

# CURRICULUM VITAE

Vasileios Vavourakis

Centre for Medical Image Computing, Department of Medical Physics & Biomedical Engineering  
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## Studies

2002 - 2006: PhD in Mechanical Engineering, Department of Mechanical Engineering & Aeronautics, University of Patras, Greece

1996 - 2001: Diploma in Aeronautics, Department of Mechanical Engineering & Aeronautics, University of Patras, Greece

## Working & Educational Experience

June 2013 - *present*: Senior Research Associate, Centre for Medical Image Computing, Department of Medical Physics & Biomedical Engineering, University College London, UK

September 2012 - May 2013: Visiting Lecturer, Department of Civil & Environmental Engineering, University of Cyprus, Cyprus

October 2010 - September 2012: Research Associate, Department of Civil & Environmental Engineering, University of Cyprus, Cyprus

Academic year 2009 - 2010: Visiting Lecturer, Department of Production Engineering & Management, Technical University of Crete, Greece

April 2008 - October 2010: Research Associate, Foundation for Research and Technology-Hellas (FORTH), Greece

Academic years 2002-2003, 2003-2004: Teaching Assistant, Dept. of Mechanical Engineers & Aeronautics, University of Patras, Greece

July - August 2000: Training project in Non-Destructive Testing, Envirocoustics S.A.<sup>1</sup> company

July - August 1997: Training project in Industrial Plastic Fabrication, Plastika Kritis S.A.<sup>2</sup> company

## Grants, Awards & Patents

- Marie Curie Intra-European Fellowship, European Research Agency; Project: *iBeSuP*: “Towards the simulation of breast surgical lumpectomy and surgery planning through an isogeometric numerical analysis approach” (~ €240k)
- Three awards from the Greek Foundation of Scholarships (IKY) while an undergraduate at the University of Patras.
- B. Eiben, S. Kabus, T. Bülow, C. Lorenz, D.J. Hawkes, J.H. Hipwell, V. Vavourakis “Device, Imaging System and Method for Correction of a Medical Breast Image” [International Application No. PCT/EP2017/053336; Patent Filed: February 15, 2017]

## Memberships

- International Association of Computational Mechanics (IACM)

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<sup>1</sup> <http://www.envirocoustics.gr/>

<sup>2</sup> <http://www.plastikakritis.com/>

- UK Association of Computational Mechanics in Engineering (ACME-UK)
- Technical Chamber of Greece (TEE)
- Marie Curie Alumni Association

### Participation in Research Projects

Febr. 2015 - *present*: MC-IEF iBeSuP project (*grant code FP7-PEOPLE 627025, EU funding*)  
 June 2013 - January 2016: VPH-PICTURE project (*grant code FP7-ICT 600948, EU funding*)  
 June 2013 - January 2015: MIMIC project (*grant code EPSRC EP/K020439/1, UK funding*)  
 Oct. 2010 - Sept. 2012: SLOSTAPILES project (*UCY internal research grant 110/2009*)  
 Sept. 2009 - Oct. 2010: OCTOPUS project (*grant code FP7-IP 231608, EU funding*)  
 January 2009 - June 2009: GOAHEAD project (*grant code IIIIE00086-1-1, Greek funding*)  
 Nov. 2008 - June 2009: UFAST project (*grant code IIIIE00114-1-1, Greek funding*)  
 April 2008 - Oct. 2008: “Polos Kainotomias” project (*grant code KΠΣ00148-1-1, Greek funding*)  
 Sept. 2002 - 2006: PENED 2001 project (*Greek Secretariat of Research & Technology*)

### Fields of Scientific Interest

- Continuum mechanics; Non-linear solids & structures; Mathematical biology
- Mathematical & computational modelling in multiphysics and multiscale problems
- Computer methods: Boundary Elements, Finite Element Method, Isogeometric Analysis, Mesh-free methods
- Development and application of fluid-solid and solid-solid interaction numerical methods in aeronautics, applied mechanics and bioengineering
- High-performance computing (HPC): parallel programming through CPU-/GPU-based procedures; object-oriented programming

