

ZIQU ZENG

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EDUCATION

University of Strasbourg

Strasbourg, France

Ph.D. Degree

Sept. 2019 – Sept. 2023

- Research Interests: Physics-Based Simulations (Deformation, Contact and Friction, Cutting); Finite Element Method; Real-Time Simulations; Medical Images; GPU-based Parallelization
- Ph.D. Thesis: *Towards real-time performance in large-scale physics-based simulations*

University of Technology of Troyes

Troyes, France

Engineering Degree in Automation

Sept. 2016 – Mar. 2019

- Control System; Modeling, Manipulation and Programming of Robots; Signal Processing and Data Science

University of Shanghai

Shanghai, China

Bachelor Degree in Computer Science

Sept. 2013 – Sept. 2017

- Applied Mathematics; Algorithm and Programming; Electronic Engineering; Embedded Techniques

PUBLICATIONS

1. Fast But Accurate: A Real-Time Hyperelastic Simulator with Robust Frictional Contact. *SIGGRAPH 2025 & ACM Transaction on Graphics*. (First Author)
2. Real-Time FE simulation for Large-Scale Problems using Precondition-Based Contact Resolution and Isolated DOFs Constraints, *Computer Graphics Forum 2022*. (First Author)
3. Dynamic Cutting Simulation using Elastic Snapping for Mesh Quality Optimization, *Computer Graphics Forum 2025*. (First Author)
4. Efficient Needle Insertion Simulation using Hybrid Constraint Solver and Isolated DOFs. *Eurographics 2023*.
5. SOFA++: A Real-Time GPU-based Surgical Robotics Simulator with Robust Frictional Contact. *ICRA 2025 Workshop*.

RESEARCH EXPERIENCE

Human-Centered Robotic Lab (HcRL)

National University of Singapore

Singapore

Research Manager

July. 2025 – Now

Learning World Model with Differentiable Physics

Differentiable Simulation is useful and order extra gradient information for robotics control and learning. We designed high-performance and high-fidelity differentiable simulator for rigid-soft dynamics and interactions, applying on real robot tasks, such as navigation, locomotion and manipulation.

Center of Artificial Intelligence and Robotics (CAIR)

Hong Kong Institute of Science & Innovation

Hong Kong, China

Assistant Professor

Oct. 2023 – June.2025

Real-Time Simulator Development for Medical Applications

We develop a GPU-optimized framework for real-time implicit simulation of elastic materials with frictional contacts, solving nonlinear and non-smooth challenges through a parallel-friendly solver with fast convergence. Our method, based on efficient matrix operations, handles large deformations, complex contacts, and various hyperelastic models while maintaining simplicity, robustness, and scalability.

University of Strasbourg

INRIA Mimesis Team & ICube Laboratory

Strasbourg, France

Ph.D. Student Researcher (Supervisor: Dr. Hadrien Courtecuisse)

July. 2019 – Sept.2023

Performance improvement in large-scale physics-based simulations

Physics-based medical simulations face a key challenge: balancing accuracy and speed for real-time deformable object modeling. We enhance computational performance for large-scale real-time simulations through improved numerical resolution methods.

INVITED TALKS

Talk at ETH CRL Seminar

"Fast but Accurate: The Next-Generation Physics Engine for Soft Body Simulations?"

April.2025

ABILITIES

Programming: C/C++; CUDA; MATLAB; Python; XML

Computer Graphics: Physics-Based Simulations; Finite Element Methods; Differentiable Physics; Real-Time Simulations; Parallel Programming; Geometry Processing

Applied Mathematics: Optimization Theory; Linear Algebra; Numerical Analysis; Control Theory