Advisory Board of Weierstrass Institute for Applied Analysis and Stochastics, 2005 – 2012.

Leader of Research Groups “Optimization and Control” at Radon Institute, Austrian Academy of Sciences, since January 2004.

SIAM Outstanding Paper Prize, 2006.

Lipschitz lecturer at Hausdorff Institute of Mathematics, Bonn, 2007.

Alwin Walther Medaille, Darmstadt, 2008.

Invited Lecture, International Congress of Mathematics, Hyderabad - India, 2010.

Member of the MATHEON Scientific Advisory Board, since 2015.

SIAM Fellow, 2017.

Evaluation board member for numerous DFG programs in Germany, INRIA programs in France and EU projects.

## **Service to Profession**

### **Editorial Board**

1. SIAM Journal on Control and Optimization (June 1983–May 1993, January 2005–) since January 2011 also corresponding editor
2. ESAIM: Mathematical Modelling and Numerical Analysis (2006–2012)
3. SIAM Journal on Numerical Analysis (since March 2007)
4. Computing (2003-2009), Computing & Visualization in Science (since 2009)
5. ESAIM: Control, Optimization and the Calculus of Variations (1995–2003, 2009–2012)
6. Inverse Problems (1990-1996)
7. Matematica Aplicada e Computacional (1988–2014)
8. Journal on Mathematical Systems, Estimation, and Control (October 1990–1998)
9. Journal of Applied Mathematics (since January 2003)
10. Walter de Gruyter: Radon Series for Computational and Applied Mathematics (since 2006)
11. Acta Applicandae Mathematicae (since 2010)

12. Vietnam Journal of Mathematics (since 2011)
13. Eurasian Journal of Mathematical and Computer Applications (since 2013)
14. Springer: Calcolo (since 2013)
15. Journal of the European Mathematical Society (since 2014)
16. Springer: PNLDE Subseries in Control (since 2016)
17. Computational & Applied Mathematics (since 2016)

## Research Funds

“Dynamical Systems”, February 1982–February 1984, funded by Austrian Science Foundation.

“Control Theory for Infinite Dimensional Systems”, April 1984–June 1989, funded by Austrian Science Foundation.

“Parameter Estimation and Boundary Control”, July 1986–December 1989, funded by US–Austrian Cooperative Science Program.

“Regularisation Methods for Nonlinear Problems”, July 1990–July 1992, funded by Austrian Science Foundation.

“Estimation and Control for Infinite Dimensional Systems”, November 1989–November 1991, US–Austrian Cooperative Science Program.

“Mathematical Optimization and Inverse Problems”, by Ministry of Science and Technology, April 1, 1991–March 31, 1994.

*Christian Doppler* Research Laboratory, 1992–1998.

“Control of Partial Differential Equations and Applications”, Human Capital and Mobility Project, funded by European Community, October 1, 1994–September 30, 1997.

“Optimal Control of the Equations of Fluid Flow”, University Special Research Program (Universitärer Forschungsschwerpunkt 8), Project T4, funded by Technical University Berlin, April 1, 1995–December 31, 1997.

“Parameter Estimation in Variational Inequalities”, funded by SFB F 003, “Optimization and Control”, August 1, 1997–July 31, 2004.

“Suboptimal Control for Nonlinear Problems with Emphasis on Fluids”, funded by SFB F 003, “Optimization and Control”, August 1, 1997–July 31, 2004.

“Augmented Lagrange-SQP Methods for the Control of Fluid Flow” funded by European Commission (TMR Marie Curie Research Training Grant) October 15, 1998–October 14, 1999.

“Variational Methods in Medical Imaging”, by Ministry of Science and Technology, February 1, 2000–January 31, 2001.

“Variational Methods in Application to Crack Problems” funded by FWF (Lise Meitner-Programm), March 1, 2002 - March 1, 2004.

Aktion-Program: Fictitious Domain Methods and Shape Optimization for Free Boundary Value Problems, with Prof. Haslinger, Karls-Universität Prag, 2001–2002 and 2003–2004.

Amadee-Program: New Numerical Methods for Free Boundary and Shape Optimization Problems, with Prof. Touzani, Université Clermont-Ferrand, 2004.

*SFB “Mathematical Optimization and Applications in Biomedical Sciences”, Speaker. 2007–*

Doctorial College: “Numerical Simulations in Technical Sciences”, Projectleader, 2007–2009.

Zukunftsfonds des Landes Steiermark: Neue Optimierungsmethoden in der Strukturmechanik, 2007–2008.

“Optimal Control of Stefan Problems with Constraints”, with R. Herzog (Griesse), August 2006–August 2010, funded by Austrian Science Foundation.

European Science Foundation Research Network Project: “Optimization with PDE Constraints”: October 2008–September 2012.

European Community FP7 Project: “Personal Glucose Predictive Diabetes Advisor”, Academic Partner in the Austrian Knot, 2008–2012.

International Research Training Group (jointly with TU-Munich): “Optimization and Numerical Analysis for Partial Differential Equations with Nonsmooth Structures”, funded by Austrian Science Foundation, Co-speaker, 2012–2020.

European Community Horizon 2020 ERC Advanced Grant: “From Open to Closed Loop Optimal Control of PDEs”, European Research Council, 2016–2020.

## **Thesis Advisor**

### **The following Ph. D. theses were completed under my guidance:**

Numerische Approximation des linear quadratischen Optimierungsproblems bei parabolischen Differentialgleichungen (D. I. M. Kroller).

Parameterschätzung in einem Reaktions–Diffusionsmodell mit Rückführung über den Rand (D. I. H. Schelch, now departement chief at AVL-Graz).

Structural Operators for Abstract Functional Differential Equations (Mag. M. Mastinsek, now Prof. at Univ. Marburg).

Identification of an Interface Using Harmonic Analysis Techniques and Regularization Methods (Mag. W. Ring).

Parameterschätzung in eindimensionalen Modellen für instationäre Strömungen in Dieseleinspritzsystemen (Dipl.-Ing. W. Egartner).

Mesh-Independence of an Augmented Lagrangian-SQP Method in Hilbert Spaces and Control Problems for the Burgers Equation (Dipl.-Math. S. Volkwein, now Professor at Univ. Konstanz).

Domain Optimization for the Stationary Stokes and Navier-Stokes Equations by an Embedding Domain Technique (Dipl.-Math. T. Slawig, now Prof. at Univ. of Kiel)

Optimal Control of the Solid Fuel Ignition Model (Dipl.-Math. A. Kauffmann)

Constrained Optimal Control of Stationary Viscous Incompressible Fluids by Primal–Dual Active Set Methods (Dipl.-Math. J. C. de los Reyes, now Prof. at Univ. Quito).

Sequential quadratic programming methods for optimal control of nonlinear hyperbolic equations (Dipl.-Math. Josef Stephane Ambani)

Infinite-dimensional semi-smooth Newton and augmented Lagrangian methods for contact and friction problems in elasticity (Dipl.-Math. Georg Stadler, now assistant Prof. at Univ. of Austin, Texas)

Semi-smooth Newton methods for time optimal control of nonautonomous ordinary differential equations (Mag. Jelena Rubesa)

Optimal shape design using translation invariant cost functionals in fluid dynamics (Dipl.-Ing. Henry Kasumba)

Uniform convergence of the POD method and applications to optimal control (Dipl.-Ing. Markus Müller)

Optimal Receding Horizon Control of the Wave Equation with help of Trigonometric Operators and SEM Methods (Dipl.-Ing. Stefan Reiterer)

Higher Order Regularization for Model Based Data Decompression (Mag. Martin Holler)

Semismooth Newton Method for variational inequalities with gradient constraint (Dipl.-Ing. Serbiniyaz Anyyeva)

Sparse measure-valued optimal control problems governed by wave equations (Dipl.-Math. Philip Trautmann)

On the Stabilizability of Infinite Dimensional Systems via Receding Horizon Control (MSc Behzad Azmi)

### **The following habilitations were completed under my guidance:**

Optimal and instantaneous control of instationary Navier–Stokes equations (Dr. M. Hinze, now Prof. at Univ. of Hamburg).

Optimal and suboptimal control of partial differential equations: Augmented Lagrange–SQP methods and reduced–order modelling with proper orthogonal decomposition (Dr. St. Volkwein, now Prof. at Univ. of Konstanz).

Optimization problems in function spaces (Dr. M. Hintermüller, now Professor at Humboldt University).

Analysis and numerical methods for geometrical variational problems (Mag. Dr. W. Ring).

Multigridverfahren für Optimalitätssysteme (Mag. Dr. Alfio Borzi, now Professor at Univ. of Würzburg).

Regularization formulations and numerical solutions for image processing (Mag. Dr. Stephen Keeling).

Stability and sensitivity analysis in optimal control of partial differential equations (Dipl. Math. Dr. R. Herzog (Griesse), now Professor in Chemnitz).

Efficient numerical solutions of optimization problems governed by partial differential equations (Dipl. Math. Dr. B. Vexler, now Professor at TU Munich).

Numerical solution of optimal control and inverse problems in non-reflexive Banach spaces (Dipl. Math. Dr. Christian Clason).

## Short Term Visits

Lefschetz Center for Dynamical Systems, Brown University, USA (April 1981, September 1984, Oktober 1985, February 1986, December 1986, August 1987, August 1988, Dezember 1988).

University of Rome (October 1981, January 1982, January 1988 and January 2006).

NASA-Research Center, ICASE, Hampton, Virginia, USA (June 1983).

University of Bari (April 1983).

Institut National de Recherche en Informatique et en Automatique (INRIA), Paris (October 1984, December 1990, November 1994, February 1995).

Advisor at "Institut for Computer Applications in Science and Engineering", NASA, Langley Research Center, Virginia, USA (March 1985, March 1987).

University of Augsburg, Schwerpunktprogramm "Anwendungsbezogene Optimierung and Steuerung" (September 1989).

Center for Applied Mathematical Sciences an der University of Southern California, Los Angeles (February 1990, November 1990, July 1991).

University of Trier (September 1990).

University of Jyväskylä, Finland (November 1991).

North Carolina State University (April/September 1993, February 1994, April/May 1996).

Visiting Professor Université Paris-Dauphine (March 1994).

Université d'Orléans (September/October 1995).

Visiting Professor Université Paris-Dauphine (February 1997).

University of Cantabria (September 1997).

Visiting Professor Université Paris-Dauphine (May 1998, April 2000).

North Carolina State University (at least once per year since 1997).

Escuela Politecnica Nacional Quito, Ecuador, (January 2007).

## Invited Lectures and Contributed Papers

(• · · · invited lecture, \* · · · contributed paper)

- \* 9. Österreichischer Mathematiker-Kongreß (Sep. 1977).
- Summer School and Conference on Functional Differential Equations and Approximation of Fixed Points, Bonn (July 1978).
- Conference in Oberwolfach on “Gewöhnliche Differentialgleichungen” (April 1979).
- Workshop on Functional Differential Equations and Nonlinear Semigroups, Retzhof (May 1979).
- \* Annual Meeting of the Canadian Mathematical Society, Toronto (July 1979).
- Conference on Nonlinear Phenomena in the Mathematical Sciences, Texas (June 1980).
- Banach Center Semester on Mathematical Control Theory, Warschau (October 1980).
- \* Rutishauser Symposium on Numerical Analysis, Zürich (October 1980).
- Workshop on Control and Identification of Distributed Parameter Systems, ICASE (NASA Research Center), Hampton, Virginia, USA (April 1981).
- \* Equadiff, International Conference on Differential Equations, Bratislava (August 1981).
- \* 10. Österreichischer Mathematikerkongreß, Innsbruck (September 1981).
- Conference in Oberwolfach on “Regelungstheorie” (March 1982).
- Conference in Oberwolfach on “Approximation von Differenzen– Differentialgleichungen” (June 1982).
- \* 3. IFAC Symposium “Control of Distributed Parameter Systems”, Toulouse (July 1982).
- \* 89-th Annual Meeting of the American Mathematical Society, Denver (January 1983).
- 802-nd Meeting of the American Mathematical Society, Norman, Oklahoma (March 1983).
- SIAM–National Meeting, Denver (May 1983).
- \* 3. Österreichisches Mathematikertreffen (September 1983).
- Conference in Oberwolfach on “Regelungstheorie” (March 1984).
- Workshop on Control and Identification of Distributed Parameter Systems, ICASE (NASA Research Center), Hampton, VA, USA (June 1985).
- SIAM Spring Meeting, Pittsburgh, USA (June 1985).
- \* 11. Österreichischer Mathematikerkongreß, Graz (September 1985).



- International Symposium on Variational Methods in the Geophysical Sciences, Norman, OK (October 1985).
- International Institute for Applied System Analysis (IIASA), Laxenburg (December 1985).
- IFIP-TC7 Conference on Control Problems Described by Partial Differential Equations and Applications, Gainesville, USA (February 1986).
- Fourth French-German Conference on Optimization, Irsee (April 1986).
- Conference in Oberwolfach on “Inverse Problems” (May 1986).
- Conference on “Ill-posed and Inverse Problems”, St. Gilgen (June 1986).
- Fourth IFAC-Symposium on Control of Distributed Parameter Systems, plenary Lecture, Pasadena, CA. (June 1986).
- From Data to Model: Lecture Week at International Institute for Applied Systems Analysis, Laxenburg (September 1986).
- Special Week on Control Theory (within: Half Year Program on Evolution Equations), Pisa, Italien (February 1987).
- Workshop on Application and Algorithms for Optimal Control and Parameter Identification, Trier (June 1987).
- Summerschool on “Angewandte Mathematik”, Frauenberg, Österreich (September 1987).
- Workshop on Illposed and Inverse Problems, FU Berlin (October 1987).
- 26-th IEEE Conference on Decision and Control, Los Angeles (December 1987), plenary lecture.
- Workshop on Computational Aspects of Identification and Control of Distributed Parameter Systems, Providence, USA (August 1988).
- Summer School: Perspectives in Control Theory, Warsaw (September 1988), plenary Lecture.
- International Conference on Numerical Methods in Optimization and Optimal Control, Trier (June 1989).
- 5-th IFAC Symposium of Control of Distributed Parameter Systems, Perpignan (June 1989).
- Modelling and Inverse Problems of Control for Distributed Parameter Systems, IIASA, Laxenburg (August 1989).
- Inverse Problems, Multicentennial Meeting, Montpellier (December 1989).
- Nonlinear Phenomena, Montpellier (December 1990).
- Inverse Problems, Computational Algorithms, College Station, Texas (February 1991).
- Optimization Methods in Differential Equations and Control, North Carolina State University (July 1991).
- Problèmes Inverses, Montpellier (December 1991).