### Journal Publications & Book Chapters

V. Vavourakis, P. Wijeratne, T. Stylianopoulos 2017. “Quantitative Dynamic Analysis of Cytotoxic Cancer Drug Delivery Through an In-Silico, Multiscale, Multiphysics Model,” *Microvascular Research (Under Submission)*

P. Wijeratne, J.H. Hipwell, D.J. Hawkes, T. Stylianopoulos, V. Vavourakis 2017. “Multiscale biphasic tumour mechanics: the effect of collagen microstructure on peritumoural fluid flow,” *PLOS ONE (Accepted)*

V. Vavourakis, P. Wijeratne, R. Shipley, M. Loizidou, T. Stylianopoulos, D.J. Hawkes 2017. “A validated multiscale in-silico model for mechano-sensitive tumour angiogenesis and growth,” *PLOS Computational Biology*, doi: 10.1371/journal.pcbi.1005259

V. Vavourakis, B. Eiben, J. Hipwell, N.R. Williams, M. Keshtgar, D.J. Hawkes 2016. “Multiscale Mechano-Biological Finite Element Modelling of Oncoplastic Breast Surgery—Numerical Study towards Surgical Planning and Cosmetic Outcome Prediction,” *PLOS ONE* 11(7), doi:10.1371/journal.pone.0159766

J. Hipwell, V. Vavourakis, L. Han, T. Mentzanidou, B. Eiben, D.J. Hawkes 2016. “A review of biomechanically informed breast image registration,” *Physics in Medicine and Biology* 61(2): R1-R31.

