Curriculum Vitae (Jooyoung HAHN)

1 Contact Information

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2 Education

Ph.D., Mathematical Sciences ..... March 2002 - February 2008

- Korea Advanced Institute of Science and Technology (KAIST), Deajeon, South Korea
- Thesis title: **PDE-based image processing for segmentation and image restoration**
- Advisor: Professor Chang-Ock Lee
- Area of Study: Image processing based on nonlinear PDEs, variational numerical methods, nonlinear optimization

M.S., Mathematics ..... March 2000 - February 2002

- KAIST, Deajeon, South Korea
- Advisor: Jin Hwan Lim
- Area of Study: Riemannian geometry

B.S., Electronic Material & Devices Engineering ..... March 1995 - February 2000

- Department name changed from Applied Physics
- Inha University, Incheon, South Korea
- Second major: Mathematics

3 Current Research Interests

- The implicit neural representation (INR) method for solving nonlinear, nonlocal, or multiscale partial differential equations (PDEs) with applications in Bioinformatics, Computational Fluid Dynamics, and Fluid Solid Interaction (FSI).
- Finite volume methods for level set equation on polyhedral meshes in 3D: Normal extension from the interface with applications in Stephan problems and ice formation in porous media.
- Topological data analysis for diverse forms of tumor data and high resolution mass spectrometry in the view of computational efficiency in MPI.

4 Professional Career

SASPRO2 Fellow ..... February 2022 - Present

- Funding: SASPRO2 (**S**lovak **A**cademic and **S**cientific **Pro**gramme, Horizon 2020 Marie Skłodowska-Curie COFUND Action Programme)
- Hosting University: Department of Mathematics and Descriptive Geometry, Faculty of Civil Engineering, Slovak University of Technology, Radlinskeho 11, 810 05 Bratislava, Slovakia
- Principal Investigator: PhD Jooyoung Hahn
- Science in Charge: Professor Karol Mikula
- Topic: Numerical methods for computational evolving manifolds

K-TAG Europe ..... July 2016 - Present

- About Korea-Technology Advisory Group (K-TAG) Europe : K-TAG Europe launched by KIAT and MOTIE in July 2014, consists of Korean engineering experts in Europe. Main activities of K-TAG are (1) to assist Korean Small and Medium-sized Enterprises (SMEs) in finding European Innovative partners (2) to provide advice as well as information related to Korea-EU R&D cooperation (3) to develop and participate in Korea-EU joint R&D projects.

EUREKA/Eurostars: Technical expert ..... July 2019 - Present

Senior Development Engineer Software Fluid Dynamics ..... May 2012 - December 2021

- Advanced Simulation Technologies, AVL, Graz, Austria
- Computational fluid dynamics in advanced simulation technologies
- The main numerical algorithm developer in finite volume method and particle-based method on polyhedral meshes:
  - G-equation (level set method) in combustion on polyhedral meshes.
  - Curve evolution for spark plug system (Particle movement controls in a complicated geometry).
  - Efficient surface-to-surface radiation.
  - Level set method with adaptive mesh refinement for multiphase flow.
  - Accurate gradient computations

Rapid Innovation Team, Advanced Simulation Technologies, AVL ..... Mar 2019 - June 2019

- Advanced Simulation Technologies, AVL, Graz, Austria
- Complete Vehicle Energy Management Control Optimization (Level-Set Dynamic Programming)

Senior Postdoc. ..... November 2010 - April 2012

- Institute for mathematics and scientific computing, University of Graz, Graz, Austria
- Advisor: Professor Michael Hintermüller
- A senior PostDoc in START Project: Interfaces and Free Boundaries

Research staff ..... November 2008 - October 2010

- Division of Mathematical Sciences, Nanyang Technological University, Singapore
- Advisor: Professor Xue-Cheng Tai
- A research staff in Mathematical Imaging and Vision Group

Postdoc. ..... March 2008 - October 2008

- Department of Mathematical Sciences KAIST, Deajeon, South Korea
- Advisor: Professor Chang-Ock Lee
- A PostDoc in Computational Mathematics and Imaging Lab.