- AMS/IMS/SIAM Summer Conference on Control and Identification on Partial Differential Equations, Mount Holyoke, Mass. (July 1992).
- Fourth Colloquium on Inverse Problems, Chemnitz (September 1992).
- Österreichisch–Slowenisches Mathematikertreffen, Graz (October 1992).
- Parameter Estimation and Control in Deterministic and Stochastic Systems, Merseburg (October 1992).
- Kolloquium des SFB 319 der DFG, Gosslar (October 1992).
- Control Theory and Its Applications, Institute for Mathematics and Its Applications, Minnesota (November 1992).
- Optimal Control of Partial Differential Equations, Oberwolfach (January 1993).
- Conferentie van Numerick Wiskundigen, Woudschoten, The Netherlands (September 1993).
- GAMM-SIAM Conference on Inverse Problems in Diffusion Processes, St. Wolfgang, Austria (June 1994).
- International Conference on Operations Research OR '94, Berlin (August 1994).
- IFIP-TC7 (WG 7.2)–Conference on Control of Partial Differential Equations and Applications, Laredo, Spain (September 1994).
- Symposium on Inverse Problems, Chemnitz (March 1995).
- Workshop on Parameter Identification and Inverse Problems in Hydrology, Geology and Ecology, Karlsruhe (April 1995).
- Third SIAM Conference on Control and Its Applications, St. Louis (April 1995).
- ICIAM 95, The Third International Congress on Industrial and Applied Mathematics, Hamburg (July 1995).
- Inverse Problems in Medical Imaging and Nondestructive Testing, Oberwolfach (February 1996).
- AMS-IMS-SIAM Joint Summer Research Conferences in the Mathematical Sciences: Conference on Optimization methods in partial differential equations, Mount Holyoke College, South Hadley, MA, USA (June 1996).
- 8th French-German Conference on Optimization, Trier (July 1996).
- Euroconference Advanced Mathematical Tools in Metrology III, Berlin (September 1996).
- GAMM Conference, Regensburg (March 1997).
- Control of Distributed Parameter Systems, Luminy–Marsailles (August 1997)
- Control Theory and Applications, Institute Henri Poincaré, Paris (March 1998).
- Workshop on Nonlinear Robust and Optimal Control, Würzburg (March 1998).
- Conference on Inverse Problems, Control and Shape Optimization, Tunis (April 1998).

- Conference on Optimal Control and Partial Differential Equations, Chemnitz (April 1998).
- Partial Differential Equations, Theory and Numerical Solutions, Prag (August 1998).
- Ill-Posed Variational Problems and Regularization Techniques, Trier (September 1998).
- Colloquium on Applied Mathematics in Austria, Wien (October 1998).
- Workshop on Adaptive Finite Element Methods and Optimization, Heidelberg (November 1998).
- Control of Systems Governed by Partial Differential Equations, Nancy (March 1999).
- International Conference on Optimization, Trier (March 1999).
- French–Russian Conference on Seismic Waves in Heterogenous Media, Moscow (May 1999).
- Shortcourse on Numerical Methods for Fluid Flow, Toulouse (June 1999). (3 tutorial lectures).
- ERCOFTAC workshop, Toulouse (June 1999).
- Workshop on Receding Horizon Control, Rodulc (November 1999).
- Fast solutions of Discretized Optimization Problems, Weierstrass Institute, Berlin (May 2000).
- Optimal control of complex dynamical structures, Oberwolfach (June 2000).
- Inverse Problems: Strobl, Austria (June 2000).
- Numerical Modelling in Continuum Mechanics: Prag, (August 2000)
- Conference on Future Directions in Distributed Parameter Systems: Raleigh, USA (October 2000)
- International Meeting on the Control and Stabilization of Partial Differential Equations: Cortona, Italien (Mai 2001)
- Meeting on Numerical Methods for Non Linear Problems in Optimization and Control: Cortona, Italien (Juni 2001), Short Course.
- GAMM Special Meeting on Multigrid Methods for Optimal Control of Partial Differential Equations: Max Planck Institut, Leipzig (January 2002)
- GAMM Jahrestagung, Augsburg (März 2002), plenary lecture.
- 2nd Conference on Inverse Problems, Control and Shape Optimization, Karthago, Tunisie (April 2002).
- 34ème Congres national d'analyse numerique, Pau (May 2002), plenary lecture.
- Mathematical Theory of Networks and Systems, South Bend, Indiana, USA (August 2002).
- Special Semester on Inverse Problems, Statistical and Applied Mathematical Sciences Institute, Research Triangle Park, USA (September 2002), plenary lecture.

- Workshop on Optimization in Partial Equations and Applications, Heidelberg (October 2002), plenary lecture.
- Numerical Techniques for Optimization Problems with PDE Constraints, Oberwolfach (February 2003).
- Workshop on Numerical and Symbolic Scientific Computing, Strobl, Austria (June 2003).
- Workshop: Control of PDEs, TU Berlin (December 2003).
- Workshop on Numerik für instationäre Kontrollprobleme, Oberwolfach (January 2004).
- GAMM Annual Meeting, Dresden, Germany (March 2004).
- EUCCO 2004, Dresden, Germany (March 2004).
- INRIA-Rocquencourt Conference on New Trends in Mathematical and Numerical Methods for Geosciences, Direct and Inverse Problems, Paris, France (December 2004), plenary lecture.
- SIAM Conference on Computational Science and Engineering, Orlando, USA (February 2005).
- Conference in Oberwolfach on “Optimal Control of Coupled Systems of PDEs” (April 2005).
- 8th SIAM Optimization Conference, Stockholm, Sweden (May 2005).
- 6th SIAM Conference on Control and its Applications, New Orleans, USA (July 2005), Short Course.
- ENUMATH 2005, 6th European Conference on Numerical Mathematics and Advanced Applications, Santiago de Compostela, Spain (July 2005), plenary lecture.
- Workshop on PDE Constrained Optimization, Tomar, Portugal (July 2005), plenary lecture.
- Short Course: Model reduction based on proper orthogonal decomposition, Rome (January 2006).
- Conference in Oberwolfach on “Numerical Methods for PDE-Constrained Optimal Control” (February 2006).
- Workshop on Model Reduction, Rice University, Houston, USA (May 2006).
- CIMPA Course on PDE-Constrained Optimal Control, Castro Urdiales (September 2006).
- DMV Meeting, Bonn (September 2006).
- Active Flow Control, Berlin (September 2006), plenary lecture.
- DFG Workshop, Linz (March 2007).
- SAMSI Opening Workshop on Random Media, North Carolina/USA (September 2007).
- Symposium in the honour of Prof. K.-H. Hoffmann, Munich (October 2007).
- Lipschitz Lecturer at the Hausdorff Institute of Mathematics, Bonn (November-December 2007).

- Conference in Oberwolfach on Optimal Control of Coupled Systems of PDE (March 2008).
- Workshop on PDE Constrained Optimization - Recent Challenges and Future Developments, Hamburg (March 2008).
- Workshop on Industrial Applications of Low Order Models Based on POD, Bordeaux (March 2008).
- Conference on 50 Years of Optimal Control, Poznan (September 2008).
- Workshop on Phase Transitions and Optimal Control, Weierstrass Institute for Applied Analysis and Stochastics (WIAS), Berlin (October 2008).
- Conference on Statistical Regularization and Qualitative Constraints, Göttingen (November 2008).
- Workshop on Optimization with PDE Constraints "OPTPDE 2008", Warsaw (December 2008).
- Conference on Numerical Methods for PDE-Constrained Optimal Control, Oberwolfach (February 2009).
- Workshop on Coherence, Control and Dissipation, Minneapolis (February/March 2009).
- Conference in Applied Mathematics "SMAI 2009", La Colle sur Loup (May 2009).
- Conference in Glasgow, 23rd Biennial Numerical Analysis (June 2009), plenary lecture.
- SIAM Conference on Control and Its Applications, Denver (July 2009), plenary lecture.
- 12th Workshop on Well Posedness of Optimization Problems in Trento, Italy (September 2009).
- 14th Belgian-French-German Conference on Optimization (BFG09) in Leuven, Belgium (September 2009).
- DMV-Tagung, Munich (March 2010).
- International Workshop on Inverse Problems, Hong Kong/Wuhan (April 2010).
- ICM-Hyderabad, invited semi-plenary lecture (August 2010).
- WIAS Workshop on Model Order Reduction in Optimization and Control with PDEs, Berlin (January 2011).
- Numerical Methods for Optimal Control and Inverse Problems Workshop, Munich (March 2011).
- GAMM 2011, Graz (April 2011).
- SIAM Conference on Optimization, Darmstadt (May 2011).
- Variational Image Analysis: Challenges and Perspectives Symposium, Heidelberg (July 2011).
- Workshop on Optimal Control of Partial Differential Equations, Klaffenbach (November 2011).

- Latin American Workshop on Optimization and Control III, Valparaiso, Chile (January 2012).
- 5th International Conference on High Performance Scientific Computing, Hanoi (March 2012).
- ESI Workshop on Computational Inverse Problems, Vienna (April 2012).
- 12th Viennese Workshop on Optimalcontrol, Dynamic Games and Nonlinear Dynamics, Vienna (June 2012).
- Workshop on Modeling, Optimization and Simulation of Complex Fluid Flow, Darmstadt (June 2012).
- International Conference on Applied and Computational Mathematics, Turkey (October 2012).
- Conference on Numerical Methods for PDE-Constrained Optimization with Uncertain Data, Oberwolfach (January 2013).
- Workshop on Optimal control of PDE, Erlangen (June 2013).
- Colloquium RICAM 10, Linz (March 2013).
- IFIP TC7, Klagenfurt (September 2013).
- IFAC CPDE, Paris (September 2013).
- SKOLTECH, Moskau (Juni 2014).
- CEDYA XIV Cádiz, Spain (June 2015).
- European Control Conference, Linz (July 2015).
- CIRM Luminy, Marseille (November 2015).
- OCDE Workshop INRIA Saclay, Paris (November 2015).
- MORCIP Lausanne (May 2016).
- OCERTO Cortona (June 2016).
- ECMath Guest Colloquium Berlin (January 2017).
- Quantum Control Theory Workshop, Munich (April 2017)
- Workshop on Numerical Methods for Optimal Control and Inverse Problems (OCIP2017), Munich (April 2017)
- NUMOC Workshop, Rom (June 2017)
- Workshop "Optimal Control of Partial Differential Equations" on the occasion of Eduardo Casas' 60th Birthday, Cantabria (September 2017)
- 18th French-German-Italian Conference on Optimization (FGI 2017), Paderborn (September 2017)
- Woudschoten Conference, Woudschoten (October 2017)

## Lectures science to public

- "Optimierung und Numerische Simulation in der Medizintechnik", Alpbacher Universitätenforum: Computational Science and Engineering, Alpbach, 2009.
- "Erfolge der Mathematik bei der Verbindung von Grundlagen- und angewandter Forschung", ÖFG Workshop: Wissenstransfer - geteilte Aufgaben von Universität und Gesellschaft, Baden bei Wien, 2012.

## Lectures at European Universities

Augsburg	Freiburg	Paris (Institute Henri Poincare)
Bari	Göttingen	Paris-Dauphine, Short Course
Bergen	Hamburg	Pisa
Berlin (TU)	Hannover	Rom
Berlin (Humboldt)	Heidelberg	Saarbrücken
Bochum	Kaiserslautern	Santander
Bonn	Konstanz	Stuttgart
Chemnitz	Leoben	Trier
Clermont Ferrand	Linz	Wien
Darmstadt	München (TU u. Univ.)	Würzburg
Dresden	Münster	Zürich (ETH u Univ.)
Erlangen	Oxford	
Essen	Paris (INRIA)	

## Lectures at American Universities

University of Florida	Southern Methodist University
University of Southern California	University of Texas at Arlington
Vanderbilt University	Memphis State University
Tulane University	Pennsylvania State University
Brown University	Southern Illinois University
Mathematical Research Center,	Virginia Polytechnic Institute and
University of Wisconsin	State University
University of Montreal	Worcester Polytechnic Institute
Pomona Colleges	Claremont Graduate School
North Carolina State University	

## Lectures at Japanese Universities

Osaka, Kobe, Kyoto, Tokushima, Naruto

## Organization of Meetings

Conference-Workshop on Control Theory for Distributed Parameter Systems, Vorau, Österreich, 11.7.–17.7.1982 (with Prof. Kappel and Prof. Schappacher).

Second International Conference on Control Theory for Distributed Parameter Systems and Applications, Vorau, Österreich, 9.7.–14.7.1984 (with Prof. Kappel and Prof. Schappacher).

International Symposium on Variational Methods in the Geophysical Sciences, Norman, OK, USA, October 1985 (Organizing Committee).

IFAC-4th International Symposium on Control of Distributed Parameter Systems, Pasadena, CA, USA, June 1986 (Organizing Committee).

International Conference on Control and Identification of Distributed Systems, 6.7.–12.7.1986, Vorau, Österreich (with Prof. Kappel and Prof. Schappacher).

International Conference on Control and Identification of Distributed Parameter Systems, Vorau, Österreich, 10.7. - 16.7.1988 (with Prof. Kappel and Prof. Schappacher).

5-th IFAC Symposium on Control of Distributed Parameter Systems, Perpignan, Frankreich, June 1989 (Organizing Committee).

Modelling and Inverse Problems of Control for Distributed Parameter Systems, IASA, Laxenburg, 24.8.–28.8.1989 (Organizing Committee).

International Conference on Control and Identification of Distributed Parameter Systems, 9.7.–14.7.1990 (with Prof. Kappel and Doz. Desch).

International Conference on Control and Identification of Distributed Parameter Systems: Non-linear Phenomena, Vorau, Österreich, 18.7.–24.7.1993 (with Prof. Kappel and Doz. Desch).

Third International Congress on Industrial and Applied Mathematics, ICIAM 95, Hamburg, Germany, 3.7.–7.7.1995, Minisymposium on Domain Optimization (with Prof. Sokolowski).

International Conference on Control and Estimation of Distributed Parameter Systems, Vorau, Austria, 14.7.–20.7.1996 (with Prof. Kappel und Doz. Desch).

SIAM-GAMM Conference Series on Inverse Problems (Organizing Committee).

Workshop on Image Processing, Graz, Austria, May 1999.

Workshop on Proper Orthogonal Decomposition and its Applications, Graz, Austria, May 2000.

International Conference on Optimal Control of Complex Dynamical Systems, Oberwolfach, Germany, June 2000.

8-th Conference on Control of Distributed Parameter Systems, Graz–Mariatrost, Österreich, 15.7.–21.7.2001 (with Prof. Desch and Prof. Kappel).

Workshop on Advances in Numerical Algorithms, Graz, Austria, September 2003.

International Workshop on “Numerik für instationäre Kontrollprobleme”, Oberwolfach, Germany, January 2004.



International Conference on Optimal Control of Coupled Systems of PDE, Oberwolfach, Germany, April 2005.

International Conference on Numerical Techniques for Optimization Problems with PDE Constraints, Oberwolfach, Germany, February/March 2006.

International Mini-Workshop on Control of Free Boundaries, Oberwolfach, Germany, February 2007.

ENUMATH 07, Graz, September 2007.

International Conference on Optimal Control of Coupled Systems of PDE, Oberwolfach, Germany, March 2008.

IMA-Workshop: Coherence, Control and Dissipation, Minneapolis, March 2009.

BIDOMAIN-Workshop: Graz-Mariatrost, Austria, October 2009.

International Workshop on Control and Optimization of Partial Differential Equations, Mariatrost, Austria, November 2011.

International Workshop on From Open to Closed Loop Control, Mariatrost, Austria, June 2015.

International Workshop on Optimal Control of Dynamical Systems, Mariatrost, Austria, May 2017.

## Courses Taught

The courses were taught at the Technical University of Graz, Technical University Berlin, Brown University, and University of Oklahoma, and University of Graz.