- K. Tzirakis, L. Botti, V. Vavourakis, Y. Papaharilaou 2016. "Numerical modeling of non-Newtonian biomagnetic fluid flow," *Computers & Fluids*, doi:10.1016/j.compfluid.2015.11.016
- B. Eiben, V. Vavourakis, J.H. Hipwell, S. Kabus, T. Buelow, C. Lorenz, T. Mertzanidou, S. Reis, N.R. Williams, M. Keshtgar, D.J. Hawkes 2015. "Symmetric biomechanically guided prone-to-supine breast image registration," *Annals of Biomedical Engineering*, doi:10.1007/s10439-015-1496-z
- B. Eiben, R. Lacher, V. Vavourakis, J.H. Hipwell, D. Stoyanov, N.R. Williams, J. Sabczynski, T. Bülow, D. Kutra, K. Meetz, S. Young, H. Barschdorf, H.P. Oliveira, J.S. Cardoso, J.P. Monteiro, H. Zolfagharnasab, R. Sinkus, P. Gouveia, G.-J. Liefers, B. Molenkamp, C.J.H. van de Velde, D.J. Hawkes, M.J. Cardoso, M. Keshtgar 2016. "Breast Conserving Surgery Outcome Prediction: A Patient-Specific, Integrated Multi-modal Imaging and Mechano-Biological Modelling Framework," In *Lecture Notes in Computer Science*, eds. A. Tingberg and K. Lång, Springer, pp. 274-281 (*Book Chapter*).
- V. Vavourakis, J. Hipwell, D.J. Hawkes 2015. "An inverse  $u/p$ -finite element formulation to predict the unloaded state of in vivo biological soft tissues," *Annals of Biomedical Engineering*, doi:10.1007/s10439-015-1405-5
- P.A. Wijeratne, V. Vavourakis, J.H. Hipwell, C. Voutouri, P. Papageorgis, et al. 2015. "Multiscale modelling of solid tumour growth: the effect of collagen micromechanics," *Biomechanics and Modeling in Mechanobiology*. doi:10.1007/s10237-015-0745-2.
- E. Metaxa, N. Kontopodis, V. Vavourakis, K. Tzirakis, C.V. Ioannou, Y. Papaharilaou 2014. "The Influence of Intraluminal Thrombus on Noninvasive Abdominal Aortic Aneurysm Wall Distensibility Measurement," *Medical & Biological Engineering & Computing*, 53(4):299-308.
- D. Loukidis, V. Vavourakis 2014. "Limit lateral resistance of vertical piles in plane strain," *Numerical Methods in Geotechnical Engineering*, eds. M.A. Hicks, R.B.J. Brinkgreve and A. Rohe, CRC Press, pp. 681-685 (*Book Chapter*). doi:10.1201/b17017-122
- A. Kazakidi, V. Vavourakis, D.P. Tsakiris, J.A. Ekaterinaris 2014. "A numerical investigation of flow around octopus-like arms: near-wake vortex patterns and force development," *Computer Methods in Biomechanics and Biomedical Engineering* 18(12): 1321-1339.
- V. Vavourakis, D. Loukidis, D. Charmpis, P. Papanastasiou 2013. "A robust finite element approach for large deformation elastoplastic plane-strain problems," *Finite Elements in Analysis and Design*, 77: 1-15.
- V. Vavourakis, D. Loukidis, D. Charmpis, P. Papanastasiou 2013. "Assessment of remeshing and remapping strategies for large deformation elastoplastic Finite Element analysis," *Computers and Structures*, 114-115: 133-146.
- V. Vavourakis, A. Kazakidi, D.P. Tsakiris, J.A. Ekaterinaris 2012. "A non-linear dynamic finite element analysis of skeletal muscles and muscular hydrostats," *Computer Methods in Biomechanics and Biomedical Engineering*, doi:10.1080/10255842.2012.723702
- V. Vavourakis, Y. Papaharilaou, J.A. Ekaterinaris 2011. "Coupled fluid-structure interaction hemodynamics in a zero-pressure state corrected arterial geometry," *Journal of Biomechanics*, 44: 2453-2460.
- V. Vavourakis 2009. "A meshless Local Boundary Integral Equation method for two-dimensional steady elliptic problems," *Computational Mechanics*, 44: 777-790.
- V. Vavourakis, V.C. Protopappas, D. Fotiadis, D. Polyzos 2009. "Numerical determination of modal dispersion and AE signal characterization in waveguides through a LBIE/BEM and time-frequency analysis," *Computational Mechanics*, 43: 431-441.
- V. Vavourakis 2008. "A Local Hypersingular Boundary Integral Equation method using a triangular background mesh," *Computer Modeling in Engineering & Sciences*, 36: 119-145.
- V. Vavourakis, V.I.C. Protopappas, D.I. Fotiadis, D. Polyzos 2007. "AE signal characterization in fuel tanks through a LBIE/BEM and Time-Frequency analysis scheme," In *Advances in Boundary Element Techniques VIII*, eds. V. Minutolo and M.H. Aliabadi, EC Ltd Publications, pp. 167-172 (*Book Chapter*).

- V. Vavourakis, D. Polyzos 2007. “A MLPG4(LBIE) formulation in elastostatics,” *Computers, Materials & Continua*, 5: 185-196.
- V. Vavourakis, D. Polyzos 2006. “A MLPG(LBIE) numerical method for solving 2D incompressible and nearly incompressible elastostatic problems,” *Communications in Numerical Methods in Engineering*, 24: 281-296.
- V. Vavourakis, D. Polyzos 2006. “A MLPG4(LBIE) formulation for solving axisymmetric problems,” In *Advances in Meshless Methods*, eds. J. Sladek and V. Sladek, Tech Science Press, pp. 291-316 (*Book Chapter*).
- V. Vavourakis, E.J. Sellountos, D. Polyzos 2006. “A comparison study on different MLPG(LBIE) formulations,” *Computer Modeling in Engineering & Sciences*, 13: 171-183.
- E.J. Sellountos, V. Vavourakis, D. Polyzos 2005. “A new Singular/Hypersingular MLPG(LBIE) method for 2D elastostatics,” *Computer Modeling in Engineering & Sciences*, 7: 35-47.

