Na Lei

Curriculum Vitae

School of Software Technology
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"Where there is matter, there is geometry."
— *Johannes Kepler*

Experiences

2016.06-Now	**Professor**, *School of Software Technology*, Dalian University of Technology (DUT), China.
2015.10-2016.09	**Visiting Professor**, *Yau Mathematical Sciences Center*, Tsinghua University, China.
2014.09-2015.09	**Visiting Professor**, *Computer Science Department*, Stony Brook University (SBU), USA.
2009.09-2016.06	**Professor**, *School of Mathematics*, Jilin University (JLU), China.
2007.09-2008.08	**JTO Research Fellow**, *Institute for Computational Engineering and Sciences*, The University of Texas at Austin (UT Austin), USA.
2005.09-2006.02	**Visiting Scholar**, *Academy of mathematics and Systems Science*, Chinese Academy of Sciences (CAS), China.
2004.12-2009.09	**Associate Professor**, *School of Mathematics*, Jilin University (JLU), China.
2001.11-2004.12	**Assistant Professor**, *School of Mathematics*, Jilin University (JLU), China.

Educations

1998.09-2002.06	**Ph.D in Mathematics**, *Institute of Mathematics*, Jilin University, China. Advisor: Dr. Guochen Feng
2003.04-2005.03	**B.S. in Mathematics**, *Department of Mathematics*, Jilin University, China. Advisor: Dr. Guochen Feng

Teaching Courses

Calculus, Linear Algebra, Numerical Algebra, Fuzzy Mathematics, Computational Algebraic Geometry, Analytic Geometry, Information Theory, Computer Algebra, Scientific Computation, Higher Engineering Mathematics, Statistics and Scientific Computing Methods, Numerical Algorithms for Nonlinear Problems

Professional Services

Conference Services (Selected)

2012	15th Chinese-American Symposium on Kavli Frontiers of Science, **Session Organizer**
2013	National Conference on Geometric Design and Computation, **Program Vice-Chair**
2013	National Conference on Computer Mathematics, **Organization Chair**

2016	32nd International Symposium on Computational Geometry, **Workshop Organizer**

Invited Talks

2016.09.29	**Optimal Mass Transportation for Shape Analysis**, YSSEC 2016, Academy of Mathematics and System Science, CAS, Beijing, China
2016.06.16	**Applications of Optimal Mass Transportation**, SoCG 2016 Tutorial, Boston, USA
2016.05.28	**Surface Meshing with Curvature Convergence**, Yau Mathematical Sciences Center, Tsinghua University, China
2016.05.13	**Optimal Mass Transportation for Shape Analysis**, Yau Mathematical Sciences Center, Tsinghua University, China
2016.01.21	**Geometric Methods in Computer Graphics and Computer Vision**, Dalian University of Technology, Dalian, China
2015.12.09	**Quadrilaterial Remeshing Based on Holomorphic Differentials**, Institute of Applied Phisics and Computational Mathematics, Beijing, China
2015.11.04	**Quadrilaterial Remeshing Based on Holomorphic Differentials**, Academy of Mathematics and System Science, CAS, Beijing, China
2015.11.03	**Computing Hyper-Elliptic Symmetry for General Riemann Surfaces**, Academy of Mathematics and System Science, CAS, Beijing, China
2015.06.02	**Mathematical Foundation for Virtual Clothing**, Harvard University, Boston, USA
2014.12.09	**Introduction to Computational Algebraic Geometry**, State University of New York at Stony Brook, New York, USA
2013.05.25	**The Stable Interpolation Space for Multivariate Birkhoff Interpolation**, Inner Mongolia University for Nationalities, Tongliao, China
2012.10.23	**Multivariate Birkhoff Interpolation**, Academy of Mathematics and System Science, CAS, Beijing, China
2011.11.11	**Computational Methods for Multivariate Birkhoff Interpolation**, Dalian University of Technology, Dalian, China
2010.05.22	**Multivariate Birkhoff Interpolation**, Xiamen University, Xiamen, China
2009.09.03	**A Fast Algorithm for Multivariate Birkhoff Interpolation**, Shandong University, Jinan, China
2008.10.25	**Symbolic Computation and Its Applications**, 5th Science and Technology Conference of Jilin Province, Changchun, China
2007.10.04	**On Multivariate Rational Interpolation**, University of Texas at Austin, Austin, USA
2007.09.27	**Blending of Implicit Surfaces**, University of Texas at Austin, Austin, USA
2005.10.15	**On Multivariate Rational Interpolation**, Academy of Mathematics and System Science, CAS, Beijing, China