WS	1978/79	Integral Equations
SS	1979	Biostatistics
WS	1979/80	Linear Operators I
SS	1980	Linear Operators II
WS	1980/81	Integral Equations
SS	1981	Ordinary Differential Equations II
WS	1981/82	Calculus of Variations
SS	1982	Seminar on Control Theory for Partial Differential Equations
WS	1982/83	Foundations of Analysis I
SS	1983	Foundations of Analysis II
WS	1983/84	Optimal Processes
SS	1984	Control Theory
WS	1984/85	Differential Equations II
SS	1985	Ordinary Differential Equations
SS	1986	Analysis 4
WS	1986/87	Measure and Integration Theory
SS	1987	Mathematical Optimization

WS	1987/88	Measure and Integration Theory
SS	1988	Lineare Algebra 2
		Selected Topics in Numerical Mathematics
WS	1989/90	Functional Analysis, Special Topics in Numerical Analysis
SS	1990	Mathematical Optimization
WS	1990/91	Partial Differential Equations, Special Topics in Numerical Analysis
SS	1991	Ordinary Differential Equations
SS	1992	Ordinary Differential Equations
WS	1992/93	Functionalanalysis
SS	1993	Ordinary Differential Equations, Special Topics in Numerical Analysis
WS	1993/94	Inverse Problems II
SS	1994	Numerical Mathematics I
WS	1994/95	Numerical Mathematics II
SS	1995	Optimization I
WS	1995/96	Optimization II
WS	1996/97	Linear Algebra
SS	1997	Analytical Geometry
WS	1997/98	Numerical Mathematics I
SS	1998	Numerical Mathematics II
WS	1998/99	Linear Algebra
SS	1999	Analytical Geometry
WS	1999/00	Numerical Mathematics I
SS	2000	Numerical Mathematics II
SS	2001	Funktionalanalysis
WS	2001/02	Lineare Algebra I
SS	2002	Lineare Algebra II
WS	2002/03	Numerical Mathematics II
SS	2003	Gewöhnliche Differentialgleichungen und Funktionentheorie
WS	2003/04	Numerical Mathematics II
SS	2004	Numerical Mathematics I
WS	2004/05	Numerical Mathematics II
SS	2005	Complex Analysis and Ordinary Differential Equations
WS	2005/06	Partial Differential Equations
SS	2006	Numerical Analysis I
WS	2006/07	Numerical Analysis II, PDE-Constrained Optimization
SS	2007	Optimization I
WS	2007/08	Optimization II
SS	2008	Numerical Mathematics I
WS	2008/09	Optimization I
SS	2009	Introduction to Numerical Mathematics Optimal Control Theory
WS	2009/10	Introduction to Optimization I
SS	2010	Optimization II

WS	2010/11	Optimization I
SS	2011	Optimization II
WS	2011/12	Optimization I
SS	2012	Optimization II, Optimization and Control in Infinite Dimensions
WS	2012/13	Optimization I
SS	2013	Optimization II
WS	2013/14	Optimization in infinite dimensional spaces
SS	2014	Optimization II
WS	2014/15	Optimization II
SS	2015	Optimization in infinite dimensional spaces
WS	2015/16	Nonlinear Optimization
SS	2016	Algorithmic infinite dimensional optimization

# LIST OF PUBLICATIONS

## Books

H. T. Banks and K. Kunisch. *Estimation Techniques for Distributed Parameter Systems*, Birkhäuser, Boston, 1989.

K. Ito and K. Kunisch. *On the Lagrange Multiplier Approach to Variational Problems and Applications*, SIAM, Philadelphia, 2008.

## Articles in Refereed Publications

- [1] K. Kunisch. Neutrale Funktional-Differentialgleichungen und Halbgruppentheorie. *Berichte der Math.-Stat. Sektion im Forschungszentrum Graz*, 81:101, 1978.
- [2] K. Kunisch. Neutral functional differential equations in  $L_p$ -spaces and averaging approximations. *Nonlinear Analysis*, 3(4):419–447, 1979. doi:[10.1016/0362-546X\(79\)90060-9](https://doi.org/10.1016/0362-546X(79)90060-9).
- [3] K. Kunisch. Abstract Cauchy problem and abstract integral equations for neutral functional differential equations. *Archiv der Mathematik*, 31(1):580–588, December 1978. doi:[10.1007/BF01226495](https://doi.org/10.1007/BF01226495).
- [4] K. Kunisch. Order preserving evolution operators of functional differential equations. *Boll. Un. Mat. Ital. B*, 16:480–500, 1979.
- [5] K. Kunisch and W. Schappacher. Positive solutions of functional differential equations. In *Functional differential equations and approximation of fixed points (Proc. Summer School and Conf., Univ. Bonn, Bonn, 1978)*, Lecture Notes in Math., pages 238–246. Springer, Berlin, 1979.
- [6] K. Kunisch and W. Schappacher. Variation of constants formulas for partial differential equations with delay. *Nonlinear Analysis*, 5(2):123–142, 1981. doi:[10.1016/0362-546X\(81\)90038-9](https://doi.org/10.1016/0362-546X(81)90038-9).
- [7] F. Kappel and K. Kunisch. Spline approximations for neutral functional differential equations. *SIAM Journal on Numerical Analysis*, 18(6):1058, 1981. doi:[10.1137/0718072](https://doi.org/10.1137/0718072).
- [8] K. Kunisch and W. Schappacher. Mild and strong solutions for partial differential equations with delay. *Annali di Matematica Pura ed Applicata*, 125(1):193–219, December 1980. doi:[10.1007/BF01789412](https://doi.org/10.1007/BF01789412).
- [9] K. Kunisch. Approximation of optimal control problems for hereditary systems of neutral type. *Berichte der Math.-Stat. Sektion im Forschungszentrum Graz*, 137(65):22, 1980.
- [10] K. Kunisch. The quasi autonomous Cauchy problem and the step method for functional differential equations. *Included in the Postdoctoral Thesis*, 1980.

- [11] K. Kunisch. A semigroup approach to partial differential equations with delay. In *Abstract Cauchy problems and functional differential equations (Proc. Workshop, Leibnitz, 1979)*, Res. Notes in Math., pages 53–70. Pitman, Boston, MA, 1981.
- [12] K. Kunisch. Approximation schemes for the linear-quadratic optimal control problem associated with delay equations. *SIAM Journal on Control and Optimization*, 20(4):506, 1982. doi:[10.1137/0320038](https://doi.org/10.1137/0320038).
- [13] K. Kunisch. Approximation schemes for nonlinear neutral optimal control systems. *Journal of Mathematical Analysis and Applications*, 82(1):112–143, July 1981. doi:[10.1016/0022-247X\(81\)90228-6](https://doi.org/10.1016/0022-247X(81)90228-6).
- [14] K. Kunisch. The Riccati integral equation arising in optimal control of delay differential equations. In *Nonlinear phenomena in mathematical sciences (Arlington, Tex., 1980)*, pages 611–618. Academic Press, New York, 1982.
- [15] H. Banks and K. Kunisch. Parameter estimation techniques for nonlinear distributed parameter systems. In *Proceedings of International Conference on Nonlinear Phenomena in Mathematical Science, Texas*, pages 57–68. Lefschetz Center for Dynamical Systems, 1980.
- [16] K. Kunisch. Identification and estimation of parameters in abstract Cauchy problems. In *Mathematical Control Theory*, Banach Center Publications, pages 279–300. PWN, Warsaw, 1983.
- [17] H. T. Banks and K. Kunisch. An approximation theory for nonlinear partial differential equations with applications to identification and control. *SIAM Journal on Control and Optimization*, 20(6):815, 1982. doi:[10.1137/0320059](https://doi.org/10.1137/0320059).
- [18] H. Banks, J. Crowley, and K. Kunisch. Cubic spline approximation techniques for parameter estimation in distributed systems. *Automatic Control, IEEE Transactions on*, 28(7):773–786, 2002. doi:[10.1109/TAC.1983.1103310](https://doi.org/10.1109/TAC.1983.1103310).
- [19] K. Kunisch and W. Schappacher. Necessary conditions for partial differential equations with delay to generate-semigroups. *Journal of Differential Equations*, 50(1):49–79, October 1983. doi:[10.1016/0022-0396\(83\)90084-0](https://doi.org/10.1016/0022-0396(83)90084-0).
- [20] K. Kunisch, W. Schappacher, and G. Webb. Nonlinear age-dependent population dynamics with random diffusion. *Computers & Mathematics with Applications*, 11(1-3):155–173, March 1985. doi:[10.1016/0898-1221\(85\)90144-0](https://doi.org/10.1016/0898-1221(85)90144-0).
- [21] K. Kunisch. Approximation of the parameter identification problem in distributed parameter systems: reduction of smoothness requirements. In *Control of distributed parameter systems, 1982 (Toulouse, 1982)*, pages 91–95. IFAC, 1983.
- [22] G. Di Blasio, K. Kunisch, and E. Sinestrari. The solution operator for a partial differential equation with delay. *Atti Accad. Naz. Lincei Rend. Cl. Sci. Fis. Mat. Natur. (8)*, 74(4):228–233, 1983.
- [23] G. Di Blasio, K. Kunisch, and E. Sinestrari. L2-regularity for parabolic partial integrodifferential equations with delay in the highest-order derivatives. *Journal of Mathematical Analysis and Applications*, 102(1):38–57, August 1984. doi:[10.1016/0022-247X\(84\)90200-2](https://doi.org/10.1016/0022-247X(84)90200-2).

- [24] F. Kappel and K. Kunisch. Approximation of the state of infinite delay- and Volterra-type equations. In *Differential-difference equations (Oberwolfach, 1982)*, Internat. Schriftenreihe Numer. Math., pages 149–168. Birkhäuser, Basel, 1983.
- [25] K. Kunisch and L. White. The parameter estimation problem for parabolic equations and discontinuous observation operators. *SIAM J. Control and Optimization* 23(1985), 900–927, 1985. doi:10.1137/0323052.
- [26] G. Di Blasio, K. Kunisch, and E. Sinestrari. Stability for abstract linear functional differential equations. *Israel Journal of Mathematics*, 50(3):231–263, September 1985. doi:10.1007/BF02761404.
- [27] K. Kunisch and L. White. Parameter estimation for elliptic equations in multidimensional domains with point and flux observations. *Nonlinear Analysis*, 10(2):121–146, February 1986. doi:10.1016/0362-546X(86)90041-6.
- [28] H. T. Banks and K. Kunisch. The linear regulator problem for parabolic systems. *SIAM Journal on Control and Optimization*, 22(5):684, 1984. doi:10.1137/0322043.
- [29] K. Kunisch and L. White. Parameter estimation, regularity and the penalty method for a class of elliptic problems. *SIAM J. Control and Optimization*, 25:100–120, 1987. doi:10.1137/0325008.
- [30] K. Kunisch and E. Graif. Parameter estimation for the Euler–Bernoulli beam. *Matematica Aplicada E Computacional*, 4:95–124, 1985.
- [31] K. Kunisch and L. White. Parameter identifiability under approximation. *Quarterly of Applied Mathematics*, 44:475–486, 1986.
- [32] H. Banks and K. Kunisch. Approximation of feedback controls for parabolic systems. In *Decision and Control, 1983. The 22nd IEEE Conference on*, volume 22, pages 247–251. IEEE, 2007.
- [33] G. Di Blasio, K. Kunisch, and E. Sinestrari. Retarded abstract equations in Hilbert space. In *Infinite-dimensional systems (Retzhof, 1983)*, Lecture Notes in Math., pages 71–77. Springer, Berlin, 1984. doi:10.1007/BFb0072767.
- [34] F. Colonius and K. Kunisch. Stability for parameter estimation in two point boundary value problems. *Journal für die Reine und Angewandte Mathematik*, 370:1–29, 1986.
- [35] K. Kunisch and L. W. White. Regularity properties in parameter estimation of diffusion coefficients in one dimensional elliptic boundary value problems. *Applicable Analysis*, 21(1):71–87, February 1986. doi:10.1080/00036818608839584.
- [36] F. Kappel and K. Kunisch. Invariance results for infinite delay and Volterra equations in Besov-spaces. *Transactions of the American Mathematical Society*, 304:1–51, 1987.
- [37] K. Kunisch and L. W. White. Identifiability under approximation for an elliptic boundary value problem. *SIAM Journal on Control and Optimization*, 25(2):279, 1987. doi:10.1137/0325017.
- [38] V. Capasso and K. Kunisch. A reaction-diffusion system modelling man-environment epidemics. *Annals of Differential Equations*, 1:1–12, 1985.

- [39] K. Kunisch. Inherent identifiability of parameters in elliptic differential equations. *Journal of Mathematical Analysis and Applications*, 132(2):453–472, June 1988. doi:[10.1016/0022-247X\(88\)90074-1](https://doi.org/10.1016/0022-247X(88)90074-1).
- [40] F. Colonius and K. Kunisch. Output least squares stability in elliptic systems. *Applied Mathematics & Optimization*, 19(1):33–63, January 1989. doi:[10.1007/BF01448191](https://doi.org/10.1007/BF01448191).
- [41] K. Ito and K. Kunisch. The augmented Lagrangian method for equality and inequality constraints in Hilbert spaces. *Mathematical Programming*, 46(1-3):341–360, January 1990. doi:[10.1007/BF01585750](https://doi.org/10.1007/BF01585750).
- [42] F. Colonius and K. Kunisch. A new approach to the stability analysis of parameter identification problems. In H. Barker and P. Young, editors, *Identification and System Parameter Estimation, H.a. Barker and P.C. Young, Eds., Pergamon Press, 1985, 581-584*, pages 581–584. Pergamon Press, 1985.
- [43] F. Colonius and K. Kunisch. Output least squares stability for estimation of the diffusion coefficient in an elliptic equation. *Control Problems for Systems Described by Partial Differential Equations and Applications*, 97:185–195, 1987. doi:[10.1007/BFb0038752](https://doi.org/10.1007/BFb0038752).
- [44] V. Capasso and K. Kunisch. A reaction-diffusion system arising in modelling man-environment diseases. *Quart. Appl. Math*, 46(3):431–449, 1988.
- [45] K. Kunisch. A review of some recent results on the output least squares formulation of parameter estimation problems. *Automatica*, 24(4):531–539, 1988.
- [46] K. Kunisch. Rate of convergence for the estimation of a coefficient in a two point boundary value problem. In H. W. Engl and C. W. Groetsch, editors, *Inverse and ill-posed problems (Sankt Wolfgang, 1986)*, Notes Rep. Math. Sci. Engrg., pages 499–511. Academic Press, Boston, MA, 1987.
- [47] K. Kunisch and G. Peichl. On the shape of the solutions of second order parabolic partial differential equations. *Journal of Differential Equations*, 75(2):329–353, October 1988. doi:[10.1016/0022-0396\(88\)90142-8](https://doi.org/10.1016/0022-0396(88)90142-8).
- [48] K. Ito and K. Kunisch. The augmented Lagrangian method for parameter estimation in elliptic systems. *SIAM Journal on Control and Optimization*, 28(1):113, 1990. doi:[10.1137/0328006](https://doi.org/10.1137/0328006).
- [49] K. Kunisch and H. Schelch. Parameter estimation in a special reaction-diffusion system modelling man-environment diseases. *Journal of mathematical biology*, 27(6):633–665, 1989.
- [50] K. Ito and K. Kunisch. The augmented Lagrangian method for estimating the diffusion coefficient in an elliptic equation. In *Proceedings of 26th IEEE Conference on Decision and Control, Los Angeles 1987*, pages 1400–1404, 1987.
- [51] K. Kunisch and L. White. Regularity properties and strict complementarity of the output-least-squares approach to parameter estimation in parabolic equations. *Inverse Problems*, 5:13, 1989. doi:[10.1088/0266-5611/5/1/006](https://doi.org/10.1088/0266-5611/5/1/006).