### Invited Talks & Seminars

- “Macro- to microscale modelling procedures of solid tumour biomechanics,” Leeds Univ., UK 2016.
- “Mathematical and computational multiscale modelling of cancer mechano-biology,” University of Glasgow, UK 2016.
- “Cancer Growth and Angiogenesis: A Validated In-silico 3D Multiscale Modelling Platform,” Strathclyde University, UK 2016.
- “In-silico Cancer Biophysics,” Replacement of Animals in Research Conference, University College London, UK 2016.
- “A novel methodology to mathematically model the tumour—host microenvironment coupled with angiogenesis,” Mathematical Institute, University of Oxford, UK 2016.
- “In-silico modelling of cancer growth & angiogenesis: Solid mechanics plays an important role in tumour vascularization,” Centre for Advanced Biomedical Imaging, UCL, UK 2016.
- “Mechano-biological modelling in Breast Cancer Research: Bridging the gap between scales,” Biozentrum, University of Basel, Switzerland 2015.
- “Large deformation analysis of elastoplastic problems through a non-linear Finite Element approach,” University of La Coruña, Spain 2013.
- “Finite element numerical simulation of large deformation problems in Geomechanics,” University of Cyprus, Cyprus 2012 (*Seminar*).

### Conference Presentations & Proceedings

- V. Vavourakis, B. Eiben, J.H. Hipwell, N.R. Williams, M. Keshtgar, D.J. Hawkes 2016. “In-silico modelling of oncoplastic breast surgery: surgical planning & cosmetic outcome prediction,” Biomechanics Symposium, University of Bath, UK.
- B. Eiben, R. Lacher, V. Vavourakis, J.H. Hipwell, D. Stoyanov, et al. 2016. “Breast Conserving Surgery Outcome Prediction: A Patient-Specific, Integrated Multi-Modal Imaging and Mechano-Biological Modelling Framework,” *Breast Imaging: 13th International Workshop (IWDM)*, Malmo, Sweden. doi:10.1007/978-3-319-41546-8\_35