Visiting researcher ..... August 2005 - July 2006

- Institute of mathematics and its applications (IMA), Minneapolis, Minnesota, USA
- Solved a challenge problem posted in IMA Impacts: An eye for aphids
- Funding: Korean Research Foundation, KRF-2006-311-C00015.

Research assistant ..... January 2005 - March 2005

- Nourishment of KAIST brand supported by the small and medium business administration & KAIST
- Cooperated with Interactive technology for the value improvement (INTVIM)
- Result: Development of 3D virtual reality engine based on real photo

5 Academic Experience

Teaching

- STUBA ..... February 2022 - December 2024
  (a) Coding project in data analysis: Can we see wine in 2D?, September 2024 - December 2024

(b) English: Professional presentation in applied mathematics, September 2024 - December 2024

(c) English: Level set method in industrial problems, February 2024 - May 2024

(d) English: Professional presentation in applied mathematics, September 2023 - December 2023

(e) English: Seminal papers in image processing before AI era, February 2023 - May 2023

(f) Finite volume method: Coding in AVL FIRE™ for the evolution of surfaces on polyhedral meshes, September 2022 - December 2022

(g) English: Professional presentation in applied mathematics, September 2022 - December 2022

(h) Numerical analysis of differentiation equations: Level Set Methods in Evolving Manifold, February 2022 - May 2022

- SSAMPLUS ..... June 2008 - October 2008
  - Real Analysis I and II, Vector Calculus, Differential Geometry
- KAIST ..... March 2008 - May 2008
  - Numerical Analysis I

Computer system manager ..... March 2002 - August 2003
- Computational mathematics laboratory, KAIST
- Regular system management of Linux and Window XP
- Establishment of integrated Window XP system on Linux using Samba primary domain controller

Teaching assistant
- Calculus, Linear algebra, Set theory, Ordinary differential equation, Differential geometry, KAIST, South Korea, March 2000 - February 2004
- Calculus, NTU, Singapore, November 2008 - October 2010

Undergraduate researcher ..... March 1997 - February 1998
- Information display laboratory, Electronic engineering, Inha university
- Study of tensor fields for understanding physical properties of liquid crystal display

Undergraduate researcher ..... March 1996 - February 1997
- Photonic integrated circuit & quantum device laboratory, Information & communication engineering, Inha university
- Construction of small model of HESS (Hoop energy storage system)

6 Invited Talks

- Emerging Trends in Computational Fluid Dynamics: Towards Industrial Applications, Stanford University Redwood City, CA 94063, United States, November 5-7, 2024, Title: *Numerical methods for computational evolving manifolds in industrial applications.*
- Advances in High-order Methods - Fluid Dynamics, Biomedical Science, and Exascale Computing, PostTech, Pohang, South Korea, June 10-13, 2024, Title: *Level set methods on polyhedral meshes.*
- A series of seminars, KAIST, Daejeon, South Korea, July 19-21, 2023, Title: *Image Processing before the Era of Neural Network.*
- Discrete Duality Finite Volume Method and Applications, Jean-Morlet Chair - Workshop, CIRM, Marseille, France, October 17-21, 2022, *Finite Volume Method for Level Set Equations on Polyhedral Meshes.*
- Workshop on Scientific Computing 2022, Děčín, Czech Republic, May 26-29, 2022, Title: *What is a proper boundary condition to solve eikonal equation on a non-convex domain?*
- ALGORITMY 2020, Conference on Scientific Computing, Vysoke Tatry, Podbanske, September 10-15, 2020, Title: *Finite volume level set methods in combustion engines*
- Summer School for modeling in medical mathematics, July 2-4, 2019, Title: *Modeling for Medical Mathematics: Evolution of Manifolds, Finite Volume Method, and Deep Learning*