- [52] K. Kunisch and M. Mastinsek. Dual semigroups and structural operators for partial functional differential equations with unbounded operators acting on the delays. *Differential Integral Equations*, 3(4):733–756, 1990.
- [53] H. Engl, K. Kunisch, and A. Neubauer. Convergence rates for Tikhonov regularisation of non-linear ill-posed problems. *Inverse Problems*, 5:523, 1989. doi:10.1088/0266-5611/5/4/007.
- [54] M. Kroller and K. Kunisch. Convergence rates for the feedback operators arising in the linear quadratic regulator problem governed by parabolic equations. *SIAM Journal on Numerical Analysis*, 28(5):1350, 1991. doi:10.1137/0728071.
- [55] K. Ito and K. Kunisch. An augmented Lagrangian technique for variational inequalities. *Applied Mathematics and Optimization*, 21(1):223–241, 1990.
- [56] K. Ito, M. Kroller, and K. Kunisch. A numerical study of an augmented Lagrangian method for the estimation of parameters in elliptic systems. *SIAM Journal on Scientific and Statistical Computing*, 12(4):884, 1991. doi:10.1137/0912048.
- [57] F. Colonius and K. Kunisch. Stability of perturbed optimization problems with applications to parameter estimation. *Numerical Functional Analysis and Optimization*, 11(9):873–915, 1990. doi:10.1080/01630569108816408.
- [58] J. Baumeister and K. Kunisch. Identifiability and stability of a two-parameter estimation problem. *Applicable Analysis*, 40(4):263–279, March 1991. doi:10.1080/00036819108840009.
- [59] K. Kunisch and L. White. Stability and identifiability of parameters in Galerkin approximation of distributed systems under multiple inputs. *Optimal Control Applications and Methods*, 12(1):63–71, January 1991. doi:10.1002/oca.4660120106.
- [60] K. Kunisch and G. Peichl. Estimation of a temporally and spatially varying diffusion coefficient in a parabolic system by an augmented Lagrangian technique. *Numerische Mathematik*, 59(1):473–509, December 1991. doi:10.1007/BF01385792.
- [61] K. Kunisch. Contributions to nonlinear inverse problems arising in parameter estimation for elliptic systems. In *Perspectives in control theory: proceedings of the Sielpia, Conference, Sielpia, Poland September 19-24, 1988*, page 108. Birkhauser, 1990.
- [62] K. Kunisch and G. Peichl. A numerical technique for the estimation of the diffusion coefficient in parabolic systems. In *Decision and Control, 1989., Proceedings of the 28th IEEE Conference on*, pages 2743–2747. IEEE, 2002.
- [63] K. Kunisch and L. White. Estimation of a boundary heat transfer coefficient. *Control Theory and Advanced Technology*, 7:55–72, 1991.
- [64] K. Ito and K. Kunisch. Sensitivity analysis of solutions to optimization problems in Hilbert spaces with applications to optimal control and estimation. *Journal of Differential Equations*, 99(1):1–40, September 1992. doi:10.1016/0022-0396(92)90133-8.
- [65] M. Kroller and K. Kunisch. on the choice of the regularization parameter using model functions. In *Inverse methods in action (Montpellier, 1989)*, Inverse Probl. Theoret. Imaging, pages 106–113. Springer, Berlin, 1990.



- [66] K. Kunisch and G. Geymayer. Convergence rates for regularized nonlinear illposed problems. *Modelling and Inverse Problems of Control for Distributed Parameter Systems*, pages 81–92, 1991.
- [67] K. Ito and K. Kunisch. On the choice of the regularization parameter in nonlinear inverse problems. *SIAM Journal on Optimization*, 2(3):376–404, 1992. doi:[10.1137/0802019](https://doi.org/10.1137/0802019).
- [68] G. Di Blasio, K. Kunisch, and E. Sinestrari. Mathematical models for the elastic beam with structural damping. *Applicable Analysis*, 48(1):133–156, February 1993. doi:[10.1080/00036819308840155](https://doi.org/10.1080/00036819308840155).
- [69] F. Colonius and K. Kunisch. Sensitivity analysis for optimization problems in Hilbert spaces with bilateral constraints. *Journal of Mathematical Systems, Estimation, and Control*, 3:265–299, 1993.
- [70] K. Ito and K. Kunisch. On the injectivity and linearization of the coefficient-to-solution mapping for elliptic boundary value problems. *Journal of Mathematical Analysis and Applications*, 188(3):1040–1066, December 1994. doi:[10.1006/jmaa.1994.1479](https://doi.org/10.1006/jmaa.1994.1479).
- [71] K. Kunisch and E. W. Sachs. Reduced SQP methods for parameter identification problems. *SIAM Journal on Numerical Analysis*, 29(6):1793, 1992. doi:[10.1137/0729100](https://doi.org/10.1137/0729100).
- [72] G. Chavent and K. Kunisch. A geometric theory for L2-stability of the inverse problem in a one-dimensional elliptic equation from an H1-observation. *Applied Mathematics & Optimization*, 27(3):231–260, May 1993. doi:[10.1007/BF01314817](https://doi.org/10.1007/BF01314817).
- [73] K. Kunisch, K. Murphy, and G. Peichl. Parameter estimation in the Stefan problem. In *Computation and control, II (Bozeman, MT, 1990)*, Progr. Systems Control Theory, pages 247–262. Birkhäuser, Boston, 1991.
- [74] K. Kunisch, K. Murphy, and G. Peichl. Estimation of conductivity in the one-phase Stefan problem i: Basic results. *Bolletino Della Unione Matematica Italiana*, 7:77–103, 1995.
- [75] K. Kunisch and X. Pan. Estimation of interfaces from boundary measurements. *SIAM Journal on Control and Optimization*, 32(6):1643, 1994. doi:[10.1137/S0363012992226338](https://doi.org/10.1137/S0363012992226338).
- [76] G. Vainikko and K. Kunisch. L1-identifiability of the transmissivity coefficient. *Zeitschrift Für Analysis Und Ihre Anwendungen*, 12:327–341, 1993.
- [77] K. Kunisch and W. Ring. Regularization of nonlinear illposed problems with closed operators. *Numerical Functional Analysis and Optimization*, 14(3):389–404, 1993. doi:[10.1080/01630569308816529](https://doi.org/10.1080/01630569308816529).
- [78] G. Chavent and K. Kunisch. Regularization in state space. *RAIRO-Modelisation Math et Analyse Numerique*, 27(5):535–564, 1993.
- [79] K. Ito and K. Kunisch. Sensitivity measures for the estimation of parameters in 1-d elliptic boundary value problems. *Journal of Mathematical Systems Estimation and Control*, 6:195–218, 1996.
- [80] K. Ito and K. Kunisch. Maximizing robustness in nonlinear illposed inverse problems. *SIAM Journal on Control and Optimization*, 33(2):643, 1995. doi:[10.1137/S0363012992230982](https://doi.org/10.1137/S0363012992230982).

- [81] G. Chavent and K. Kunisch. Convergence of Tikhonov regularization for constrained ill-posed inverse problems. *Inverse Problems*, 10:63, 1994. doi:[10.1088/0266-5611/10/1/006](https://doi.org/10.1088/0266-5611/10/1/006).
- [82] O. Scherzer, H. W. Engl, and K. Kunisch. Optimal a posteriori parameter choice for Tikhonov regularization for solving nonlinear ill-posed problems. *SIAM Journal on Numerical Analysis*, 30(6):1796, 1993. doi:[10.1137/0730091](https://doi.org/10.1137/0730091).
- [83] K. Kunisch, K. Murphy, and G. Peichl. Estimation of the conductivity in the one-phase Stefan problem: numerical results. *Modélisation mathématique et analyse numérique*, 27(5):613–650, 1993.
- [84] V. Barbu and K. Kunisch. Identification of nonlinear elliptic equations. *Applied Mathematics and Optimization*, 33(2):139–167, 1996. doi:[10.1007/S002459900007](https://doi.org/10.1007/S002459900007).
- [85] K. Kunisch. On a class of damped Morozov principles. *Computing*, 50(3):185–198, September 1993. doi:[10.1007/BF02243810](https://doi.org/10.1007/BF02243810).
- [86] K. Kunisch and S. Nakagiri. Identifiability of spatially-varying parameters in distributed systems of parabolic type by continuous interior observations. *Control Theory and Advanced Technology*, 10:2065–2082, 1995.
- [87] K. Ito and K. Kunisch. Augmented Lagrangian-SQP-methods in Hilbert spaces and application to control in the coefficients problems. *SIAM Journal on Optimization*, 6(1):96, 1996. doi:[10.1137/0806007](https://doi.org/10.1137/0806007).
- [88] G. Chavent and K. Kunisch. State-space regularization: Geometric theory. *Applied Mathematics and Optimization*, 37(3):243–267, May 1998. doi:[10.1007/s002459900076](https://doi.org/10.1007/s002459900076).
- [89] K. Kunisch and X. C. Tai. Sequential and parallel splitting methods for bilinear control problems in Hilbert spaces. *SIAM Journal on Numerical Analysis*, 34(1):91, 1997. doi:[10.1137/S0036142993255253](https://doi.org/10.1137/S0036142993255253).
- [90] K. Ito and K. Kunisch. Augmented Lagrangian–SQP methods for nonlinear optimal control problems of tracking type. *SIAM Journal on Control and Optimization*, 34(3):874, 1996. doi:[10.1137/S0363012994261707](https://doi.org/10.1137/S0363012994261707).
- [91] M. Kroller and K. Kunisch. Matlab-software for parametric estimation in two point boundary value problems. In *Identification and control in systems governed by partial differential equations (South Hadley, MA, 1992)*, pages 59–68. SIAM, Philadelphia, PA, 1993.
- [92] V. Barbu and K. Kunisch. Identification of nonlinear parabolic equations. *Control Theory and Advanced Technology*, 10(4):1959–1980, 1995.
- [93] K. Ito and K. Kunisch. Augmented Lagrangian methods for nonsmooth, convex optimization in Hilbert spaces. *Nonlinear Analysis*, 41(5-6):591–616, August 2000. doi:[10.1016/S0362-546X\(98\)00299-5](https://doi.org/10.1016/S0362-546X(98)00299-5).
- [94] G. Chavent and K. Kunisch. On weakly nonlinear inverse problems. *SIAM Journal on Applied Mathematics*, 56(2):542, 1996. doi:[10.1137/S0036139994267444](https://doi.org/10.1137/S0036139994267444).

- [95] V. Barbu and K. Kunisch. Identifying the nonlinearity in a parabolic boundary value problem. In *Optimal Control of Differential Equations*, N.H. Pavel, Ed., Marcel Dekker, New York, pages 29–37. N.H. Pavel, Ed., Marcel Dekker, 1994.
- [96] K. Ito and K. Kunisch. An active set strategy based on the augmented Lagrangian formulation for image restoration. *Mathematical Modelling and Numerical Analysis*, 33(1):1–21, January 1999. doi:[10.1051/m2an:1999102](https://doi.org/10.1051/m2an:1999102).
- [97] K. Kunisch. Numerical methods for parameter estimation problems. In *Inverse Problems in Diffusion Processes (Proc. GAMM–SIAM Symposium)*, pages 199–216, 1995.
- [98] V. Barbu, K. Kunisch, and W. Ring. Control and estimation of the boundary heat transfer function in Stefan problems. *RAIRO-M2AN Modelisation Math et Analyse Numerique-Mathem Modell Numerical Analysis*, 30(6):671–710, 1996.
- [99] K. Ito and K. Kunisch. Augmented Lagrangian formulation of nonsmooth convex optimization in Hilbert spaces. In *Control of Partial Differential Equations and Applications, Proceedings of the IFIP TC7/WG-7.2 International Conference, Laredo, Spain*, pages 107–117, 1994.
- [100] K. Ito and K. Kunisch. Estimation of the convection coefficient in elliptic equations. *Inverse Problems*, 13:995, 1997. doi:[10.1088/0266-5611/13/4/007](https://doi.org/10.1088/0266-5611/13/4/007).
- [101] K. Kunisch and G. Peichl. Shape optimization for mixed boundary value problems based on an embedding domain method. *Dynamics of Continuous Discrete and Impulsive Systems*, 4:439–478, 1998.
- [102] M. Bergounioux and K. Kunisch. Augmented Lagrangian techniques for elliptic state constrained optimal control problems. *SIAM Journal on Control and Optimization*, 35(5):1524, 1997. doi:[10.1137/S036301299529330X](https://doi.org/10.1137/S036301299529330X).
- [103] G. Chavent, K. Kunisch, and J. E. Roberts. Primal-dual formulations for parameter estimation problems. *Computational and Applied Mathematics*, 18:165–212, 1999.
- [104] E. Casas, K. Kunisch, and C. Pola. Regularization by functions of bounded variation and applications to image enhancement. *Applied Mathematics and Optimization*, 40(2):229–257, September 1999. doi:[10.1007/s002459900124](https://doi.org/10.1007/s002459900124).
- [105] G. Chavent and K. Kunisch. Regularization of linear least squares problems by total bounded variation. *Control, Optimisation and Calculus of Variations*, 2:359–376, 1997. doi:[10.1051/cocv:1997113](https://doi.org/10.1051/cocv:1997113).
- [106] M. Bergounioux and K. Kunisch. Augmented Lagrangian algorithms for state constrained optimal control problems. In *Control and estimation of distributed parameter systems (Vorau, 1996)*, Internat. Ser. Numer. Math., pages 33–48. Birkhäuser, Basel, 1998.
- [107] K. Kunisch and X. C. Tai. Nonoverlapping domain decomposition methods for inverse problems. In P. Björstad, M. Espedal, and D. Keyes, editors, *Proceedings of the 9th International Conference on Domain Decomposition Methods, Bergen, Norway*, pages 517–524, 1996.