Grants (Selected)

2013.01-2016.12 **The research on multivariate non-ideal interpolation**, National Natural Science Foundation of China (No.11271156) Principal

2014.01-2016.12 **The Study of invariant characters of image under rigid transformation**, The technological creative plan of Jilin province (No.20130522104JH) Principal

2011.01-2013.12 **The computer mathematical methods for multivariate algebraic interpolation**, National Natural Science Foundation of China (No.11171133) Participant

2007.01-2009.12 **The research on the theory and algorithm of multivariate rational interpolation using constructive algebraic geometry**, National Natural Science Foundation of China (No.10601020) Principal

2005.01-2007.12 **The theory of algebraic geometry and feasible algorithms for some problems in CAGD**, National Natural Science Foundation of China (No.10471055) Participal

2005.01-2007.12 **The application of the theory of algebraic geometry in multivariate polynomial interpolation**, The science and technology plan of Jilin Province (No.2005077) Principal

Research Sketch

My core research interests are applying modern differential-algebraic geometry for applications in engineering and medicine fields, mainly focus on computational conformal geometry, computational topology and symbolic computations, and their applications in computer graphics, computer vision, geometric modeling and medical imaging. Recently, we focus on

1. Optimal mass transportation theory and applied for surface area-preserving parameterization, volume measure-preserving parameterization.

2. Volumetric hexahedral mesh generation based on surface measured foliation and conformal geometry, which is applied for isogemetric analysis.

3. Geometric big data analysis, especially geometric data clustering /classification based on Wasserstein distance.

4. Dynamic surface registration/tracking, dynamic human expression capture for 3D facial recognition and animation.

5. Surface discretization with curvature measure convergence based on discrete normal cycle theory.

6. Global conformal symmetry analysis for general shapes.

7. Embedding surface and algebraic curve conversion, which gives an algebraic representation for 3D shapes, then it is applied for shape analysis and data retrieval.

Publications

Journals

[29] **Na Lei**, Xiaopeng Zheng, Jian Jiang, Yu-Yao Lin, David Xianfeng Gu, Quadrilateral and hexahedral mesh generation based on surface foliation theory. *Computer Methods in Applied Mechanics and Engineering*. In Press. Available online 19 October 2016.

[28] Kehua Su, Wei Chen, **Na Lei***, Junwei Zhang, Kun Qian, Xianfeng Gu, Volume Preserv-

ing Parameterization Based on Optimal Mass Transportation. *Computer-Aided Design*, 2016. http://www.sciencedirect.com/science/article/pii/S0010448516300495

[27] Kehua Su, Wei Chen, **Na Lei***, Li Cui, Jian Jiang, Xianfeng Gu, Measure Controllable Volumetric Mesh Parameterization, *Computer-Aided Design*, 2016(78):188–198.

[26] Kehua Su, Cui Li, Kun Qian, **Na Lei**, Junwei Zhang, Min Zhang, Xianfeng Gu, Area-preserving Mesh Parameterization for Poly-Annulus Surfaces Based on Optimal Mass Transportation, *Journal of Computer Aided Geometric Design*, 2016. http://www.sciencedirect.com/science/article/pii/S0167839616300528.

[25] Xiaopeng Zheng, Junjie Chai, Mengci Song, **Na Lei***, On minimal monomial basis of Birkhoff interpolation problem, *Journal of Systems Science & Complexity*, 2016(29):825-841.