7 Minisymposium Organizer

- SIAM Conference on Imaging Science, May 28-31, 2024, Atlanta, USA, Title: *Surface reconstruction: PDEs, Variational, and Deep Learning Methods - Part I and II*
- ALGORITMY 2024, March 15-20, 2024, High Tatra Mountains, Slovakia, Title: *Numerical methods for level-set and eikonal equations - theory and applications*
- International Congress on Industrial and Applied Mathematics, August 20-25, 2023, Tokyo, Japan, Title: *Numerical Algorithms for the Eikonal Equation and Its Applications - Part I, II, and III*
- International Congress on Industrial and Applied Mathematics, July 15-19, 2019, Valencia, Spain, Title: *Advanced numerical methods for evolving manifolds*
- Europe-Korea Conference on Science and Technology, August 20-24, 2018, Glasgow, UK. Title: *Information technology and machine learning*
- 6^{th} European Conference on Computational Mechanics, 7^{th} European Conference on Computational Fluid Dynamics, June 11-15, 2018, Glasgow, UK. Title: *Moving interface problems in computational fluid dynamics*
- Europe-Korea Conference on Science and Technology, July 26-29, 2017, Stockholm, Sweden. Title: *Industrial mathematics for scientific computing: Imaging and machine learning and computational fluid dynamics*
- Europe-Korea Conference on Science and Technology, July 27-30, 2016, Berlin, Germany. Title: *Contemporary topics in image processing and computer vision*
- SIAM Imaging Science, May 23-26, 2016, New Mexico, USA. Title: *PDE-based image processing: Reconstruction, filtering, segmentation, compression, and inpainting*
- International Conference on Numerical Combustion, April 19-22, 2015, Avignon, France. Title: *Surface evolution methods in gasoline direct injection combustion engines*
- SIAM Imaging Science, May 20-22, 2012, Philadelphia, USA. Title: *Functional analysis and accurate numerical methods in image processing*
- International Congress on Industrial and Applied Mathematics, July 18-22, 2011, Vancouver, Canada. Title: *Fast optimization algorithms in image processing and its applications*
- SIAM Imaging Science, April 12-14, 2010, Chicago, USA. Title: *Surface reconstruction from sparse gradient fields, unorganized point clouds, and photometric stereo*

8 Funding

AVL AST University Partnership Program (principal investigator)

- `AVL FIRE`$^{\text{TM}}$ and `PREONLAB`, May 2022 - Apr 2025. Accepted.

Global Visiting Fellowship at Seoul National University, South Korea

- Topic: Neural network solver for PDEs, June 2023 - Aug 2023. Accepted.
- Topic: Application of the eikonal equation and Surface-to-surface radiation, June 2024 - Aug 2024. Accepted.

SASPRO2/Horizon 2020 Marie Skłodowska-Curie COFUND Action Programme (principal investigator)

- Title: Numerical methods for computational evolving manifolds, Feb 2022 - Jan 2025. Accepted.

K-TAG: Technical Consulting for EUREKA/EUROSTAR

- Title: Analysis and prediction of evolving particulated matter in the air, 2018, Metariver Technology Co., Ltd. Accepted.
- Title: Health care system for emotion and stress measurement based on image processing, 2019, Inforshare. Accepted.
- Title: Exploration of Overseas Partners and International Collaborative R&D Project Planning for Real-time Simulation Cyber-Physical Systems (CPS) System Development, 2020, UVC Co.,Ltd.. Accepted.

EIC Pathfinder (co-investigator)

- Title: Unified Diagnosis Platform by Nano-Metric Molecular Sensing, Submitted in 2022 and 2023. Not accepted.

Industrial Project (project leader in AVL)

- Title: Finite volume level-set methods for G-equation in AVL FIRE™, Feb 2017 - Jul 2017. Accepted.

FETOPEN (co-investigator)

- Title: Computational Evolving Manifolds for Future Emerging Technology, Submitted in 2015 and 2016. Not accepted.

Humbolt Research Fellowship in 2012

- Title: Higher-order Regularity in PDE-based Image Analysis and Computer Vision, Host: Prof. Daniel Cremers in Department of Computer Science, Technical University of Munich, Germany. Not accepted.

