Manos **Kamarianakis**

Computational Geometer · Algorithm Designer · Algebraist · Computer Graphics · HCI

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"A single idea, if it is right, saves us the labor of an infinity of experiences." - Jacques Maritain

Summary

Manos Kamarianakis was born in Chania, Crete, Greece, on 22 March 1986. He is a mathematician researcher that specializes in Computational Geometry. He got his PhD in applied mathematics from University of Crete (UoC), where he studied the Apollonius Diagram of 3D spheres. He holds a M.Sc. (Honors) in mathematics with specialization in applied mathematics, mainly concerning the design and analysis of algorithms for problems involving mathematics. He also holds 2 bachelor degrees, both in pure (Honors) and applied mathematics (Honors).

For the past 2 years, he is a member of Foundation for Research and Technology Hellas - Institute of Computer Science (FORTH-ICS) spinoff startup ORamaVR. His role in ORamaVR as the R&D director involves the design of innovative, geometric-based algorithms, suitable for Augmented, Virtual and Mixed Reality. He currently leads the development of the Cut/Tear/Drill (CTD) module, which consists a major step towards revolutionizing VR medical training. He is also the deputy ORamaVR coordinator in the 5G-Epicentre Horizon2020 EU project working in advanced medical HCI applications in 5G edge cloud computing environments. His vision in the Human-Computer Interaction field is to utilize the effectiveness of GPU programming and the benefits of various mathematical tools, such as Clifford (and higher-dimension) algebras and/or machine learning, as building blocks for optimized algorithms that will effectively tackle problems in computer graphics, robotics or adjacent research fields.

Manos was, until August 2021, a post-doctoral researcher in the Department of Mathematics & Applied Mathematics, UoC, focusing on research topics regarding Algebra, Logic and Number theory.

Professional Experience

Post-Doctoral Researcher and R&D Director

July 2019 - present

ORamaVR Company — *Heraklion, Greece*

- Team Leader: Prof. George Papagiannakis
- Applications of Clifford Algebra and Conformal Geometric Algebra (CGA) in Computer Graphics
- Animation, deformation, cutting and tearing skinned models via CGA
- Computer graphics systems for human computer interaction in mixed reality

Post-Doctoral Researcher

Apr. 2020 - Aug. 2021

University of Crete — *Heraklion, Greece*

- Team Leader: Prof. Athanasios Pheidas
- Diophantine Problems in Logic and Number Theory (ESPA Project)
- Research regarding abc-conjecture and related problems
- Decidability and Undecidability over certain languages and rings

Researcher

Feb. 2016 - Sept. 2016

University of Athens — *Athens, Greece*

- Team Leader: Prof. Ioannis Emiris
- Thales Project: Advanced Geometric Computing and Critical Applications (ESPA Project)
- Study of Apollonius diagrams of 3D spheres.
- Predicate design for Voronoi diagrams.

Conference Papers

C1. **Kamarianakis, M.**, & Karavelas, M. I. Analysis of the Incircle predicate for the Euclidean Voronoi diagram of axes-aligned line segments. In W. Didimo & G. Liotta (Eds.), Proceedings of the 28th European Workshop on Computational Geometry (EuroCG 2012) (pp. 117–120). March 2012.

C2. **Kamarianakis, M.**. The EdgeConflict Predicate in the 3D Apollonius Diagram. In Proceedings of the 6th International Conference on Analytic Number Theory and Spatial Tessellations. September 2018.

C3. Papagiannakis, G., Zikas, P., Lydatakis, N., Kateros, S., Kentros, M., Geronikolakis, E., **Kamarianakis, M.**, Kartsonaki, I., Evangelou, G. MAGES 3.0: Tying the knot of medical VR. ACM SIGGRAPH 2020 Immersive Pavilion, 1–2. August 2020.

C4. **Kamarianakis, M.**, Papagiannakis, G. Deform, Cut and Tear a skinned model using Conformal Geometric Algebra. CGI20. October 2021.

C5. Zikas, P., **Kamarianakis, M.**, Kartsonaki, I., Lydatakis, N., Kateros, S., Kentros, M., Geronikolakis, E., Evangelou, G., Apostolou, A., Catilo, P. A. A., Papagiannakis, G. Covid-19 - VR Strikes Back: Innovative medical VR training. ACM SIGGRAPH 2021 Immersive Pavilion. August 2021.

C6. **Kamarianakis, M.**, Lydatakis, N., Papagiannakis, G. Never "Drop the Ball" in the Operating Room: An efficient hand-based VR HMD controller interpolation algorithm, for collaborative, networked virtual environments. CGI21. September 2021.