- [108] K. Kunisch and S. Volkwein. Augmented Lagrangian-SQP techniques and their approximations. In *Optimization methods in partial differential equations (South Hadley, MA, 1996)*, volume 209 of *Contemp. Math.*, pages 147–159. Amer Mathematical Society, 1997.
- [109] K. Ito and K. Kunisch. Newton’s method for a class of weakly singular optimal control problems. *SIAM Journal on Optimization*, 10(3):896, 2000. doi:[10.1137/S1052623497320840](https://doi.org/10.1137/S1052623497320840).
- [110] M. Hinze and K. Kunisch. Suboptimal control strategies for backward facing step flows. In A. Sydow, editor, *Proceedings of 15Th Imacs World Congress on Scientific Computation, Modelling and Applied Mathematics*, volume 3, pages 53–58, 1997.
- [111] M. Hinze and K. Kunisch. Suboptimal control of fluid flows. In *Operations Research Proceedings 1997 (Jena)*, pages 182–187. Springer, Berlin, 1998.
- [112] M. Bergounioux, K. Ito, and K. Kunisch. Primal-dual strategy for constrained optimal control problems. *SIAM Journal on Control and Optimization*, 37(4):1176, 1999. doi:[10.1137/S0363012997328609](https://doi.org/10.1137/S0363012997328609).
- [113] K. Ito and K. Kunisch. Optimal control of elliptic variational inequalities. *Applied Mathematics and Optimization*, 41(3):343–364, May 2000. doi:[10.1007/s002459911017](https://doi.org/10.1007/s002459911017).
- [114] E. Casas, K. Kunisch, and C. Pola. Some applications of BV functions in optimal controls and calculus of variations. *ESAIM: Proceedings*, 4:83–96, 1998. doi:[10.1051/proc:1998022](https://doi.org/10.1051/proc:1998022).
- [115] M. Hinze and K. Kunisch. On suboptimal control strategies for the Navier–Stokes equations. *ESAIM: Proceedings*, 4:181–198, 1998. doi:[10.1051/proc:1998028](https://doi.org/10.1051/proc:1998028).
- [116] K. Kunisch and J. Zou. Iterative choices of regularization parameters in linear inverse problems. *Inverse Problems*, 14:1247, 1998. doi:[10.1088/0266-5611/14/5/010](https://doi.org/10.1088/0266-5611/14/5/010).
- [117] K. Kunisch and G. Peichl. Numerical gradients for shape optimization based on embedding domain techniques. *Comp. Optimization and Applications*, 18:95–114, 2001. doi:[10.1023/a:1008779803348](https://doi.org/10.1023/a:1008779803348).
- [118] H. Choi, M. Hinze, and K. Kunisch. Instantaneous control of backward-facing step flows. *Applied Numerical Mathematics*, 31(2):133–158, October 1999. doi:[10.1016/S0168-9274\(98\)00131-7](https://doi.org/10.1016/S0168-9274(98)00131-7).
- [119] M. Bergounioux, M. Haddou, M. Hintermüller, and K. Kunisch. A comparison of a Moreau–Yosida-based active set strategy and interior point methods for constrained optimal control problems. *SIAM Journal on Optimization*, 11(2):495, 2000. doi:[10.1137/S1052623498343131](https://doi.org/10.1137/S1052623498343131).
- [120] K. Ito and K. Kunisch. Optimal control. In J. Webster, editor, *Encyclopedia of Electrical and Electronic Engineering*, pages 364–379. Wiley, New York, 1999. doi:[10.1002/047134608X.W1029](https://doi.org/10.1002/047134608X.W1029).
- [121] K. Kunisch and X. Marduel. Optimal control of stationary viscoelastic fluids. *Journal of Non-Newtonian Fluid Mechanics*, 88:261–301, 2000. doi:[10.1016/S0377-0257\(99\)00021-X](https://doi.org/10.1016/S0377-0257(99)00021-X).

- [122] M. Bergounioux and K. Kunisch. Primal-dual strategy for state-constrained optimal control problems. *Computational Optimization and Applications*, 22(2):193–224, 2002. doi:[10.1023/a:1015489608037](https://doi.org/10.1023/a:1015489608037).
- [123] K. Kunisch and S. Volkwein. Control of Burgers' equation by reduced order approach using proper orthogonal decomposition. *Journal of Optimization Theory and Applications*, 102:345–371, 1999. doi:[10.1023/a:1021732508059](https://doi.org/10.1023/a:1021732508059).
- [124] K. Ito and K. Kunisch. Optimal control of the solid fuel ignition model with H1-cost. *SIAM Journal on Control and Optimization*, 40(5):1455, 2002. doi:[10.1137/S0363012900366042](https://doi.org/10.1137/S0363012900366042).
- [125] G. Chavent and K. Kunisch. New results on the non-linearity and the sensitivity of the estimation of the diffusion coefficient in a 2d elliptic equation. In *Proc. 3rd International Conference on Inverse Problems in Engineering, Port Ludlow*, 1999.
- [126] K. Kunisch and X. Marduel. Sub-optimal control of transient non-isothermal viscoelastic fluid flows. *Physics of Fluids*, 13:2478–2491, 2001. doi:[10.1063/1.1384869](https://doi.org/10.1063/1.1384869).
- [127] K. Kunisch and A. Rösch. Primal-dual active set strategy for a general class of constrained optimal control problems. *SIAM Journal on Optimization*, 13(2):321, 2002. doi:[10.1137/S1052623499358008](https://doi.org/10.1137/S1052623499358008).
- [128] K. Kunisch and G. Peichl. Embedding domain technique representation of the gradient for some shape optimization problems. *Advances in Mathematical Sciences and Applications*, 9:717–736, 1999.
- [129] A. Kauffmann and K. Kunisch. Optimal control of the solid fuel ignition model. *ESAIM: Proceedings*, 8:65–76, 2000. doi:[10.1051/proc:2000005](https://doi.org/10.1051/proc:2000005).
- [130] M. Hinze and K. Kunisch. Second order methods for optimal control of time-dependent fluid flow. *SIAM Journal on Control and Optimization*, 40(3):925, 2001. doi:[10.1137/S0363012999361810](https://doi.org/10.1137/S0363012999361810).
- [131] A. Borzi and K. Kunisch. The numerical solution of the steady state solid fuel ignition model and its optimal control. *SIAM Journal on Scientific Computing*, 22(1):263, 2000. doi:[10.1137/S1064827599360194](https://doi.org/10.1137/S1064827599360194).
- [132] M. Hinze and K. Kunisch. Three control methods for time-dependent fluid flow. *Journal of Flow, Control and Combustion*, 65:273–298, 2000. doi:[10.1023/a:1011417305739](https://doi.org/10.1023/a:1011417305739).
- [133] M. Bergounioux and K. Kunisch. Active set strategy for constrained optimal control problems: the finite dimensional case. *Lecture Notes in Economics and Mathematical Systems*, pages 36–54, 2000. doi:[10.1007/978-3-642-57014-8\\_3](https://doi.org/10.1007/978-3-642-57014-8_3).
- [134] K. Kunisch and S. Volkwein. Galerkin proper orthogonal decomposition methods for parabolic problems. *Numerische Mathematik*, 90(1):117–148, November 2001. doi:[10.1007/s002110100282](https://doi.org/10.1007/s002110100282).
- [135] A. Borzi, K. Kunisch, and M. Vanmaele. A multigrid approach to the optimal control of solid fuel ignition problems. In *Multigrid methods VI: proceedings of the Sixth European Multigrid Conference, held in Gent, Belgium, September 27-30, 1999*, page 59. Springer Verlag, 2000. doi:[10.1007/978-3-642-58312-4\\_7](https://doi.org/10.1007/978-3-642-58312-4_7).

- [136] K. Ito and K. Kunisch. BV-type regularization methods for convoluted objects with edge, flat and grey scales. *Inverse Problems*, 16:909, 2000. doi:10.1088/0266-5611/16/4/303.
- [137] K. Ito and K. Kunisch. Asymptotic properties of receding horizon optimal control problems. *SIAM Journal on Control and Optimization*, 40(5):1585, 2002. doi:10.1137/S0363012900369423.
- [138] K. Kunisch and F. Rendl. An infeasible active set method for quadratic problems with simple bounds. *SIAM Journal on Optimization*, 14(1):35, 2003. doi:10.1137/S1052623400376135.
- [139] M. Bergounioux and K. Kunisch. On the structure of Lagrange multipliers for state-constrained optimal control problems. *Systems & Control Letters*, 48(3-4):169–176, March 2003. doi:10.1016/S0167-6911(02)00262-1.
- [140] K. Ito, K. Kunisch, and G. Peichl. On the regularization and the numerical treatment of the inf-sup condition for saddle point problems. *Computational and Applied Mathematics*, 21:245–274, 2002.
- [141] K. Ito, K. Kunisch, and Z. Li. Level-set function approach to an inverse interface problem. *Inverse problems*, 17:1225, 2001. doi:10.1088/0266-5611/17/5/301.
- [142] K. Kunisch and S. Volkwein. Galerkin proper orthogonal decomposition methods for a general equation in fluid dynamics. *SIAM Journal on Numerical Analysis*, 40(2):492, 2002. doi:10.1137/S0036142900382612.
- [143] A. Borzi, K. Ito, and K. Kunisch. An optimal control approach to optical flow computation. *International Journal for Numerical Methods in Fluids*, 40(1-2):231–240, September 2002. doi:10.1002/flid.273.
- [144] M. Hintermüller, K. Ito, and K. Kunisch. The primal-dual active set strategy as a semismooth newton method. *SIAM Journal on Optimization*, 13(3):865–888, 2002. doi:10.1137/S1052623401383558.
- [145] G. Chavent and K. Kunisch. The output least squares identifiability of the diffusion coefficient from an H1-observation in a 2d elliptic equation. *ESAIM: Control, Optimisation and Calculus of Variations*, 8:423–440, 2002. doi:10.1051/cocv:2002028.
- [146] K. Ito and K. Kunisch. Receding horizon optimal control for infinite dimensional systems. *ESAIM: Control, Optimisation and Calculus of Variations*, 8:741–760, 2002. doi:10.1051/cocv:2002032.
- [147] A. Borzi, K. Kunisch, and D. Y. Kwak. Accuracy and convergence properties of the finite difference multigrid solution of an optimal control optimality system. *SIAM Journal on Control and Optimization*, 41(5):1477, 2002. doi:10.1137/S0363012901393432.
- [148] T. Kärkkäinen, K. Kunisch, and P. Tarvainen. Augmented Lagrangian active set methods for obstacle problems. *Journal of Optimization Theory and Applications*, 119(3):499–533, December 2003. doi:10.1023/B:JOTA.0000006687.57272.b6.
- [149] K. Ito and K. Kunisch. Semi-smooth Newton methods for variational inequalities of the first kind. *Mathematical Modelling and Numerical Analysis*, 37(1):41–62, January 2003. doi:10.1051/m2an:2003021.

- [150] M. Hinze and K. Kunisch. Second order methods for boundary control of the instationary Navier–Stokes system. *ZAMM*, 84(3):171–187, March 2004. doi:[10.1002/zamm.200310094](https://doi.org/10.1002/zamm.200310094).
- [151] K. Ito and K. Kunisch. The primal-dual active set method for nonlinear optimal control problems with bilateral constraints. *SIAM Journal on Control and Optimization*, 43(1):357, 2004. doi:[10.1137/S0363012902411015](https://doi.org/10.1137/S0363012902411015).
- [152] J. Haslinger, K. K. T. Kozubek, and G. Peichl. Shape optimization and fictitious domain approach for solving free-boundary value problems of Bernoulli type. *Comp. Optimization and Applications*, 26:231–151, 2003. doi:[10.1023/a:1026095405906](https://doi.org/10.1023/a:1026095405906).
- [153] K. Ito and K. Kunisch. Semi-smooth Newton methods for state-constrained optimal control problems. *Systems & Control Letters*, 50(3):221–228, October 2003. doi:[10.1016/S0167-6911\(03\)00156-7](https://doi.org/10.1016/S0167-6911(03)00156-7).
- [154] A. Borzì, K. Ito, and K. Kunisch. Optimal control formulation for determining optical flow. *SIAM Journal on Scientific Computing*, 24(3):818, 2003. doi:[10.1137/S1064827501386481](https://doi.org/10.1137/S1064827501386481).
- [155] A. Borzì and K. Kunisch. A multigrid method for optimal control of time-dependent reaction diffusion processes. In *Fast solution of discretized optimization problems: workshop held at the Weierstrass Institute for Applied Analysis and Stochastics, Berlin, May 8-12, 2000*, page 50. Birkhäuser, 2001. doi:[10.1016/S0377-0427\(03\)00417-5](https://doi.org/10.1016/S0377-0427(03)00417-5).
- [156] K. Kunisch and S. Volkwein. Crank–Nicolson Galerkin proper orthogonal decomposition approximations for a general equation in fluid dynamics. In *Proceedings of the 18th Gamm Seminar Multigrid and Related Methods for Optimization Problems, 2002*, pages 97–114, 2002.
- [157] S. Chaabane, J. Ferchichi, and K. Kunisch. Differentiability of the L1-tracking functional linked to the Robin inverse problem. *Comptes Rendus Mathématique*, 337(12):771–776, December 2003. doi:[10.1016/j.crma.2003.10.023](https://doi.org/10.1016/j.crma.2003.10.023).
- [158] M. Hintermüller, V. Kovtunenکو, and K. Kunisch. The primal-dual active set method for a crack problem with non-penetration. *IMA Journal of Applied Mathematics*, 69(1):1–26, February 2004. doi:[10.1093/imat/69.1.1](https://doi.org/10.1093/imat/69.1.1).
- [159] M. Hintermüller, K. Kunisch, Y. Spasov, and S. Volkwein. Dynamical systems-based optimal control of incompressible fluids. *International Journal for Numerical Methods in Fluids*, 46(4):345–359, October 2004. doi:[10.1002/fluid.725](https://doi.org/10.1002/fluid.725).
- [160] W. Hinterberger, M. Hintermüller, K. Kunisch, M. von Oehsen, and O. Scherzer. Tube methods for BV regularization. *Journal of Mathematical Imaging and Vision*, 19(3):219–235, 2003. doi:[10.1023/a:1026276804745](https://doi.org/10.1023/a:1026276804745).
- [161] J. Haslinger, T. Kozubek, K. Kunisch, and G. Peichl. An embedding domain approach for a class of 2-d shape optimization problems: mathematical analysis. *Journal of Mathematical Analysis and Applications*, 290(2):665–685, February 2004. doi:[10.1016/j.jmaa.2003.10.038](https://doi.org/10.1016/j.jmaa.2003.10.038).
- [162] T. Kärkkäinen, K. Kunisch, and K. Majava. Denoising of smooth images using L1-fitting. *Computing*, 74(4):353–376, November 2004. doi:[10.1007/s00607-004-0097-8](https://doi.org/10.1007/s00607-004-0097-8).

- [163] K. Kunisch, S. Volkwein, and L. Xie. HJB-POD-based feedback design for the optimal control of evolution problems. *SIAM Journal on Applied Dynamical Systems*, 3(4):701, 2004. doi:[10.1137/030600485](https://doi.org/10.1137/030600485).
- [164] S. Chaabane, J. Ferchichi, and K. Kunisch. Differentiability properties of the L1-tracking functional and application to the Robin inverse problem. *Inverse Problems*, 20:1083, 2004. doi:[10.1088/0266-5611/20/4/006](https://doi.org/10.1088/0266-5611/20/4/006).
- [165] K. Kunisch and M. Hintermüller. Total bounded variation regularization as a bilaterally constrained optimization problem. *SIAM Journal on Applied Mathematics*, 64(4):1311, 2004. doi:[10.1137/S0036139903422784](https://doi.org/10.1137/S0036139903422784).
- [166] J. C. de los Reyes and K. Kunisch. A semi-smooth Newton method for control constrained boundary optimal control of the Navier–Stokes equations. *Nonlinear Analysis*, 62(7):1289–1316, September 2005. doi:[10.1016/j.na.2005.04.035](https://doi.org/10.1016/j.na.2005.04.035).
- [167] J. C. de los Reyes and K. Kunisch. A comparison of algorithms for control constrained optimal control of the Burgers equation. *Calcolo*, 41(4):203–225, December 2004. doi:[10.1007/s10092-004-0092-7](https://doi.org/10.1007/s10092-004-0092-7).
- [168] Y. Spasov and K. Kunisch. Dynamical system based optimal control of incompressible fluids. boundary control. *European Journal of Mechanics - B/Fluids*, 25(2):153–163, March 2006. doi:[10.1016/j.euromechflu.2005.06.004](https://doi.org/10.1016/j.euromechflu.2005.06.004).
- [169] M. Hintermüller, V. Kovtunenکو, and K. Kunisch. Semi-smooth Newton methods for a class of unilaterally constrained variational problems. *Adv. in Math. Sci. and Appl.*, 14(2):513–535, 2004.
- [170] M. Hintermüller, V. A. Kovtunenکو, and K. Kunisch. Generalized Newton methods for crack problems with nonpenetration condition. *Numerical Methods for Partial Differential Equations*, 21(3):586–610, May 2005. doi:[10.1002/num.20053](https://doi.org/10.1002/num.20053).
- [171] K. Ito and K. Kunisch. Receding horizon control with incomplete observations. *SIAM Journal on Control and Optimization*, 45(1):207, 2006. doi:[10.1137/S0363012903437988](https://doi.org/10.1137/S0363012903437988).
- [172] K. Kunisch and L. Xie. POD-based feedback control of the Burgers equation by solving the evolutionary HJB equation. *Computers & Mathematics with Applications*, 49(7-8):1113–1126, May 2005. doi:[10.1016/j.camwa.2004.07.022](https://doi.org/10.1016/j.camwa.2004.07.022).
- [173] K. Kunisch and L. Xie. Suboptimal feedback control of flow separation by POD model reduction. In *SIAM Real-Time PDE-Constrained Optimization*, Computational Science & Engineering, pages 233–250. SIAM, 2007. arXiv:<http://epubs.siam.org/doi/pdf/10.1137/1.9780898718935.ch12>, doi:[10.1137/1.9780898718935.ch12](https://doi.org/10.1137/1.9780898718935.ch12).
- [174] K. Ito, K. Kunisch, and G. Peichl. Variational approach to shape derivatives for a class of Bernoulli problems. *Journal of Mathematical Analysis and Applications*, 314(1):126–149, May 2005. doi:[10.1016/j.jmaa.2005.03.100](https://doi.org/10.1016/j.jmaa.2005.03.100).
- [175] K. Ito and K. Kunisch. Reduced order control based on approximate inertial manifolds. *Linear Algebra and its Applications*, 415(2-3):531–541, June 2006. doi:[10.1016/j.laa.2004.10.019](https://doi.org/10.1016/j.laa.2004.10.019).