Korean Research Foundation, KRF-2006-311-C00015

- Visiting researcher at Institute of mathematics and its applications (IMA), Minneapolis, Minnesota, USA, Aug 2005 - Jul 2006. Accepted

9 Patent

- Real-time fine dust monitoring system and its methods, KR20210050831A, 2021, Seungjun Jeon, Jun Beum Kim, Jooyoung Hahn, and Seong Weon Jeong.
- A method for reconstructing a 3d surface from a 2d sketch, CN103460252B, 2017, Jie Qiu, Jooyoung Hahn, Eiji Sugisaki, Lei Jia, Xue-Cheng Tai, and Hock Soon Seah.
- A method for reconstructing a 3d surface from a 2d sketch, WO2012118439A1, 2012, Jie Qiu, Jooyoung Hahn, Eiji Sugisaki, Lei Jia, Xue-Cheng Tai, and Hock Soon Seah.
- Methods and systems for generating enhanced images using Euler's Elastica model, US8447135B2, 2013, Xue-Cheng Tai, Jooyoung Hahn, Jason Ginmo Chung.
- Method for image segmentation using statistically reinstating force and multi-resolution, KR100925180B1, 2009, Chang-Ock Lee, Sung Ha Park, and Jooyoung Hahn.

10 Awards

K-TAG awards 2019 for consulting business

- Analysis and prediction of evolving particulated matter in the air
- Health care system for emotion and stress measurement based on image processing.
- News: click the link

English Teaching Award: Numerical Analysis I, KAIST, Spring semester in 2008

KSIAM Young researcher award

- Korean society for industrial and applied mathematics (KSIAM) 2007 spring conference, May 25-26, 2007, KAIST, South Korea
- Title: Fine segmentation using geometric attraction-driven flow and edge-regions

University students contest of mathematics held by the Korean Mathematical Society

- Honorable mention prize in November 1998
- Bronze prize in November 1997

Inha University

- ***Summa cum Laude***, with honors in engineering
- University scholarship, 1995-1999

11 Languages

Communication

- English (Fluent)
- Korean (Native)
- German (Basic)

Computation

- Python (2022 - present): Development of data analysis in 2D chromatography, tumor microenvironments, and high performance computing in TDA.
- FORTRAN (2012 - present): Development of commercial CFD software and computational geometry algorithms.
- MPI and parallel computing (2012 - present): Development of commercial CFD software and computational geometry algorithms.
- Linux (2002 - present), System manager of Linux (2002 - 2003): Integration of linux and window systems, security, web server, etc.
- C, C++ (1995 - 2014), Visual Studio, MFC, API (2002 - 2008): Development of in-house codes for computer vision and image processing. (three patents)
- GPU (2008 - 2010): Development of real-time 3D reconstruction from hand drawing sketch. (a patent)
- Others: Tools for TDA (Gudhi and Ball Mapper), Latex, Matlab, HTML

12 Soft Skills

Singing in a choir: 2^{nd} Bass

- UniChor in Graz by the conductor Matthias Unterkofler
- Cappella Nova Graz by the conductor Otto Kargl

Cooking

- Home Cooking (Instagram)

Publications List (Jooyoung HAHN)

h-index: 10

See the web page link in Scopus: https://www.scopus.com/authid/detail.uri?authorId=58090037100

Five Representative Papers

- Jooyoung Hahn, Karol Mikula, Peter Frolkovič, Laplacian regularized eikonal equation with Soner boundary condition on polyhedral meshes. *Computers & Mathematics with Applications*, 156, 74-86, 2024, https://doi.org/10.1016/j.camwa.2023.12.016.
  ⇒ The fast and efficient finite volume solver of eikonal equation on non-convex computational domain discretized by polyhedral meshes.

- Jooyoung Hahn, Karol Mikula, Peter Frolkovič, Peter Priesching, Martin Balažovjech, Branislav Basara, Second-order accurate finite volume method for G-equation on polyhedral meshes. *Japan Journal of Industrial and Applied Mathematics*, 40, 1053-1082, 2023, https://doi.org/10.1007/s13160-023-00574-x.
  ⇒ The first paper to show a second experimental order of convergence using finite volume method for the G-equation on polyhedral meshes.

- Yesom Park, Taekyung Lee, Jooyoung Hahn, Myungjoo Kang, p-Poisson surface reconstruction in curl-free flow from point clouds, *NeurIPS 2023, Advances in Neural Information Processing Systems 36, New Orleans, USA*, December 10-16, 2023, Paper Link, Open Review
  ⇒ The state-of-the-art in 2023 of implicit neural representation in surface reconstruction from point cloud.