- P.A. Wijeratne, V. Vavourakis, J.H. Hipwell, T. Stylianopoulos, A. Evans, S. Pinder, D.J. Hawkes 2016. "Multiscale biphasic modelling of tumour growth: the effect of collagen micromechanics on drug delivery," European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS), Crete, Greece.
- V. Vavourakis, B. Eiben, J.H. Hipwell, N.R. Williams, M. Keshtgar, D.J. Hawkes 2016. "Modelling breast-conserving surgery: A validated 3D, multiscale, mechano-biological, computational framework for surgical planning and cosmetic outcome prediction of breast cancer treatment," European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS), Crete, Greece.
- V. Vavourakis, P.A. Wijeratne, R. Shipley, T. Stylianopoulos, D.J. Hawkes 2016. "The Mechanical Underpinning of Tumour-induced Angiogenesis and Growth," 24<sup>th</sup> Conference on Computational Mechanics (ACME-UK), Cardiff, UK. <https://acme2016.sciencesconf.org/87678>
- B. Eiben, V. Vavourakis, J.H. Hipwell, S. Kabus, et al. 2016. "Surface Driven Biomechanical Breast Image Registration," SPIE Medical Imaging, San Diego, California, USA. doi:10.1117/12.2216728
- P. Wijeratne, V. Vavourakis, T. Stylianopoulos 2015. "Multiscale modelling of the mechanics of solid tumours and interactions with the host tissue," International Conference on Computational Methods for Coupled Problems in Science and Engineering (ECCOMAS-COUPLED), Venice, Italy.
- V. Vavourakis, B. Eiben, J.H. Hipwell, D.J. Hawkes 2014. "Numerical investigation of breast wound healing after tumour resection for the assessment of surgical interventions outcome," 12<sup>th</sup> International Symposium in Computer Methods in Biomechanics & Biomedical Engineering (CMBBE), Amsterdam, Netherlands.
- P. Wijeratne, V. Vavourakis, J.H. Hipwell, D.J. Hawkes 2014. "A biomechanical exploration of collagen fibre realignment associated with cancer spread using a three-dimensional multiscale finite element procedure," 7<sup>th</sup> World Congress of Biomechanics, Boston, Massachusetts, USA (*Poster*).
- V. Vavourakis, B. Eiben, J.H. Hipwell, D.J. Hawkes 2014. "Post breast conserving surgery finite element simulations of wound healing: a preliminary study towards cosmesis," 11<sup>th</sup> World Congress on Computational Mechanics (WCCM XI), Barcelona, Spain.
- B. Eiben, V. Vavourakis, J.H. Hipwell, S. Kabus, C. Lorenz, T. Buelow, D.J. Hawkes 2014. "Breast Deformation Modelling: Comparison of Methods to Obtain a Patient Specific Unloaded Configuration," SPIE Medical Imaging, San Diego, California, USA. doi:10.1117/12.2043607
- D. Loukidis, V. Vavourakis 2014. "Limit lateral resistance of vertical piles in plane strain," Numerical Methods in Geotechnical Engineering, Delft, The Netherlands.
- E. Metaxa, V. Vavourakis, N. Kontopodis, K. Pagonidis, C.V. Ioannou, Y. Papaharilaou 2013. "Abdominal aortic aneurysm rupture risk assessment exploiting dynamic (4D) CT based wall motion data and Finite Element analysis," ASME 2013 Summer Bioengineering Conference, Oregon, USA.
- E. Metaxa, N. Kontopodis, V. Vavourakis, C.V. Ioannou, Y. Papaharilaou 2013. "Redistribution of wall stress in Abdominal Aortic Aneurysm due to nonuniform thrombus deposition," 19<sup>th</sup> Congress of the European Society of Biomechanics (ESB2013), Patras, Greece.
- V. Vavourakis, D. Loukidis, D. Charmpis, P. Papanastasiou 2012. "Large deformation analysis of Geotechnical problems through a non-linear Finite Element approach," 8<sup>th</sup> European Solid Mechanics Conference (ESMC), Graz, Austria.
- A. Kazakidi, V. Vavourakis, N. Pateromichelakis, D.P. Tsakiris, J.A. Ekaterinaris 2012. "Flow patterns around moving octopus-like arms," 10<sup>th</sup> World Congress on Computational Mechanics (WCCM), São Paulo, Brazil.