C7. Chompitaki, D., **Kamarianakis, M.**, Pheidas, T. Decidability of the theory of addition and the Frobenius map in fields of rational functions. Panhellenic Logic Symbosium. August 2021.

C8. **Kamarianakis, M.**, Lydatakis, N., Protopsaltis, A., Petropoulos, J., Tamiolakis, M., Zikas, P., Papagiannakis, G.. "Deep Cut": An all-in-one Geometric Algorithm for Unconstrained Cut, Tear and Drill of Soft-bodies in Mobile VR. SIGGRAPH ASIA 2021. (Submitted) 2021.

Journal Papers

J1. **Kamarianakis, M.**, Papagiannakis, G. An All-in-One Geometric Algorithm for Cutting, Tearing, and Drilling Deformable Models. Advances in Applied Clifford Algebras, 31(3), 58. May 2021.

J2. Chompitaki, D., **Kamarianakis, M.**, Pheidas, T. Decidability of the theory of addition and the Frobenius map in rings of rational functions. ArXiv:2107.11266 [Math]. (Submitted) July 2021.

J3. Chompitaki, D., **Kamarianakis, M.**, Pheidas, T. Notes on the decidability of Addition and the Frobenius map for polynomials and rational functions. (Submitted) July 2021.

J4. Zikas, P., Kateros, S., Lydatakis, N., Kentros, M., Geronikolakis, E., **Kamarianakis, M.**, Evangelou, G., Kartsonaki, I., Apostolou, A., Birrenbach, T., Exadaktylos, A. K., Sauter, T. C., G. Papapagiannakis (Submitted). Virtual reality medical training for Covid-19 swab testing and proper handling of personal protective equipment: development and usability. (Submitted) August 2021.

Honors & Awards

Scholarships

2011	**Scholarship**, to obtain a Ph.D., 4 years duration	*Onassis Foundation*
2011	**Scholarship**, to obtain a Ph.D., declined due to Onassis Scholarship mutual exclusiveness	*ELKE*
2009	**Scholarship «Maria Manasaki»**, for performance excellency in graduate studies	*University of Crete*
2004	**State Scholarship**, for performance excellency in undergraduate studies	*IKY*
2004	**State Scholarship**, for performance excellency in undergraduate studies	*IKY*

Education

University of Crete, Department of Mathematics & Applied Mathematics — *January 2019*

Ph.D. in Applied Mathematics — *Heraklion, Greece*

- Thesis: «Predicates for the 3D Apollonius Diagram», Supervisor: Menelaos Karavelas

University of Crete, Department of Applied Mathematics — *September 2014*

B.S. in Applied Mathematics — *Heraklion, Greece*

- Specialization: Mathematical Methods and Software Development
- Honors, 8.78

University of Crete, Department of Mathematics & Department of Applied Mathematics — *July 2011*

M.S. in Mathematics — *Heraklion, Greece*

- Interdepartmental Program: «Foundations of Computer Science»
- Honors
- Thesis: «Predicates for Euclidean Voronoi diagram of axis- aligned and ortho-45 line segments», Supervisor: Menelaos Karavelas

University of Crete, Department of Mathematics — *September 2008*

B.S. in Pure Mathematics — *Heraklion, Greece*

- Honors, 8.51
- Thesis: «Deterministic Primality Testing: The theorem of Agrawal, Kayal and Saxena», Supervisor: Yannis Antoniadis

Teaching Experience

I was a teaching assistant in the Department of Mathematics, University of Crete from 2005 to 2014. After 2014, I have been a private tutor for students of the same department.

Among the courses I have taught, both as a teaching assistant and a private tutor, are: Algebra, Number Theory, Logic, Probabilities, Analysis and Design of Algorithms, Discrete Mathematics, Numerical Analysis, Numerical Solution of ODEs, Cryptology, Linear Algebra, Analytic Geometry, Group Theory, Galois Theory, Analysis and Foundation of Mathematics. I have also helped students with programming in various languages/frameworks such as Python, C/C++, Maple, Matlab, Latex/Xetex/Bibtex and Ipe (graphics editor). Finally, I trained students for GRE-general and GRE-mathematics tests.

Extracurricular Information

Computer Skills

All OS (Windows,MacOS, Unix/Linux), Python, Jupyter ,C/C++, GPU programming, OpenGL, Maple, Matlab, Latex/XeLatex/Bibtex, Ipe, Git, SVN, Office

Languages

Greek: Native, English: Fluent, French: Fair

Military Obligations Fulfilled *May 2017 - Feb. 2018*

President of Heraklion Bridge Club *June 2016 - present*