- Jooyoung Hahn, Karol Mikula, Peter Frolkovič and Branislav Basara, Inflow-Based Gradient Finite Volume Method for a Propagation in a Normal Direction in a Polyhedron Mesh, *Journal of Scientific Computing*, 72(1), 442-465, 2017, https://doi.org/10.1007/s10915-017-0364-4.
  ⇒ Numerical method for the propagation in a normal direction on star-shaped convex polyhedral cells, wihch is straightforwardly applicable to conventional computational fluid dynamics codes of cell-centered finite volume method with parallel computing and is numerically confirmed to be the second order of accuracy in both space and time.

- Xue-Cheng Tai, Jooyoung Hahn, Ginmo Jason Chung, A Fast Algorithm for Euler's Elastica Model Using Augmented Lagrangian Method, *SIAM Journal on Imaging Sciences*, 4:313-344, 2011, https://doi.org/10.1137/100803730
  ⇒ The first paper to show the possibility to use augmented Lagrangian method for Euler's elastica model, aiming to dramatically improve the computational cost.

Journals

- Jooyoung Hahn, Karol Mikula, Peter Frolkovič, Eikonal boundary condition for level set method. *submitted*, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4712362.

- Jooyoung Hahn, Karol Mikula, Peter Frolkovič, Laplacian regularized eikonal equation with Soner boundary condition on polyhedral meshes. *Computers & Mathematics with Applications*, 156, 74-86, 2024, https://doi.org/10.1016/j.camwa.2023.12.016.

- Yesom Park, Chang hoon Song, Jooyoung Hahn, Myungjoo Kang, ReSDF: Redistancing implicit surfaces using neural networks. *Journal of Computational Physics*, 502(1), 112803, 2024, https://doi.org/10.1016/j.jcp.2024.112803.

- Jooyoung Hahn, Karol Mikula, Peter Frolkovič, Peter Priesching, Martin Balažovjech, Branislav Basara, Second-order accurate finite volume method for G-equation on polyhedral meshes. *Japan Journal of Industrial and Applied Mathematics*, 40, 1053-1082, 2023, https://doi.org/10.1007/s13160-023-00574-x.

- Jooyoung Hahn, Karol Mikula, Peter Frolkovič, and Branislav Basara, Finite volume method with the Soner boundary condition for computing the signed distance function on polyhedral meshes, *International Journal of Numerical Methods in Engineering*, 123(4), 1057-1077, 2022, https://doi.org/10.1002/nme.6888.

- Peter Frolkovič, Karol Mikula, Jooyoung Hahn, Dirk Martin and Branislav Basara, Flux balanced approximation with least-squares gradient for diffusion equation on polyhedral mesh, *Discrete & Continuous Dynamical Systems-S*, 14(3), 865-879, 2021, https://doi.org/10.3934/dcdss.2020350.

- Rafał Pyszczek, Jooyoung Hahn, Peter Priesching and Andrzej Teodorczyk, Numerical modeling of spark ignition in internal combustion engines, *Journal of Energy Resources Technology*, 142(2), 2020, https://doi.org/10.1115/1.4044222.

- Jooyoung Hahn, Karol Mikula, Peter Frolkovič, Matej Medľa, and Branislav Basara, Iterative inflow-implicit outflow-explicit finite volume scheme for level-set equations on polyhedron meshes, *Computers & Mathematics with Applications, 77(6)*, 1639-1654, 2019, https://doi.org/10.1016/j.camwa.2018.06.033.

- Jooyoung Hahn, Karol Mikula, Peter Frolkovič and Branislav Basara, Inflow-Based Gradient Finite Volume Method for a Propagation in a Normal Direction in a Polyhedron Mesh, *Journal of Scientific Computing*, 72(1), 442-465, 2017, https://doi.org/10.1007/s10915-017-0364-4.

