Jie JIANG Ph.D.

#237, 4849 El Cemonte Ave, Davis, CA, United States (95618) Tel: +1 (279) 789-1294 E-mail: jie.river.jiang@gmail.com

EDUCATION

Nanyang Technological University, Singapore

Ph.D. in Computer Science, Jul 2016 – May 2022

Dissertation Advisor: Prof. SEAH Hock Soon

Dissertation title: Depth-aware 2D stroke-based drawing, inbetweening, and painting

Northwestern Polytechnical University, China

M.Eng. in Aeronautics, Sep 2014 – Mar 2017

Dissertation Advisor: Prof. LIU Zhenbao

Dissertation title: 2D stroke technology for auto gap closing

Northwestern Polytechnical University, China

B.S. in Electrical Engineering and Automation, Sep 2010 – Jul 2014

RESEARCH INTERESTS

Applications of computer graphics-related technologies including but not limited to:

- 2D computational geometry
- Vector image painting technologies and applications
- 2D animation
- Computer-aided design
- Scientific computing

RESEARCH EXPERIENCE

Nanyang Technological University, Singapore

Ph.D, 2016 – 2022, advised by Prof. SEAH Hock Soon

Depth-aware 2D stroke-based drawing, inbetweening, and painting

Innovated the vector-based animation process by decoupling the drawing, inbetweening, and painting into three manageable stages. Developed a purely stroke-based workflow for 2D animation process. It includes the following sub-topics:

– ***Occlusion representation and resolution for vector graphics***

- Proposed a novel stroke-based occlusion representation for vector-based drawings, which saves 60% of the work in resolving occlusion in animation process.
- Proposed a contour tracing method for boundary completion based on geometry clues including line connectivity, junctions, and cusps.
- Implemented rotational sweep line algorithm to find the shortest path between two points in a drawing with various 2D primitives.

– ***Handling gaps for 2D vector line drawings***

- Proposed geometric features to quantify 2D stroke connection correctness for missing stroke connection estimation.
- Modeled gap closing problem as an energy optimization problem using proposed geometry features.
- Proposed a sweep line-based vector drawing searching algorithm for stroke connection detection and region detection.

– ***Vector graphics painting and animation auto-painting***

- Proposed a stroke-based painting representation for colored vector drawings by combining color information with strokes, which allows users to freely edit drawings with colors dynamically updated.
- Implemented a stroke-based flat shading method using proposed painting model.

– ***Contributions in engineering projects***

- Implemented research outcomes as three tools with user interfaces in CACANi (a commercial 2D vector-based animation application) using ***C++*** and ***Qt***.
- Implemented a sweep-line algorithm to find regions and intersections in line drawings.
- Designed data structures to store regions and intersections based on half-edge structure and link structure and linked chain for fast access and retrieval, which improved the overall runtime by 30~40% compared with the previous design
- Introduced a numerical error handling method for complicated line drawings, which improved the robustness of the analysis algorithm and almost handled all the user-reported failure cases. Designed, and developed the afore-mentioned research outcomes into CACANi, a 2D vector-based commercial animation application developed in C++ and Qt, as three tools from planning, design, implementation, testing, optimization.
- Implemented basic geometric algorithms into its geometry processing library, including sweep line algorithm and vector-related computations.

Nanyang Technological University, Singapore

Ph.D, 2020 – 2021: advised by Prof. FANG Mingliang

An environmental engineering-related project for compound transformation productions analysis

- Developed a platform from scratch for environmental engineering researchers to analyze reactive compound transformation, which has been proven to be effective and efficient, and has been used in several research groups.
- Improved the performance of the database searching algorithm by 75% using multi-thread.
- Designed interfaces for users to conveniently input, process, view, output data.

Northwestern Polytechnical University, Xi'an, P.R. China

M.Eng. 2014 – 2015: advised by Prof. LIU Zhenbao

Optimal disassembly routine detection

- Implemented a graph-based algorithm in Matlab based on a research paper to automatically find the optimized way to disassembly components from a composited object by considering the connectivity of individual parts.

Northwestern Polytechnical University, Xi'an, P.R. China

B.S. 2013 – 2014: advised by Prof. LIU Zhenbao

Image-based assembly training system

- Implemented a single image- and light field-based model retrieval from a model database by detecting contours from the image. The model database consisted of a collection of digital Lego model building blocks created using Google SketchUp.

WORK EXPERIENCE

CGG Services (Singapore) Pte Ltd

Software Developer, May 2022 – Present

Well log data calibration

- Developed a depth-time tool to calibrate well data with a graphical user interface for result visualization, parameter tuning, convenient quality control etc, using checkshot theory, regression/fitting methods. This tool has been utilized in geophysicists' daily production work and received positive feedback.

Statistical and deterministic wavelet extraction from seismic data

- Developed two wavelet extraction methods using Fourier transformation, convolution and other related signal processing techniques to analyze seismic and well data.

General graphical application support

- Gave timely support of user-reported graphical tool-related issues including but not limited to interaction re-design, module re-design, bug fixing, understanding large database, attending to users' enquiries, minor developments of functionalities etc.

PROFESSIONAL SKILLS:

Math knowledge: Linear algebra, 2D/3D geometry, computer graphics, data processing

Coding: C++ (7-year experience), Qt, Matlab, Python (entry-level)

Platform: Windows, Linux

IDE: MS Visual Studio Code / Visual Studio / Qt creator

Debugger: GDB

Version control: Git, Perforce

Software: Adobe Illustrator, LaTeX

Others: Debugging, code optimization, data structure, interactive application design

ACADEMIC ACTIVITIES:

- Attendance to Computer Graphics International 2021 (CGI 2021). ***Oral presentation*** entitled "Handling gaps for vector graphics coloring".
- Attendance to International Workshop on Advanced Image Technology 2023 (IWAIT 2023). ***Oral presentation*** entitled "Stroke-based painting".

HONORS & AWARDS:

- Nanyang Technological University (NTU, Singapore) research scholarship.

TEACHING

- CZ1005 Digital logic
- CZ1106 Computer Organization and Architecture
- CZ2003 Computer Graphics and Visualization
- CZ2004 Human Computer Interaction

PUBLICATIONS

1. **Jie Jiang**, Hock Soon Seah*, Hong Ze Liew. (2023) Stroke-Based Painting. ***International Workshop on Advanced Image Technology (IWAIT) 2023*** (Vol. 12592, pp. 6-11). SPIE.

2. **Jie Jiang***, Hock Soon Seah, Hong Ze Liew. (2022) Stroke-Based Drawing and Inbetweening with Boundary Strokes. ***Computer Graphics Forum***. 41:257-269

3. **Jie Jiang***, Hock Soon Seah, Hong Ze Liew. (2021) Handling Gaps for Vector Graphics Coloring. ***The Visual Computer***. 37:2473-2484

4. **Jie Jiang***, Hock Soon Seah, Hong Ze Liew, and Quan Chen. (2020) Challenges in Designing and Implementing a Vector-Based 2D Animation System. ***The Digital Gaming Handbook***. 245-274

5. Min Liu, **Jie Jiang**, Jie Zheng, Tao Huan, Bei Gao, Xunchang Fei, Yulan Wang, and Mingliang Fang*. (2021). RTP: One Effective Platform to Probe Reactive Compound Transformation Products and Its Applications for a Reactive Plasticizer BADGE. ***Environmental Science & Technology.*** 55, 23, 16034–16043