# TIANYU WANG

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## BIOGRAPHY

Now I am a senior R&D engineer at Faceunity Technology at Hangzhou and a visiting researcher at State Key Lab of CAD&CG, Zhejiang University, hosted by Prof. Kun Zhou. Before that, I got my M.Eng. degree from the same university advised by Prof. Jin Huang and my B.Eng. degree from Sichuan University. My current research interest includes **(a). physically based differentiable simulation, (b). inverse problems in fabrication and design, (c). human digitization**.

## EDUCATION

**Zhejiang University, Hangzhou, China** *Sept. 2016 - Mar. 2020*
M.Eng. in Computer Science Advisor: Prof. Jin Huang
**Sichuan University, Chengdu, China** *Sept. 2012 - Jun. 2016*
B.Eng. in Computer Science

## PUBLICATION

**Tianyu Wang**, Dongping Li, Xiaowei Liu, Jiong Chen, Huamin Wang, Kun Zhou
A Two-Way Interior Point Method for Collision Handling in Deformable Body Simulation
to be submitted to *SIGGRAPH 2022*

**Tianyu Wang**
Super-resolution of shallow water equation simulation based on GAN
*Master Thesis at Zhejiang University 2020*

Jiong Chen, Hujun Bao, **Tianyu Wang**, Mathieu Desbrun, Jin Huang
Numerical Coarsening using Discontinuous Shape Functions
*ACM Transaction Graphics 37(4)(SIGGRAPH 2018)*, Vancouver, Canada, 2018

## INDUSTRY EXPERIENCE

**Senior R&D Engineer, Faceunity Technology Co. Ltd, Hangzhou** May 2020 - Now
· **Co-developed a GPU-based cloth simulation CAD software as the core engineer**

**R&D Intern, Xmov Technology Co. Ltd, Shanghai** Sept. 2019 - Jan. 2020
*Mentor: Prof. Jinxiang Chai*
· **Developed an open-sourced single view based hair modeling system**
· **Developed static hair/cloth retargeting algorithms for artists**

## RESEARCH EXPERIENCE

**Visiting Researcher, State Key Lab of CAD&CG, ZJU** Oct. 2021 - Now
*Host: Prof. Kun Zhou*
· **Lead research on collision handling of deformable body (to be submitted to SIGGRAPH 2022)**

**Research Assistant, State Key Lab of CAD&CG, ZJU** Sept. 2016 - Mar. 2020
*Advisor: Prof. Jin Huang*
· **Research on super-resolution of shallow water equation simulation (Master Thesis 2020)**
· **Participated in research on numerical coarsening of FEM based simulation (SIGGRAPH 2018)**

## SELECTED CHRONOLOGICAL R&D EXPERIENCE DETAILS

**R&D on GPU-based deformable body simulation and collision handling, 2020 - Now**
After graduation, I was hired by Faceunity Technology to develop a GPU-based garment simulation engine, from scratch. I exhausted the survey of existed methods, designed the whole framework of the engine and implemented the original version independently. Until now, I solved several challenging problems independently: **(a). solving the indefiniteness problem of the several different energy's Hessian matrix with existed methodology, (b). fixing several incorrect formula of existed famous papers which can cause unexpected numerical instability when using the mesh with extremely poor quality made by artists, (c). inventing a novel algorithm efficiently to handle the notorious self-collision problem which guarantees an intersection-free simulation without using any tedious continuous collision detection and Log-Barrier terms**.
As the industrial achievement, with my magic colleagues Dongping Li, Xiaowei Liu, Cihui Xie, Hao Guo, we together developed a high-performance fully GPU-based cloth simulation CAD software which outperforms the simulation quality, speed of the well-known professional software Mavelous Designer 10 and our product has been used for commercial purpose successfully. As the academic fruit, collaborating with Prof. Huamin Wang and Prof. Kun Zhou, we wrote a technical paper and it will be submitted to SIGGRAPH 2022. I extended the novel collision-handling method to variety of codimensional deformable body simulation, including volumetric bodies, hair, sand in addition to the shell-liked cloth which is our original aim. Furthermore, I did all the experiments of the paper and our experiment shows our method is safe, fast, friendly with GPU parallelization, robust against large time steps and deformation. Prof. Huamin Wang led the writing reconstruction and I learned countless scientific writing skills from him. Prof. Kun Zhou supported me to do this research as a visiting researcher in his group and helped me a lot.

**Developed an open-sourced single view based hair modeling system, 2019**
Development of using a single image as input to reconstruct the 3D hair model to accelerate the process of hair asset production for artists. I surveyed 18 representative related papers from 2012 to 2019 and understood its evolution clearly. According to four aspects: (a). robustness of the algorithm, (b). whether the input of algorithm matches the input from the current available hardware, (c). whether the output of algorithm can be used for simulation, (d). whether the data flow of the algorithm can be refined by artists flexibly, I implemented, modified and combined existed algorithms from scratch to make a tool for artists. See the *hair report* for more implementation details. Find the source code *here*.

**Developed static hair/cloth retargeting algorithms for artists, 2019**
Development of retargeting a hair/cloth model from one suited character to another different character. I used less than a day to design and implement the algorithm for hair retargeting based on ARAP deformation and the artists gave a positive feedback to my timely help. Find the source code *here*. After surveying cloth retargeting related papers, I gave out a suitable solution to the artists. See the *retargeting report* for details.

**Research on super-resolution of shallow water equation simulation, 2018 - 2019**
My master thesis proposed to achieve the SWE data's super-resolution using generative adversarial network. After considering the temporal smoothness constraint, rotation equivalence requirement, the possible negative value, this thesis proposed some insightful modifications to the state of the art framework and obtained verified better results. See the *SWE report* for details.

**Participated in research on numerical coarsening of FEM based simulation, 2017 - 2018**
Research on numerical coarsening to accelerate the FEM based solid simulation with heterogeneous materials and non-linear constitutive laws on coarse grid. See our *paper* on SIGGRAPH 2018 for more details. I implemented a FEM based solid simulation framework and did the major two papers' comparison experiments quickly and independently from scratch.

## HONORS AND AWARDS

**Graduate of Merit/Triple A graduate**, Zhejiang University, 2018
**Award of Honor for Graduate**, Zhejiang University, 2018
**Wen Chixiang Scholarship**, Zhejiang University, 2018
**Silver Medal**, ACM-ICPC China Provincial Programming Contest, Chengdu Site, 2013 and 2014
**2nd University Scholarship**, Sichuan University, 2013

## SKILLS

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| **English** | TOEFL score: 102 (R:29 L:24 S:21 W:28) |
| **Programming Languages** | C, C++, Python |
| **Main Toolkit** | CUDA, Eigen, NumPy, Tensorflow, PyQt, OpenGL, LaTeX, Git |
| **Software** | ParaView, MeshLab, Maya, Blender, Origin, Office |