- Michael Hintermüller, Carlos N Rautenberg, and Jooyoung Hahn, Functional-analytic and numerical issues in splitting methods for total variation-based image reconstruction, *Inverse Problems*, 30(5), 055014, 2014

- Sung Ha Park, Chang-Ock Lee, Jooyoung Hahn, Image segmentation based on the statistical variational formulation using the local region information, *Journal of the Korean Society for Industrial and Applied Mathematics*, 18(2), 129-142, 2014

- Yuping Duan, Yu Wang, and Jooyoung Hahn, A Fast Augmented Lagrangian Method for Euler's Elastica Models, *NUMERICAL MATHEMATICS: Theory, Methods and Applications*, 6(1), 47-71, 2013.

- Jooyoung Hahn, Jie Qiu, Eiji Sugisaki, Lei Jia, Xue-Cheng Tai, and Hock Soon Seah, Stroke-Based Surface Reconstruction, *NUMERICAL MATHEMATICS: Theory, Methods and Applications*, 6(1), 297-324, 2013.

- Jooyoung Hahn, Chunlin Wu, and Xue-Cheng Tai, Augmented Lagrangian method for generalized TV-Stokes model, *Journal of Scientific Computing*, 50(2), 235-264, 2012.

- Xue-Cheng Tai, Jooyoung Hahn, Ginmo Jason Chung, A Fast Algorithm for Euler's Elastica Model Using Augmented Lagrangian Method, *SIAM Journal on Imaging Sciences*, 4:313-344, 2011, https://doi.org/10.1137/100803730

- Jooyoung Hahn, Xue-Cheng Tai, Sofia Borok, and Alfred M. Bruckstein, On Orientation-Matching Minimization TV-Stokes Equation Image Denoising and Image Inpainting, *International Journal of Computer Vision*, 92(3):308-324, 2011.

- Jooyoung Hahn and Chang-Ock Lee, Geometric attraction-driven flow for image segmentation and boundary detection, *Journal of Visual Communication and Image Representation*, 21(1):56-66, 2010.

- Jooyuong Hahn and Chang-Ock Lee, A nonlinear structure tensor with diffusivity matrix composed of image gradient, *Journal of Mathematical Imaging and Vision*, 34:137-151, 2009.

- Min Jeong Kwon, Jooyoung Hahn, and HyunWook Park, A fast spherical inflation method of the cerebral cortex by deformation of a simplex mesh on the polar coordinates, *International Journal of Imaging Systems and Technology*, 18:9-16, 2008.

- Chang-Ock Lee, Kiwan Jeon, Youngsoo Ha, and Jooyoung Hahn, A variational approach to blending based on warping for non-overlapped images, *Computer Vision and Image Understanding*, 105:112-120, 2007.

- Suk-ho Lee, Jin Keun Seo, Chunjae Park, Byung Il Lee, Eung Je Woo, Soo Yeol Lee, Ohin Kwon, and Jooyoung Hahn, Conductivity image reconstruction from defective data in MREIT: Numerical simulation and animal experiment, *IEEE Transactions on Medical Imaging*, 25:168-176, 2006.
- Jooyoung Hahn and Chang-Ock Lee, Fine segmentation using geometric attraction-driven flow and edge-regions, *Journal of the Korean Society for Industrial and Applied Mathematics*, 11:41-48, 2007.

Patent

- Real-time fine dust monitoring system and its methods, KR20210050831A, 2021, Seungjun Jeon, Jun Beum Kim, Jooyoung Hahn, and Seong Weon Jeong.
- A method for reconstructing a 3d surface from a 2d sketch, CN103460252B, 2017, Jie Qiu, Jooyoung Hahn, Eiji Sugisaki, Lei Jia, Xue-Cheng Tai, and Hock Soon Seah.
- A method for reconstructing a 3d surface from a 2d sketch, WO2012118439A1, 2012, Jie Qiu, Jooyoung Hahn, Eiji Sugisaki, Lei Jia, Xue-Cheng Tai, and Hock Soon Seah.
- Methods and systems for generating enhanced images using Euler's Elastica model, US8447135B2, 2013, Xue-Cheng Tai, Jooyoung Hahn, Jason Ginmo Chung.
- Method for image segmentation using statistically reinstating force and multi-resolution, KR100925180B1, 2009, Chang-Ock Lee, Sung Ha Park, and Jooyoung Hahn.