- [176] M. Hintermüller and K. Kunisch. Path-following methods for a class of constrained minimization problems in function space. *SIAM Journal on Optimization*, 17(1):159, 2006. doi:[10.1137/040611598](https://doi.org/10.1137/040611598).
- [177] M. Hintermüller, V. Kovtunenکو, and K. Kunisch. An optimization approach for the delamination of a composite material with nonpenetration. In *Free and Moving Boundaries: Analysis, Simulation and Control*, Lect. Notes Pure Appl. Math., pages 331–348. CRC Press, 2007.
- [178] A. Borzì and K. Kunisch. A multigrid scheme for elliptic constrained optimal control problems. *Computational Optimization and Applications*, 31(3):309–333, July 2005. doi:[10.1007/s10589-005-3228-z](https://doi.org/10.1007/s10589-005-3228-z).
- [179] K. Ito and K. Kunisch. On a semi-smooth Newton method and its globalization. *Mathematical Programming*, 118(2):347–370, November 2007. doi:[10.1007/s10107-007-0196-3](https://doi.org/10.1007/s10107-007-0196-3).
- [180] K. Kunisch. Some suboptimal strategies for numerical realisation of large scale optimal control problems. *Research directions in distributed parameter systems*, page 237, 2003.
- [181] K. Kunisch and G. Stadler. Generalized Newton methods for the 2D-Signorini contact problem with friction in function space. *Mathematical Modelling and Numerical Analysis*, 39(4):827–854, July 2005. doi:[10.1051/m2an:2005036](https://doi.org/10.1051/m2an:2005036).
- [182] K. Ito and K. Kunisch. Parabolic variational inequalities: The Lagrange multiplier approach. *Journal de Mathématiques Pures et Appliquées*, 85(3):415–449, March 2006. doi:[10.1016/j.matpur.2005.08.005](https://doi.org/10.1016/j.matpur.2005.08.005).
- [183] S. Chaabane, J. Ferchichi, and K. Kunisch. Optimal control of vortices in non-homogeneous Navier–Stokes flows. *Nonlinear Analysis: Theory, Methods & Applications*, 66(11):2618–2634, June 2007. doi:[10.1016/j.na.2006.03.044](https://doi.org/10.1016/j.na.2006.03.044).
- [184] A. Borzì and K. Kunisch. A globalization strategy for the multigrid solution of elliptic optimal control problems. *Optimization Methods and Software*, 21(3):445–459, June 2006. doi:[10.1080/10556780500099944](https://doi.org/10.1080/10556780500099944).
- [185] K. Ito and K. Kunisch. Convergence of the primal-dual active set strategy for diagonally dominant systems. *SIAM Journal on Control and Optimization*, 46(1):14, 2007. doi:[10.1137/050632713](https://doi.org/10.1137/050632713).
- [186] K. Kunisch and B. Vexler. Optimal vortex reduction for instationary flows based on translation invariant cost functionals. *SIAM Journal on Control and Optimization*, 46(4):1368, 2007. doi:[10.1137/050632774](https://doi.org/10.1137/050632774).
- [187] V. Kovtunenکو and K. Kunisch. Problem of crack perturbation based on level sets and velocities. *ZAMM*, 87(11-12):809–830, December 2007. doi:[10.1002/zamm.200510354](https://doi.org/10.1002/zamm.200510354).
- [188] M. Hintermüller and K. Kunisch. Feasible and noninterior path-following in constrained minimization with low multiplier regularity. *SIAM Journal on Control and Optimization*, 45(4):1198, 2006. doi:[10.1137/050637480](https://doi.org/10.1137/050637480).
- [189] K. Ito and K. Kunisch. Optimal control of obstacle problems by  $H^1$ -obstacles. *Applied Mathematics and Optimization*, 56(1):1–17, June 2007. doi:[10.1007/s00245-007-0877-6](https://doi.org/10.1007/s00245-007-0877-6).

- [190] K. Ito and K. Kunisch. Optimal bilinear control of an abstract Schrödinger equation. *SIAM Journal on Control and Optimization*, 46(1):274, 2007. doi:[10.1137/05064254X](https://doi.org/10.1137/05064254X).
- [191] J. Haslinger, T. Kozubek, K. Kunisch, and G. Peichl. Fictitious domain methods in shape optimization with applications in free-boundary problems. In *Numerical mathematics and advanced applications: proceedings of ENUMATH 2003, the 5th European Conference on Numerical Mathematics and Advanced Applications, Prague, August 2003*, page 56. Springer Verlag, 2004. doi:[10.1023/a:1026095405906](https://doi.org/10.1023/a:1026095405906).
- [192] J. Haslinger, K. K. T. Kozubek, and G. Peichl. Shape differentiability of the solution to a fictitious domain formulation. *Advances in Mathematical Sciences and Applications*, 16:95–109, 2006.
- [193] M. Hintermüller and K. Kunisch. Inverse problems for elasto-hydrodynamic models. *Zeitschrift für Angewandte Mathematik und Mechanik*, 81:17–20, 2001.
- [194] R. Griesse and K. Kunisch. Optimal control for a stationary MHD system in velocity-current formulation. *SIAM Journal on Control and Optimization*, 45(5):1822, 2006. doi:[10.1137/050624236](https://doi.org/10.1137/050624236).
- [195] K. Kunisch and B. Vexler. On the choice of the cost functional for optimal vortex reduction for instationary flows. In R. King, editor, *Active Flow Control*, pages 339–352. Springer, Berlin/Heidelberg, 2007. doi:[10.1007/978-3-540-71439-2\\_21](https://doi.org/10.1007/978-3-540-71439-2_21).
- [196] J. C. de los Reyes and K. Kunisch. A semi-smooth Newton method for regularized state-constrained optimal control of the Navier–Stokes equations. *Computing*, 78(4):287–309, November 2006. doi:[10.1007/s00607-006-0183-1](https://doi.org/10.1007/s00607-006-0183-1).
- [197] M. Hintermüller, V. A. Kovtunenکو, and K. Kunisch. Constrained optimization for interface cracks in composite materials subject to non-penetration conditions. *Journal of Engineering Mathematics*, 59(3):301–321, November 2006. doi:[10.1007/s10665-006-9113-7](https://doi.org/10.1007/s10665-006-9113-7).
- [198] K. Kunisch and S. Volkwein. Proper orthogonal decomposition for optimality systems. *Mathematical Modelling and Numerical Analysis*, 42(1):1–23, January 2008. doi:[10.1051/m2an:2007054](https://doi.org/10.1051/m2an:2007054).
- [199] K. Ito, K. Kunisch, and G. H. Peichl. Variational approach to shape derivatives. *ESAIM: Control, Optimisation and Calculus of Variations*, 14(3):517–539, February 2008. doi:[10.1051/cocv:2008002](https://doi.org/10.1051/cocv:2008002).
- [200] K. Kunisch and J. Sass. Trading regions under proportional transaction costs. *Operations Research Proceedings*, pages 563–568, 2006. doi:[10.1007/978-3-540-69995-8\\_89](https://doi.org/10.1007/978-3-540-69995-8_89).
- [201] K. Kunisch and B. Vexler. Constrained Dirichlet boundary control in  $L^2$  for a class of evolution equations. *SIAM Journal on Control and Optimization*, 46(5):1726, 2007. doi:[10.1137/060670110](https://doi.org/10.1137/060670110).
- [202] M. Hintermüller and K. Kunisch. Stationary optimal control problems with pointwise state constraints. *Lecture Notes in Computational Science and Engineering*, 72, 2009.
- [203] K. Ito and K. Kunisch. Asymptotic properties of feedback solutions for a class of quantum control problems. *SIAM Journal on Control and Optimization*, 48(4):2323, 2009. doi:[10.1137/080720784](https://doi.org/10.1137/080720784).

- [204] J. C. de los Reyes and K. Kunisch. Optimal control of partial differential equations with affine control constraints. *Control and Cybernetics*, 38:1217–1249, 2009.
- [205] K. Ito, K. Kunisch, V. Schulz, and I. Gherman. Approximate nullspace iterations for KKT systems. *SIAM Journal on Matrix Analysis and Applications*, 31(4):1835, 2010. doi:[10.1137/080724952](https://doi.org/10.1137/080724952).
- [206] V. A. Kovtunenکو, K. Kunisch, and W. Ring. Propagation and bifurcation of cracks based on implicit surfaces and discontinuous velocities. *Computing and Visualization in Science*, 12(8):397–408, July 2008. doi:[10.1007/s00791-008-0125-x](https://doi.org/10.1007/s00791-008-0125-x).
- [207] R. Griesse and K. Kunisch. A semi-smooth Newton method for solving elliptic equations with gradient constraints. *ESAIM: Mathematical Modelling and Numerical Analysis*, 43(2):209–238, December 2008. doi:[10.1051/m2an:2008049](https://doi.org/10.1051/m2an:2008049).
- [208] K. Ito and K. Kunisch. Reduced-order optimal control based on approximate inertial manifolds for nonlinear dynamical systems. *SIAM Journal on Numerical Analysis*, 46(6):2867, 2008. doi:[10.1137/060666421](https://doi.org/10.1137/060666421).
- [209] K. Ito and K. Kunisch. Semi-smooth Newton methods for the Signorini problem. *Applications of Mathematics*, 53(5):455–468, December 2008. doi:[10.1007/s10492-008-0036-7](https://doi.org/10.1007/s10492-008-0036-7).
- [210] K. Kunisch and X. Lu. Optimal control for multi-phase fluids stokes problems. *Nonlinear Analysis Series A:Theory, Methods and Applications*, 74(2):585–599, 2011. doi:[10.1016/j.na.2010.09.014](https://doi.org/10.1016/j.na.2010.09.014).
- [211] J. C. de los Reyes and K. Kunisch. On some nonlinear optimal control problems with vector-valued affine control constraints. *Optimal Control of Coupled Systems of Partial Differential Equations*, pages 105–122, 2009. doi:[10.1007/978-3-7643-8923-9\\_6](https://doi.org/10.1007/978-3-7643-8923-9_6).
- [212] K. Kunisch and S. Volkwein. Optimal snapshot location for computing POD basis functions. *ESAIM: Mathematical Modelling and Numerical Analysis*, 44(3):509–529, February 2010. doi:[10.1051/m2an/2010011](https://doi.org/10.1051/m2an/2010011).
- [213] M. Hintermüller and K. Kunisch. PDE-constrained optimization subject to pointwise constraints on the control, the state, and its derivative. *SIAM Journal on Optimization*, 20(3):1133, 2010. doi:[10.1137/080737265](https://doi.org/10.1137/080737265).
- [214] J. Haslinger, K. Ito, T. Kozubek, K. Kunisch, and G. Peichl. On the shape derivative for problems of Bernoulli type. *Interfaces and Free Boundaries*, pages 317–330, 2009. doi:[10.4171/IFB/213](https://doi.org/10.4171/IFB/213).
- [215] M. Hintermüller, V. A. Kovtunenکو, and K. Kunisch. A Papkovich–Neuber-based numerical approach to cracks with contact in 3D. *IMA Journal of Applied Mathematics*, 74(3):325–343, April 2009. doi:[10.1093/imamat/hxp017](https://doi.org/10.1093/imamat/hxp017).
- [216] C. Clason, B. Jin, and K. Kunisch. A semismooth Newton method for  $L^1$  data fitting with automatic choice of regularization parameters and noise calibration. *SIAM Journal on Imaging Sciences*, 3(2):199–232, 2010. doi:[10.1137/090758003](https://doi.org/10.1137/090758003).

- [217] C. Clason and K. Kunisch. A duality-based approach to elliptic control problems in non-reflexive Banach spaces. *ESAIM: Control, Optimisation and Calculus of Variations*, 17(1):243–266, 2011. doi:[10.1051/cocv/2010003](https://doi.org/10.1051/cocv/2010003).
- [218] C. Nagaiah, K. Kunisch, and G. Plank. Numerical solution for optimal control of the reaction-diffusion equations in cardiac electrophysiology. *Computational Optimization and Applications*, August 2009. doi:[10.1007/s10589-009-9280-3](https://doi.org/10.1007/s10589-009-9280-3).
- [219] K. Ito, K. Kunisch, and Q. Zhang. Feedback solutions for a class of quantum control problems. In K.-H. Hoffmann, D. Mittelmann, R. E. Bank, H. Kawarada, R. J. LeVeque, C. Verdi, J. Todd, K. Kunisch, J. Sprekels, G. Leugering, and F. Tröltzsch, editors, *International Series of Numerical Mathematics*, volume 158, pages 155–170. Birkhäuser Basel, 2009. doi:[10.1007/978-3-7643-8923-9\\_9](https://doi.org/10.1007/978-3-7643-8923-9_9).
- [220] K. Ito and K. Kunisch. Optimal control of parabolic variational inequalities. *Journal de Mathématiques Pures et Appliquées*, 93(4):329–360, April 2010. doi:[10.1016/j.matpur.2009.10.005](https://doi.org/10.1016/j.matpur.2009.10.005).
- [221] K. Kunisch, W. B. Liu, Y. Chang, N. Yan, and R. Li. Adaptive finite element approximation for a class of parameter estimation problems. *Journal of Computational Mathematics*, 28(5):1–31, 2010. doi:[10.4208/jcm.2009.10-m1016](https://doi.org/10.4208/jcm.2009.10-m1016).
- [222] K. Ito and K. Kunisch. Semismooth Newton methods for time-optimal control for a class of ODEs. *SIAM Journal on Control and Optimization*, 48(6):3997, 2010. doi:[10.1137/090753905](https://doi.org/10.1137/090753905).
- [223] A. Kröner, K. Kunisch, and B. Vexler. Semismooth Newton methods for optimal control of the wave equation with control constraints. *SIAM Journal on Control and Optimization*, 49(2):830, 2011. doi:[10.1137/090766541](https://doi.org/10.1137/090766541).
- [224] K. Bredies, K. Kunisch, and T. Pock. Total generalized variation. *SIAM Journal on Imaging Sciences*, 3(3):492, 2010. doi:[10.1137/090769521](https://doi.org/10.1137/090769521).
- [225] K. Kunisch, K. Liang, and X. Lu. Optimal control for an elliptic system with polygonal state constraints. *SIAM Journal on Control and Optimization*, 48(8):5053, 2010. doi:[10.1137/090758155](https://doi.org/10.1137/090758155).
- [226] K. Kunisch and D. Wachsmuth. Sufficient optimality conditions and semi-smooth Newton methods for optimal control of stationary variational inequalities. *ESAIM: Control, Optimisation and Calculus of Variations*, 18:520–547, 2012. doi:[10.1051/cocv/2011105](https://doi.org/10.1051/cocv/2011105).
- [227] C. Clason, B. Jin, and K. Kunisch. A duality-based splitting method for  $\ell^1$ -TV image restoration with automatic regularization parameter choice. *SIAM Journal on Scientific Computing*, 32(3):1484, 2010. doi:[10.1137/090768217](https://doi.org/10.1137/090768217).
- [228] K. Kunisch and X. Lu. Optimal control for elliptic systems with pointwise euclidean norm constraints on the controls. *Mathematical Programming*, 142(1–2):461–483, 2013. doi:[10.1007/s10107-012-0587-y](https://doi.org/10.1007/s10107-012-0587-y).
- [229] K. Kunisch and D. Wachsmuth. Path-following for optimal control of stationary variational inequalities. *Computational Optimization and Applications*, 51(3):1345–1373, 2012. doi:[10.1007/s10589-011-9400-8](https://doi.org/10.1007/s10589-011-9400-8).