[24] Ming Ma, **Na Lei**, Kehua Su, Junwei Zhang, Chengfeng Wen, Li Cui, Xin Fan, Xianfeng Gu. Surface-based shape classification using Wasserstein Distance. *Geometry, Imaging and Computing*, Vol. 2, No. 4 (2015), pp. 237-255.

[23] Peng Xia; Shugong Zhang; **Na Lei***; Zhangyong Kim, The Fitzpatrick-Neville-Type Algorithm for Multivariate Vector-Valued Osculatory Rational Interpolation, *Journal of Systems Science & Complexity*, 2015(28):222-242.

[22] Kai Cui; **Na Lei***, Stable monomial basis for multivariate Birkhoff interpolation problems, *J. Comp. Appl. Math.*, 2015(277):162–170.

[21] **Na Lei**; Yuan Teng; Yuxue Ren, A fast algorithm for multivariate Hermite interpolation, *Appl. Math. J. Chinese Univ.* 2014, 29(4): 438-454.

[20] Peng Xia; Shugong Zhang; **Na Lei***, The Neville-Like Form of the Fitzpatrick Algorithm for Rational Interpolation, *Numerical Algorithms*, 2012(61):105-120.

[19] Qiuzhan Zhou, Jian Xu, **Na Lei***, Dane Wu, OCDs reliability screening using normalization variance of noise spectrum, *Applied Mechanics and Materials*, Vols. 130-134 (2012) pp 72-75.

[18] **Na Lei**, Junjie Chai, Peng Xia, Ying Li*, A Fast Algorithm for Multivariate Birkhoff Interpolation Problem, *J. Comp. Appl. Math.*, Volume 236, Issue 6, 15 October 2011, Pages 1656-1666.

[17] Peng Xia; Shugong Zhang; **Na Lei**, A Fitzpatrick algorithm for multivariate rational interpolation, *J. Comp. Appl. Math.*, 235(2011): 5222-5231

[16] Junjie Chai, **Na Lei***, Ying Li, Peng Xia, The Proper Interpolation Space of Multivariate Birkhoff Interpolation, *J. Comp. Appl. Math.*, 235 (2011) 3207–3214.

[15] Peng Li, Tian Dong, **Na Lei**, Constructive theory of multivariate rational interpolation of degree zero with algorithm, *Numerical Mathematics A Journal of Chinese Universities*, 32(4), 2010, 303-314. (In Chinese)

[14] Ying Li, Qigang Shang, **Na Lei**, Fuzzy Multiresolution Neural Networks, *Lecture Notes in Aritificial Intelligence*, V5855, 2009, 369-378

[13] C. Bajaj, A. Paoluzzi, S. Portuesi, **N. Lei**, W. Zhao, Boolean Set Operations with Cubic Algebraic Patches, *Computer-Aided Design and Applications*, 5(5), 2008, 730-742.

[12] Bingjun Zhan, Genzhu Bai, **Na Lei***, Blending Algebraic Surfaces Using Quadric Surfaces, *Journal of Jilin Univ. (Science Edition)*, 45(4), 2007, 562-565. (In Chinese)

[11] Genzhu Bai, Bingjun Zhan, **Na Lei***, Blending of Two Cylinders with Axes in Different Planes, *Journal of Jilin Univ.(Science Edition)*, 45(2), 2007, 216-218. (In Chinese)

[10] **Na Lei**, Tingzhan Liu and Shugong Zhang, Some problems on multivariate rational interpolation, *Journal of Information and Computational Science*, 3:3 (2006), 453-461.

[9] Tian Dong, Peng Li and **Na Lei***, Existence Condition for Multivariate Rational Interpolation of Zero Degree and Related Algorithm, *Journal of Jilin Univ.(Science Edition)*, 44(6), 367-369, 2006. (In Chinese)

[8] **Na Lei**, Shugong Zhang, Tian Dong and Guochen Feng. The existence and expression of osculatory rational interpolation, *Journal of Information and Computational Science*, 2:3 (2005), 493-500.

[7] Tian Dong, Shugong Zhang and **Na Lei**. Interpolation basis for nonuniform rectangular grid, *Journal of Information and Computational Science*, 2: 4 (2005), 671-680.