Conferences

The content with the link is peer-reviewed and has been published in conference proceedings and the rest of the content is conference presentations.

- Jooyoung Hahn, Karol Mikula, Peter Frolkovič, Eikonal boundary condition for level set method, *ALGORITMY 2024 Conference on Scientific Computing, Vysoke Tatry, Podbanske, Slovakia*, March 15-20, 2024.
- Yesom Park, Taekyung Lee, Jooyoung Hahn, Myungjoo Kang, p-Poisson surface reconstruction in curl-free flow from point clouds, *NeurIPS 2023, Advances in Neural Information Processing Systems 36, New Orleans, USA*, December 10-16, 2023, Paper Link, Open Review
- Jooyoung Hahn, Karol Mikula, Peter Frolkovič, Regularized eikonal equation on polyhedral meshes, *International Congress on Industrial and Applied Mathematics, Tokyo, Japan*, August 20-25, 2023.
- Jooyoung Hahn, Finite Volume Method for Level Set Equations on Polyhedral Meshes, *Discrete Duality Finite Volume Method and Applications, Jean-Morlet Chair - Workshop, CIRM, Marseille, France*, October 17-21, 2022.
- Jooyoung Hahn, Karol Mikula, Peter Frolkovič, Finite volume method for regularized eikonal equation with Soner boundary condition on polyhedral meshes, *The 8th international conference on Advanced COmputational Methods in ENgineering, Liège, Belgium*, August 31-September 2, 2022.
- Jooyoung Hahn, Karol Mikula, Peter Frolkovič, Branislav Basara, Time-dependent eikonal equation with Soner boundary condition, *XVIII International Conference on Hyperbolic Problems Theory, Numerics, Applications, Málaga, Spain*, June 20-24, 2022.
- Jooyoung Hahn, Karol Mikula, Peter Frolkovič, Martin Balažovjech and Branislav Basara, Cell-Centered Finite Volume Method for Regularized Mean Curvature Flow on Polyhedral Meshes, In *International Conference on Finite Volumes for Complex Applications IX, Bergen, Norway*, 755-763, 2020, https://doi.org/10.1007/978-3-030-43651-3_72.
- Jooyoung Hahn, Matej Medľa, Karol Mikula, Peter Frolkovič, Branislav Basara, Industrial Mathematics for G-equation in Premixed Turbulent Combustion, In 13^{th} *International Congress on Industrial and Applied Mathematics, Valencia, Spain*, July 15-19, 2019.
- In 14^{th} *IEEE International Conference on Automatic Face and Gesture Recognition, Lille, France*, May 14-18, 2019.