- [230] K. Kunisch and X. Lu. Optimal control for an elliptic system with pointwise nonlinear control constraints. *IMA Journal of Numerical Analysis*, 33(3):875–897, 2012. doi:[10.1093/imanum/drs029](https://doi.org/10.1093/imanum/drs029).
- [231] M. Hintermüller, V. A. Kovtunenکو, and K. Kunisch. Obstacle problems with cohesion: a hemi-variational inequality approach and its efficient numerical solution. *SIAM Journal on Optimization*, 21(2):491–516, 2011. doi:[10.1137/10078299](https://doi.org/10.1137/10078299).
- [232] C. Clason, K. Ito, and K. Kunisch. Minimal invasion: An optimal  $L^\infty$  state constraint problem. *ESAIM: Mathematical Modelling and Numerical Analysis*, 45(3):505–522, October 2010. doi:[10.1051/m2an/2010064](https://doi.org/10.1051/m2an/2010064).
- [233] C. Nagaiah and K. Kunisch. Higher order optimization and adaptive numerical solution for optimal control of monodomain equations in cardiac electrophysiology. *Applied Numerical Mathematics*, 61(1):53–65, January 2011. doi:[10.1016/j.apnum.2010.08.004](https://doi.org/10.1016/j.apnum.2010.08.004).
- [234] A. Kröner, K. Kunisch, and B. Vexler. Semismooth Newton methods for an optimal boundary control problem of wave equations. In M. Diehl, F. Glineur, E. Jarlebring, and W. Michiels, editors, *Recent Advances in Optimization and its Applications in Engineering*, pages 389–398. Springer, 2010. doi:[10.1007/978-3-642-12598-0\\_33](https://doi.org/10.1007/978-3-642-12598-0_33).
- [235] K. Ito and K. Kunisch. Novel concepts for nonsmooth optimization and their impact on science and technology. In B. Rajendra, editor, *Proceedings of the International Congress of Mathematicians Vol. IV*, pages 3061–3090. Hindustan Book Agency, New Delhi, 2010.
- [236] H. Kasumba and K. Kunisch. Shape design optimization for viscous flows in a channel with a bump and an obstacle. In *2010 15th International Conference on Methods and Models in Automation and Robotics*, pages 284–289. IEEE, August 2010. doi:[10.1109/MMAR.2010.5587219](https://doi.org/10.1109/MMAR.2010.5587219).
- [237] R. Herzog and K. Kunisch. Algorithms for PDE-constrained optimization. *GAMM-Mitteilungen*, 33(2):163–176, October 2010. doi:[10.1002/gamm.201010013](https://doi.org/10.1002/gamm.201010013).
- [238] K. Ito and K. Kunisch. Karush–Kuhn–Tucker conditions for non-smooth mathematical programming in function spaces. *SIAM Journal on Control and Optimization*, 49(5), 2011. doi:[10.1137/100817061](https://doi.org/10.1137/100817061).
- [239] K. Ito and K. Kunisch. Minimal effort problems and their treatment by semi-smooth Newton methods. *SIAM Journal on Control and Optimization*, 49(5):2083–2100, October 2011. doi:[10.1137/100784667](https://doi.org/10.1137/100784667).
- [240] C. Clason, K. Ito, and K. Kunisch. A minimum effort optimal control problem for elliptic PDEs. *ESAIM: Mathematical Modelling and Numerical Analysis*, 46(4):911–927, 2012. doi:[10.1051/m2an/2011074](https://doi.org/10.1051/m2an/2011074).
- [241] K. Kunisch and M. Wagner. Optimal control of the bidomain system (I): The monodomain approximation with the Rogers–McCulloch model. *Nonlinear Analysis: Real World Applications*, 13(4):1525–1550, 2012. doi:[10.1016/j.nonrwa.2011.11.003](https://doi.org/10.1016/j.nonrwa.2011.11.003).
- [242] C. Nagaiah, K. Kunisch, and M. Wagner. A parallel Newton-Krylov method for optimal control of the monodomain model in cardiac electrophysiology. *Computing and Visualization in Science*, 14(6):257–269, 2011. doi:[10.1007/s00791-012-0182-z](https://doi.org/10.1007/s00791-012-0182-z).

- [243] K. Bredies, K. Kunisch, and T. Valkonen. Properties of L1-TGV2: The one-dimensional case. *Journal of Mathematical Analysis and Applications*, 398(1):438 – 454, 2013. doi:[10.1016/j.jmaa.2012.08.053](https://doi.org/10.1016/j.jmaa.2012.08.053).
- [244] R. Herzog, K. Kunisch, and J. Sass. Primal-dual methods for the computation of trading regions under proportional transaction costs. *Mathematical Methods of Operations Research*, 77:101–130, 2013. doi:[10.1007/s00186-012-0416-3](https://doi.org/10.1007/s00186-012-0416-3).
- [245] K. Kunisch and M. Wagner. Optimal control of the bidomain system (II): Uniqueness and regularity theorems for weak solutions. *Annali di Matematica Pura ed Applicata*, 192(6):951–986, 2013. doi:[10.1007/s10231-012-0254-1](https://doi.org/10.1007/s10231-012-0254-1).
- [246] H. Kasumba and K. Kunisch. On shape sensitivity analysis of the cost functional without shape sensitivity of the state variable. *Control and Cybernetics*, 4(4):989–1017, 2011.
- [247] K. Ito and K. Kunisch. A variational approach to sparsity optimization based on Lagrange multiplier theory. *IOP Science Inverse Problems, Highlight Paper 2014*, 30(1), 2014. doi:[10.1088/0266-5611/30/1/015001](https://doi.org/10.1088/0266-5611/30/1/015001).
- [248] C. Clason and K. Kunisch. A measure space approach to optimal source placement. *Computational Optimization and Applications*, 53(1):155–171, 2012. doi:[10.1007/s10589-011-9444-9](https://doi.org/10.1007/s10589-011-9444-9).
- [249] H. Kasumba and K. Kunisch. Vortex control in channel flows using translation invariant cost functionals. *Computational Optimization and Applications*, 52(3):691–717, 2012. doi:[10.1007/s10589-012-9516-5](https://doi.org/10.1007/s10589-012-9516-5).
- [250] K. Kunisch and D. Wachsmuth. On time optimal control of the wave equation, its regularization and optimality system. *ESAIM: Control, Optimisation and Calculus of Variations*, 19(2):317–336, 2013. doi:[10.1051/cocv/2012010](https://doi.org/10.1051/cocv/2012010).
- [251] E. Casas, C. Clason, and K. Kunisch. Approximation of elliptic control problems in measure spaces with sparse solutions. *SIAM Journal on Control and Optimization*, 50(4):1735–1752, 2012. doi:[10.1137/110843216](https://doi.org/10.1137/110843216).
- [252] H. Kasumba and K. Kunisch. On free surface PDE constrained shape optimization problem. *Applied Mathematics and Computation*, 218(23):11429–11450, 2012. doi:[10.1016/j.amc.2012.05.032](https://doi.org/10.1016/j.amc.2012.05.032).
- [253] C. Nagaiah, K. Kunisch, and G. Plank. Optimal control approach to termination of re-entry waves in cardiac electrophysiology. *Journal of Mathematical Biology*, 67(2):359–388, 2013. doi:[10.1007/s00285-012-0557-2](https://doi.org/10.1007/s00285-012-0557-2).
- [254] K. Kunisch and L. Wang. Time optimal control of the heat equation with pointwise control constraints. *ESAIM: Control, Optimisation and Calculus of Variations*, 19(2):460–485, 2013. doi:[10.1051/cocv/2012017](https://doi.org/10.1051/cocv/2012017).
- [255] K. Kunisch and L. Wang. Time optimal control of the Fitzhugh-Nagumo equation. *Journal of Mathematical Analysis and Applications*, 395(1):114–130, 2012. doi:[10.1016/j.jmaa.2012.05.028](https://doi.org/10.1016/j.jmaa.2012.05.028).

- [256] K. Kunisch and M. Wagner. Optimal control of the bidomain system (iii): Existence of minimizers and first-order optimality conditions. *ESAIM: Mathematical Modelling and Numerical Analysis*, 47(4):1077–1106, 2013. doi:[10.1051/m2an/2012058](https://doi.org/10.1051/m2an/2012058).
- [257] E. Casas, C. Clason, and K. Kunisch. Parabolic control problems in measure spaces with sparse solutions. *SIAM Journal on Control and Optimization*, 51(1):28–63, 2013. doi:[10.1137/120872395](https://doi.org/10.1137/120872395).
- [258] H. Kasumba and K. Kunisch. On computation of the shape Hessian of the cost functional without shape sensitivity of the state variable. *Journal of Optimization Theory and Applications*, 162(3):779–804, 2014. doi:[10.1007/s10957-013-0520-4](https://doi.org/10.1007/s10957-013-0520-4).
- [259] K. Kunisch and D. Wachsmuth. On time optimal control of the wave equation and its numerical realization as parametric optimization problem. *SIAM Journal on Control and Optimization*, 51(2):1232–1262, 2013. doi:[10.1137/120877520](https://doi.org/10.1137/120877520).
- [260] K. Kunisch and T. Pock. A bilevel optimization approach for parameter learning in variational models. *SIAM Journal on Imaging Sciences*, 6(2):938–983, 2012. doi:[10.1137/120882706](https://doi.org/10.1137/120882706).
- [261] C. Nagaiah, K. Kunisch, and G. Plank. On boundary stimulation and optimal boundary control of the bidomain equations. *Mathematical Biosciences*, 245(2):206–215, 2013. doi:[10.1016/j.mbs.2013.07.004](https://doi.org/10.1016/j.mbs.2013.07.004).
- [262] K. Ito and K. Kunisch. Optimal control with  $l^p(\omega)$ ,  $p \in [0, 1)$ , control cost. *SIAM Journal on Control and Optimization*, 52(2):1251–1275, 2014. doi:[10.1137/120896529](https://doi.org/10.1137/120896529).
- [263] A. Kröner and K. Kunisch. A minimum effort optimal control problem for the wave equation. *Computational Optimization and Applications*, 57(1):241–270, 2014. doi:[10.1007/s10589-013-9587-y](https://doi.org/10.1007/s10589-013-9587-y).
- [264] V. Kovtunenکو and K. Kunisch. High precision identification of an object: optimality conditions based concept of imaging. *SIAM Journal on Control and Optimization*, 52:773–796, 2014. doi:[10.1137/13091172X](https://doi.org/10.1137/13091172X).
- [265] C. Clason and K. Kunisch. Multi-bang control of elliptic systems. *Annales de l'Institut Henri Poincaré (C) Analyse Non Linéaire*, 31:1109–1130, 2014. doi:[10.1016/j.anihpc.2013.08.005](https://doi.org/10.1016/j.anihpc.2013.08.005).
- [266] H. Kasumba, K. Kunisch, and A. Laurain. A bilevel shape optimization problem for the exterior Bernoulli free boundary value problem. *Interfaces and Free Boundaries*, 16(4):459–487, 2014. doi:[10.4171/IFB/326](https://doi.org/10.4171/IFB/326).
- [267] K. Kunisch and L. Wang. Bang-bang property of time optimal controls of Burgers equation. *Journal Discrete and Continuous Dynamical System - A*, 34(9):3611–3637, 2014. doi:[10.3934/dcds.2014.34.3611](https://doi.org/10.3934/dcds.2014.34.3611).
- [268] S. Götschel, C. Nagaiah, K. Kunisch, and M. Weiser. Lossy compression in optimal control of cardiac defibrillation. *Journal of Scientific Computing*, 60(1):35–59, 2013. doi:[10.1007/s10915-013-9785-x](https://doi.org/10.1007/s10915-013-9785-x).

- [269] E. Casas and K. Kunisch. Optimal control of semilinear elliptic equations in measure spaces. *SIAM Journal on Control and Optimization*, 52:339–364, 2014. doi:[10.1137/13092188X](https://doi.org/10.1137/13092188X).
- [270] C. Nagaiah, C. Engwer, and K. Kunisch. Boundary control of bidomain equations with state dependent switching source functions in the ionic model. *Journal of Computational Physics*, 273:227–242, 2014. doi:[10.1016/j.jcp.2014.05.017](https://doi.org/10.1016/j.jcp.2014.05.017).
- [271] M. Holler and K. Kunisch. On infimal convolution of total variation type functionals and applications. *SIAM Journal on Imaging Sciences*, 7(4):2258–2300, 2014. doi:[10.1137/130948793](https://doi.org/10.1137/130948793).
- [272] A. Kröner, K. Kunisch, and H. Zidani. Optimal feedback control of undamped wave equations by solving a HJB equation. *ESAIM: Control, Optimisation and Calculus of Variations*, 2014. doi:[10.1051/cocv/2014033](https://doi.org/10.1051/cocv/2014033).
- [273] K. Ito and K. Kunisch. A note on the existence of nonsmooth nonconvex optimization problems. *Journal of Optimization Theory and Applications*, 2014. doi:[10.1007/s10957-014-0552-4](https://doi.org/10.1007/s10957-014-0552-4).
- [274] C. Nagaiah, K. Kunisch, and G. Plank. Application of optimal control to the cardiac defibrillation problem using a physiological model of cellular dynamics. *Applied Numerical Mathematics*, 2015. doi:[10.1016/j.apnum.2015.01.006](https://doi.org/10.1016/j.apnum.2015.01.006).
- [275] C. Clason, K. Ito, and K. Kunisch. A convex analysis approach to optimal controls with switching structure for partial differential equations. *ESAIM: Control, Optimisation and Calculus of Variations*, 2015. doi:[10.1051/cocv/2015017](https://doi.org/10.1051/cocv/2015017).
- [276] S. Keeling and K. Kunisch. Robust  $\ell_1$  approaches to computing the geometric median and principal and independent components. *Journal of Mathematical Imaging and Vision*, 2016. doi:[10.1007/s10851-016-0637-9](https://doi.org/10.1007/s10851-016-0637-9).
- [277] K. Kunisch, K. Pieper, and B. Vexler. Measure valued directional sparsity for parabolic optimal control problems. *SIAM Journal on Control and Optimization*, 52(5):3078–3108, 2014. doi:[10.1137/140959055](https://doi.org/10.1137/140959055).
- [278] K. Kunisch and S. Reiterer. A Gautschi time-stepping approach to optimal control of the wave equation. *Applied Numerical Mathematics*, 90:55–76, 2015. doi:[10.1016/j.apnum.2014.12.001](https://doi.org/10.1016/j.apnum.2014.12.001).
- [279] K. Kunisch and A. Rund. Time optimal control of the monodomain model in cardiac electrophysiology. *IMA Journal of Applied Mathematics*, 2015. doi:[10.1093/imamat/hxv010](https://doi.org/10.1093/imamat/hxv010).
- [280] T. Breiten and K. Kunisch. Ricatti-based feedback control of the monodomain equations with the Fitzhugh-Nagumo model. *SIAM Journal on Control and Optimization*, 52(6):4057–4081, 2014. doi:[10.1137/140964552](https://doi.org/10.1137/140964552).
- [281] K. Kunisch and M. Müller. Uniform convergence of the POD method and applications to optimal control. *Journal Discrete and Continuous Dynamical System - A*, 35(9), 2015. doi:[10.3934/dcds.2015.35.4477](https://doi.org/10.3934/dcds.2015.35.4477).