[6] Yurong Li, **Na Lei***, Shugong Zhang and Guochen Feng. Constructive Theory and Algorithm for Blending Several Implicit Algebraic Surfaces, *Lecture Notes in Computer Science*, Volume 3519, 83-96, 2005

[5] Tingzhan Liu, **Na Lei** and Shaotian Chen. Existence condition of Cauchy multivariate rational interpolation, *Journal of Jilin Univ.(Science Edition)*, 42(3), 356-358, (2004) (In Chinese)

[4] Shugong Zhang, Yurong Li and **Na Lei**. Existence Criteria of Blending Surfaces of Three Quadric Surfaces—Wu Wen-tsun's Formulae, *Northeast Math. J.* 19(3), 201-204, 2003

[3] Yurong Li, **Na Lei** and Shugong Zhang, Existence Criterion of Blending Several Quadratic Surfaces with the Lowest Degree Surface, *Journal of Jilin Univ.(Science Edition)*, 41(2), 157-158, 2003 (In Chinese)

[2] **Na Lei**, Li Cui and Tieru Wu, Blending Tubes Whose Axes are Non-coplanar, *Journal of Jilin Univ.(Science Edition)*, 40(2),138-140, 2002 (In Chinese)

[1] Tieru Wu, **Na Lei** and Jinsan Cheng. Wu Wen-tsun Formulae for the Blending of Pipe Surfaces, *Northeast Math. J.* 17(4), 383-386, 2001

Conferences

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[8] Y. M. Qin, L. Chen, B. F. Chen and **N. Lei**, Optimal design of QR code encoding, *In: Control Engineering and Information Systems - Proceedings of the International Conference on Control Engineering and Information System (ICCEIS)*, 2014, Page 333-337.

[7] **Na Lei**; Xiaopeng Zheng; Yuxue Ren, The vanishing ideal of a finite set of points with multiplicity structures, *In: Computer Mathematics, 10th Asian Symposium (ASCM2012)*, Beijing, October 2012,

[6] C. Bajaj, R. Bettadapura, **N. Lei**, A. Mollere, C. Peng and A. Rand, Constructing A-Spline Weight Functions for Stable WEB-Spline Finite Element Methods, *ACM Symposium on Solid and Physical Modeling (SPM)*, 2010. 153-158.

[5] **Na Lei**, Jiao Du, Qiuzhan Zhou* and Dane Wu, Fitting Noise Power Spectrum Parameter By Squared Distance Minimization, *International Conference on Computer Science and Software Engineering (CSSE)* 2009

[4] Ying Li, **Na Lei**, Jian Ma, Statistical Analysis of Gene Co-expression Networks by Maximal Overlap Discrete Wavelet Transform, *2nd International Conference on Biomedical Engineering and Informatics*, 2009, ISBN: 978-1-4244-4134-4, 731-735.

[3] **Na Lei**, Shugong Zhang and Guochen Feng. On osculatory rational interpolation, *International Symposium on Computing and Its Applications in Information Science 2005 (Hefei)*. In: Advances in Information & Computational Science, Renghong Wang, Jieqing Tan (eds), Press of University of Science and Technology of China, 2005, 88-93

[2] Yurong Li, **Na Lei**, Shugong Zhang and Guochen Feng. Constructive and Recurring Method for Blending Implicit Quadratic Surfaces, *Chinagraph'2004*, 120-126 (2004) (In Chinese)

[1] **Na Lei**, Tieru Wu and Guochen Feng. Wu Wen-tsun Formulae for the Blending of Quadratic Surfaces, *Proceedings of the First International Comgress of Mathematical Software 2002 (Beijing)*. In: Mathematical software, Arjeh M. Cohen, Xiao-Shan Gao and Nobuki Takavama(eds), 372-378, World Sci. Publishing, London, 2002.

Textbook

[1] Shugong Zhang, **Na Lei**, Tingzhan Liu, *Basic Computer Algebra*. Science Press, 2005. (In Chinese)