- Jooyoung Hahn, Matej Medľa, Karol Mikula, Peter Frolkovič, Branislav Basara, Industrial Methods for G-equation Combustion Model in a 3D Polyhedron Mesh, In 13^{th} *World Congress on Computational Mechanics, New York, NY, USA*, July 23-27, 2018.
- Jooyoung Hahn, Matej Medľa, Karol Mikula, Peter Frolkovič, Branislav Basara, Semi-implicit level set method for advective and normal flow on polyhedron meshes, In 6^{th} *European Conference on Computational Mechanics,* 7^{th} *European Conference on Computational Fluid Dynamics, Glasgow, UK*, June 11-15, 2018.
- Jooyoung Hahn, Karol Mikula, Peter Frolkovič, Branislav Basara, Semi-implicit method with inflow-based gradient for the G-equation model on a polyhedron mesh, In 7^{th} *International Conference on Advanced Computational Methods in Engineering, ACOMEN 2017, Gent, Belgium*, September 18-22, 2017.
- Jooyoung Hahn, Karol Mikula, Peter Frolkovič, Semi-implicit method with inflow-based gradient for the level set equations on a polyhedron mesh, In *Equadiff2017, Bratislava, Slovakia*, July 24-28, 2017.
- Jooyoung Hahn, Karol Mikula, Peter Frolkovič, Branislav Basara, Semi-implicit level set method with inflow-based gradient in a polyhedron mesh, In *International Conference on Finite Volumes for Complex Applications 8, Lille*, 81-89, 2017, https://doi.org/10.1007/978-3-319-57394-6_9.
- Jooyoung Hahn, Karol Mikula, Peter Frolkovič, Inflow-based finite volume method for level set equations in a polyhedron mesh, In 88^{th} *Annual Meeting of the International Association of Applied Mathematics and Mechanics, Weimar, Germany*, March 6-10, 2017.
- Jooyoung Hahn, Inflow-based gradient finite volume method for level set method in the premixed combustion, In *The* 36^{th} *International Symposium on Combustion, Seoul, Korea*, July 31-August 5, 2016.
- Jooyoung Hahn, Karol Mikula, Peter Frolkovič and Branislav Basara, Inflow-based gradient finite volume method for level set Equation, In *SIAM Conference on Imaging Science (IS16), Albuquerque, New Mexico, USA*, May 23-26, 2016.
- Jooyoung Hahn, Karol Mikula, Peter Frolkovič, An extension of Rouy-Tourin scheme into a polyhedron mesh, In *ALGORITMY 2016 Conference on Scientific Computing, Vysoke Tatry, Podbanske, Slovakia*, March 13-18, 2016.
- Jooyoung Hahn, Regularized flux-based gradient for level set methods, In 15^{th} *International Conference on Numerical Combustion, Avignon, France*, April 19-22, 2015.
- Jooyoung Hahn, Xue-cheng Tai, and Jason Ginmo Chung, Numerical algorithms for Euler's Elastica models in image processing, In *SIAM Conference on Imaging Science (IS12), Philadelphia, Pennsylvania, USA*, May 20-22, 2012.
- Jooyoung Hahn, Carlos N. Rautenberg, and Michael Hintermüller, Accurate numerical schemes in image denoising, In *SIAM Conference on Imaging Science (IS12), Philadelphia, Pennsylvania, USA*, May 20-22, 2012.
- Jooyoung Hahn, Xue-Cheng Tai, and Ginmo Chung, A Fast Algorithm for Euler's Elastica Model Using Augmented Lagrangian Method, In *ICIAM, Vancouver, BC, Canada*, July 18-22, 2011.
- Jooyoung Hahn, Ginmo Chung, Yu Wang, and Xue-Cheng Tai, Fast algorithms for p-elastica energy with the application to image inpainting and curve reconstruction, In: Bruckstein, A.M., ter Haar Romeny, B.M., Bronstein, A.M., Bronstein, M.M. (eds) Scale Space and Variational Methods in Computer Vision. SSVM 2011. Lecture Notes in Computer Science, vol 6667. Springer, Berlin, Heidelberg, pp. 162-182, In 3^{rd} *International Conference on Scale Space and Variational Methods in Computer Vision, Ein-Gedi, Israel*, May 29-Jun 2, 2011, https://doi.org/10.1007/978-3-642-24785-9_15.
- Yuping Duan, Yu Wang, Xue-Cheng Tai, and Jooyoung Hahn, A fast augmented Lagrangian method for Euler's elastica model, In: Bruckstein, A.M., ter Haar Romeny, B.M., Bronstein, A.M., Bronstein, M.M. (eds) Scale Space and Variational Methods in Computer Vision. SSVM 2011. Lecture

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Preparation

- Neural Shortest Path for Reconstructing Surfaces from Point Clouds, *Ready to submit.*
- Identification of Unique Chemical Compounds in Wines Using Two-Dimensional Gas Chromatography Coupled with High-Resolution Mass Spectrometry and Topological Data Analysis, *Writing.*
- Spatial Analysis of Malignant-Immune Cell Interactions Using Topological Methods, *Writing.*
- GPU-accelerated Solver for Nonlinear Heat Conduction with Surface-To-Surface Radition, *Finalizing numerical tests.*

- Analysis of MILU under Dirichlet Boundary Conditions: Focusing on Variable Coefficient Poisson Equation in Quadtree Applications, *Writing*.
- Convergence Proof of Over-relaxed Methods for Tensor Diffusion on Polyhedral Meshes, *Concept design*.