- V. Vavourakis, D. Bampasakis, A. Kazakidi, N. Pateromichelakis, J.A. Ekaterinaris, D.P. Tsakiris 2012. "Generation of primitive behaviors for non-linear hyperelastic octopus-inspired robotic arm," IEEE International Conference on Biomedical Robotics and Biomechatronics (BioRob), Rome, Italy.
- V. Vavourakis, D. Loukidis, D. Charmpis, P. Papanastasiou 2012. "Comparison of remeshing and remapping techniques for the FE simulation of large deformation elastoplastic problems," International Conference on Computational & Experimental Engineering and Sciences (ICCES), Crete, Greece.
- A. Kazakidi, V. Vavourakis, N. Pateromichelakis, J.A. Ekaterinaris, D.P. Tsakiris 2012. "Hydrodynamic analysis of octopus-like robotic arms," IEEE International Conference on Robotics and Automation (ICRA), St.Paul, Minnesota, USA. doi:10.1109/ICRA.2012.6225037
- V. Vavourakis, A. Kazakidi, D.P. Tsakiris, J.A. Ekaterinaris 2011. "A finite element method for non-linear hyperelasticity applied for the simulation of octopus arm motions," International Conference on Computational Methods for Coupled Problems in Science and Engineering (ECCOMAS-COUPLED), Kos Island, Greece.
- A. Kazakidi, V. Vavourakis, J.A. Ekaterinaris, D.P. Tsakiris 2011. "Computational Investigation of Octopus Arm Hydrodynamics," 4<sup>th</sup> ANSA &  $\mu$ ETA International Conference, Thessaloniki, Greece.
- V. Vavourakis, Y. Papaharilaou, J.A. Ekaterinaris 2010. "Coupled Fluid-Structure Interaction hemodynamics in stress-free state corrected arterial geometry," Hellenic Society of Biomechanics (ELEMBIO), Ioannina, Greece.
- V. Vavourakis, J.A. Ekaterinaris, D.P. Tsakiris 2010. "The Finite Element Method for simulating biological muscular tissues," Hellenic Society of Biomechanics (ELEMBIO), Ioannina, Greece.
- V. Vavourakis, Y. Papaharilaou, J. A. Ekaterinaris 2008. "Fluid Structure Interaction Computations in Arterial Geometries," Hellenic Society of Biomechanics (ELEMBIO), Athens, Greece.
- V. Vavourakis, D. Polyzos 2007. "A new MLPG(LBIE) method for solving elastic problems," ICCES Special Symposium on Meshless & Other Novel Computational Methods (ICCES MM), Patras, Greece.
- V. Vavourakis, V.I. Protopappas, D.I. Fotiadis, D. Polyzos 2007. "AE signal characterization in fuel tanks through a LBIE/BEM and Time-Frequency analysis scheme," International Conference on Boundary Element Techniques (BETEQ), Naples, Italy.
- V. Vavourakis, D. Polyzos 2006. "A new MLPG4(LBIE) method for solving elastic problems," ICCES Special Symposium on Meshless & Other Novel Computational Methods (ICCES MM), Dubrovnik, Croatia.
- V. Vavourakis, D. Polyzos 2006. "A time domain MLPG (LBIE) formulation for solving elastic problems related to Non-Destructive Testing," ICCES Special Symposium on Meshless & Other Novel Computational Methods (ICCES MM), Dubrovnik, Croatia.
- V. Vavourakis, D. Polyzos 2006. "A MLPG(LBIE) numerical method for solving 2D incompressible and nearly incompressible elastostatic problems," International Conference on Boundary Element Techniques (BETEQ), Paris, France.
- V. Vavourakis, D. Polyzos 2005. "A numerical study on the propagation of transient elastic waves in axisymmetric vessels," 7<sup>th</sup> International Workshop of Scattering Theories and Biomedicine, Nymfaio, Greece.
- V. Vavourakis, D. Polyzos 2005. "A MLPG(LBIE) method for solving elastic problems with axisymmetry," ICCES Special Symposium on Meshless & Other Novel Computational Methods (ICCES MM), Stara Lesna, Slovakia.
- E.J. Sellountos, V. Vavourakis, D. Polyzos 2005. "A comparison study on different formulations in the MLPG(LBIE) method," ICCES Special Symposium on Meshless & Other Novel Computational Methods (ICCES MM), Stara Lesna, Slovakia.
- V. Vavourakis, K.G. Tsepoura, D. Polyzos 2003. "Wave propagation in plates with microstructure," 6<sup>th</sup> International Workshop of Scattering Theories and Biomedicine, Tsepelovo, Greece.

V. Vavourakis, D. Polyzos 2003. "A BEM/2D-FFT numerical technique for solving wave propagation problems in damaged plates," International Conference on Computational & Experimental Engineering and Sciences (ICCES), Corfu, Greece.

V. Vavourakis, D. Polyzos 2002. "A BEM/2D-FFT numerical technique for solving wave propagation problems in thin plates and shells," Acoustics 2002, Patras, Greece.