- [282] K. Ito and K. Kunisch. A sequential method for a class of stable mathematical programming problems. *SIAM Journal on Optimization*, 26(2):1262–1292, 2016. doi:[10.1137/140985597](https://doi.org/10.1137/140985597).
- [283] K. Kunisch, K. Pieper, and A. Rund. Time optimal control for a reaction diffusion system arising in cardiac electrophysiology - a monolithic approach. *ESAIM: Mathematical Modelling and Numerical Analysis*, 50(2):381–414, 2016. doi:[10.1051/m2an/2015048](https://doi.org/10.1051/m2an/2015048).
- [284] T. Breiten and K. Kunisch. Compensator design for the monodomain equations. *ESAIM: Control, Optimisation and Calculus of Variations*, 2015. doi:[10.1051/cocv/2015047](https://doi.org/10.1051/cocv/2015047).
- [285] K. Kunisch and Z. Rao. Minimal time problem with impulsive controls. *Applied Mathematics & Optimization*, 2015. doi:[10.1007/s00245-015-9324-2](https://doi.org/10.1007/s00245-015-9324-2).
- [286] K. Kunisch, P. Trautmann, and B. Vexler. Optimal control of the undamped linear wave equation with measure valued controls. *SIAM Journal on Control and Optimization*, 54(3):1212–1244, 2016. doi:[10.1137/141001366](https://doi.org/10.1137/141001366).
- [287] E. Casas and K. Kunisch. Parabolic control problems in space-time measure spaces. *ESAIM: Control, Optimisation and Calculus of Variations*, 22(2):355–370, 2016. doi:[10.1051/cocv/2015008](https://doi.org/10.1051/cocv/2015008).
- [288] D. Kalise, A. Kröner, and K. Kunisch. Local minimization algorithms for dynamic programming equations. *SIAM Journal on Scientific Computing*, 38(3):A1587–A1615, 2015. doi:[10.1137/15M1010269](https://doi.org/10.1137/15M1010269).
- [289] C. Clason, A. Rund, K. Kunisch, and R. Barnard. A convex penalty for switching control of partial differential equations. *Systems & Control Letters*, 2016. doi:[10.1016/j.sysconle.2015.12.013](https://doi.org/10.1016/j.sysconle.2015.12.013).
- [290] G. Friesecke, F. Henneke, and K. Kunisch. Sparse control of quantum systems. Submitted, 2015.
- [291] B. Azmi and K. Kunisch. On the stabilizability of the burgers’ equation by receding horizon control. *SIAM Journal on Control and Optimization*, 54(3):1378–1405, 2016. doi:[10.1137/15M1030352](https://doi.org/10.1137/15M1030352).
- [292] C. Clason and K. Kunisch. A convex analysis approach to multi-material topology optimization. *ESAIM: Mathematical Modelling and Numerical Analysis*, 50:1917–1936, 2016. doi:[10.1051/m2an/2016012](https://doi.org/10.1051/m2an/2016012).
- [293] T. Breiten, K. Kunisch, and S. S. Rodrigues. Feedback stabilization to non-stationary solutions of a class of reaction diffusion equations of fitzhugh-nagumo type. *SIAM Journal on Control and Optimization*, 55, 2017. doi:[10.1137/15M1038165](https://doi.org/10.1137/15M1038165).
- [294] C. Nagaiah, K. Kunisch, and G. Plank. Pde constrained optimization of electrical defibrillation in a 3d ventricular slice geometry. *International Journal for Numerical Methods in Biomedical Engineering*, 2015. doi:[10.1002/cnm.2742](https://doi.org/10.1002/cnm.2742).
- [295] D. Kalise, K. Kunisch, and Z. Rao. Infinite horizon sparse optimal control. *Journal of Optimization Theory and Applications*, pages 1–37, 2016. doi:[10.1007/s10957-016-1016-9](https://doi.org/10.1007/s10957-016-1016-9).

- [296] C. Clason, K. Kunisch, and A. Rund. Nonconvex penalization of switching control of partial differential equations. *System and Control Letters*, 106:1–8, 2017. doi:[10.1016/j.sysconle.2017.05.006](https://doi.org/10.1016/j.sysconle.2017.05.006).
- [297] E. Casas, F. Kruse, and K. Kunisch. Optimal control of semilinear parabolic equations by bv-functions. *SIAM Journal on Control and Optimization*, 55:1752–1788, 2017. doi:[10.1137/16M1056511](https://doi.org/10.1137/16M1056511).
- [298] T. Breiten, K. Kunisch, and L. Pfeiffer. Control strategies for the fokker-planck equation. *Accepted in ESAIM: Control, Optimisation and Calculus of Variations*, 2017. doi:[10.1051/cocv/2017046](https://doi.org/10.1051/cocv/2017046).
- [299] S. Court and K. Kunisch. Almost global existence of weak solutions for the nonlinear elastodynamics system with general strain energy. *Advances in Differential Equations*, 23(1/2):135–160, 2018.
- [300] E. Casas and K. Kunisch. Stabilization by sparse controls for a class of semilinear parabolic equations. *SIAM Journal on Control and Optimization*, 55(1):512–532, 2017. doi:[10.1137/16M1084298](https://doi.org/10.1137/16M1084298).
- [301] N. Chamakuri and K. Kunisch. Primal-dual active set strategy for large scale optimization of cardiac defibrillation. *Applied Mathematics and Computation*, 292:178–193, 2017. doi:[10.1016/j.amc.2016.07.035](https://doi.org/10.1016/j.amc.2016.07.035).
- [302] S. Court, K. Kunisch, and L. Pfeiffer. Optimal control for a class of infinite dimensional systems involving an  $L^\infty$ -term in the cost functional. *Accepted for publication in ZAMM - Journal of Applied Mathematics and Mechanics*, 2017. doi:[10.1002/zamm.201600199](https://doi.org/10.1002/zamm.201600199).
- [303] T. Breiten, K. Kunisch, and L. Pfeiffer. A reduction method for riccati-based control of the fokker-planck. *IFAC-PapersOnLine*, 50(1):1631 – 1636, 2017. 20th IFAC World Congress. doi:[10.1016/j.ifacol.2017.08.329](https://doi.org/10.1016/j.ifacol.2017.08.329).
- [304] S. Court, K. Kunisch, and L. Pfeiffer. Hybrid optimal control problems for a class of semilinear parabolic equations. *to appear in DCDS, Series S*, 2018.
- [305] T. Breiten and K. Kunisch. Boundary feedback stabilization of the monodomain equations. *Mathematical Control & Related Fields*, 7:369–391, 2017. doi:[10.3934/mcrf.2017013](https://doi.org/10.3934/mcrf.2017013).
- [306] B. Azmi, A.-C. Boulanger, and K. Kunisch. On the semi-global stabilizability of the korteweg-de vries equation via model predictive control. *Control, Optimisation and Calculus of Variations*, 2017. doi:[10.1051/cocv/2017001](https://doi.org/10.1051/cocv/2017001).
- [307] D. Kalise and K. Kunisch. Polynomial approximation of high-dimensional hamilton-jacobi-bellman equations and applications to feedback control of semilinear parabolic pdes. *SIAM Journal on Scientific Computing*, 40(2):A629–A652, 2018. doi:[10.1137/17M1116635](https://doi.org/10.1137/17M1116635).
- [308] D. Ghilli and K. Kunisch. A monotone scheme for sparsity optimization in  $l^p$  with  $p \in (0, 1]$ . *IFAC-PapersOnLine*, 50(1):494 – 499, 2017. 20th IFAC World Congress. doi:[10.1016/j.ifacol.2017.08.102](https://doi.org/10.1016/j.ifacol.2017.08.102).
- [309] D. Ghilli and K. Kunisch. On the monotone and primal-dual active set schemes for  $l^p$ -type schemes,  $p \in (0, 1]$ . Submitted, 2017.

- [310] A. Rund, C. S. Aigner, K. Kunisch, and R. Stollberger. Magnetic resonance rf pulse design by optimal control with physical constraints. *IEEE Transactions on Medical Imaging*, 37:461–472, 2018. doi:[10.1109/TMI.2017.2758391](https://doi.org/10.1109/TMI.2017.2758391).
- [311] A. Rund, C. S. Aigner, K. Kunisch, and R. Stollberger. Simultaneous multislice refocusing via time-optimal control. *Magnetic Resonance in Medicine*, 2018. doi:[10.1002/mrm.27124](https://doi.org/10.1002/mrm.27124).
- [312] D. A. Souza and K. Kunisch. On the one-dimensional nonlinear monodomain equations with moving control. Submitted, 2017.
- [313] T. Breiten, K. Kunisch, and L. Pfeiffer. Taylor expansions of the value function associated with a bilinear optimal control problem. Submitted, 2017.
- [314] C. Clason, K. Kunisch, and A. Rund. Nonconvex penalization of switching control of partial differential equations. *Systems & Control Letters*, 106:1 – 8, 2017. doi:[10.1016/j.sysconle.2017.05.006](https://doi.org/10.1016/j.sysconle.2017.05.006).
- [315] B. Azmi and K. Kunisch. Receding horizon control for the stabilization of the wave equation. *AIMS: Discrete and Continuous Dynamical Systems - Series A (DCDS-A)*, 38:449–484, 2017. doi:[10.3934/dcds.2018021](https://doi.org/10.3934/dcds.2018021).
- [316] Z. Peng and K. Kunisch. Optimal control of elliptic variational-hemivariational inequalities. *Accepted for publication in JOTA (Journal of Optimization Theory and Applications)*, 2018.
- [317] E. Casas and K. Kunisch. Analysis of optimal control problems of semilinear elliptic equations by bv-functions. *Accepted for publication in Set-Valued and Variational Analysis*, 2018.
- [318] D. Kalise, K. Kunisch, and K. Sturm. Optimal actuator design based on shape calculus. Submitted, 2017.
- [319] G. Friesecke, F. Henneke, and K. Kunisch. Frequency-spares optimal quantum control. *Accepted for publication in AIMS: Mathematical Control and Related Fields (MCRF), Special Issue on the occasion of Prof. Eduardo Casas' 60th birthday*, 2017.
- [320] K. Kunisch and S. Rodrigues. Explicit exponential stabilization of nonautonomous linear parabolic-like systems by a finite number of locally supported actuators. Submitted, 2017.
- [321] C. Clason, F. Kruse, and K. Kunisch. Total variation regularization of multi-material topology optimization. *ESAIM: Mathematical Modelling and Numerical Analysis*, 52(1):275–303, 2018. doi:[10.1051/m2an/2017061](https://doi.org/10.1051/m2an/2017061).
- [322] S. Court, K. Kunisch, and L. Pfeiffer. Optimal control problem for systems of conservation laws, with geometric parameter, and application to the shallow-water equations. Submitted, 2018.
- [323] G. Peralta and K. Kunisch. Interface stabilization of a parabolic-hyperbolic pde system with delay in the interaction. *AIMS: Discrete and Continuous Dynamical Systems - Series A (DCDS-A)*, 38(6):3055–3083, 2018. doi:[10.3934/dcds.2018133](https://doi.org/10.3934/dcds.2018133).

[324] E. Casas and K. Kunisch. Optimal control of the 2d stationary navier-stokes equations with measure valued controls. Submitted, 2018.

## Editor of Proceedings

“Control and Identification of Distributed Parameter Systems”, in: Lecture Notes in Control and Information Sciences, Vol.54, Springer–Verlag, 1983, Eds.: F. Kappel, K. Kunisch, and W. Schappacher.

“Distributed Parameter Systems”, in: Lecture Notes in Control and Information Sciences, Vol.75, Springer–Verlag, 1985, Eds.: F. Kappel, K. Kunisch, and W. Schappacher.

“Distributed Parameter Systems”, in Lecture Notes in Control and Information Sciences, Vol.102, Springer-Verlag, 1987, Eds.: F. Kappel, K. Kunisch, and W. Schappacher.

“Control and Identification of Distributed Systems”, in: International Series of Numerical Mathematics, Birkhäuser, Vol.91, 1989, Eds.: F. Kappel, K. Kunisch, and W. Schappacher.

“Estimation and Control of Distributed Parameter System”, in: International Series of Numerical Mathematics, Birkhäuser, 1991, Eds.: W. Desch, F. Kappel, and K. Kunisch.

“Control and Estimation of Distributed Parameter Systems”: “Nonlinear Phenomena”, International Series of Numerical Mathematics, Birkhäuser, 1994, Eds.: W. Desch, F. Kappel, and K. Kunisch.

“Estimation and Control of Distributed Parameter System”, in: International Series of Numerical Analysis, Birkhäuser, 1998, Eds.: W. Desch, F. Kappel and K. Kunisch.

“Control and Estimation of Distributed Parameter Systems”, International Series of Numerical Mathematics, Birkhäuser, 2001, Eds.: W. Desch, F. Kappel and K. Kunisch.

“Control of Coupled Partial Differential Equations”, International Series of Numerical Mathematics, Birkhäuser, 2007, Eds.: K. Kunisch, G. Leugering, J.Sprekels and F. Tröltzsch.

“Optimal Control of Coupled Systems of Partial Differential Equations”, International Series of Numerical Mathematics, Birkhäuser, 2009, Eds.: K. Kunisch, G. Leugering, J. Sprekels and F. Tröltzsch.

“Control and Optimization with PDE Constraints”, International Series of Numerical Mathematics, Birkhäuser, 2013, Eds.: K. Bredies, C. Clason, K. Kunisch, and G. von Winkel.

## Translation

B. Kunisch and K. Kunisch. *D. E. Knuth, Surreal Numbers*, Addison–Wesley, 1974, for Vieweg & Sohn, 1979.

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