Zong-Ying Kuo

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EDUCATION

University of Southern California, United States Expected May 2024

M.S. in Computer Science – Multimedia and Creative Technologies (Second Year)

- Courses: Computer Graphics, Computer Animation, Multimedia System Design, Analysis of Algorithms

National Central University, Taiwan Sep. 2017 – Jun. 2021

B.S. in Computer Science and Information Engineering

- Courses: Computer Graphics, Mixed Reality, Computer Vision, Machine Learning

SKILLS

C/C++, OpenGL, GLSL, Unreal Engine 5, Unity, C#, KinectV2, Linux, Python, Java, JavaScript, HTML, CSS, MATLAB

WORK EXPERIENCE

Advanced Visualization Intern (Remote), Hexagon Manufacturing Intelligence, United States May. 2023 – Aug. 2023

Helped with developing visualization applications and participated in the discussion and development of a new **proof-of-concept product** that will test the market validity of the concept of bringing "**digital twins** to life in the **manufacturing metaverse**":

Robot Arm Animation Skills: Javascript, Typescript

- Made a keyframe animation of a robot arm digital twin by interpolating between the joint angle values in each keyframe, the animation was presented in Hexagon's private conference

Virtual CNC Machine Trainer Skills: Unreal Engine 5, C++

- Developed a **virtual reality** version of Hexagon's physical CNC machine trainer where users can enter a virtual environment, import their g-codes into the CNC machine digital twin and see the machine operating according to the g-code

PROJECT EXPERIENCE

3D Teapot Rendering Skills: C++, OpenGL

- Implemented **3D graphics pipeline** to render a 3D teapot
- Implemented all the functions (Bresenham's line algorithm, 3D transformation and projection, clipping, hidden surface removal) from scratch without calling OpenGL functions

3D Cubes Rendering Skills: C++, GLSL

- Wrote a vertex shader and a fragment shader to render 3D cubes
- Knowledge includes: 3D graphics pipeline, texture mapping, movable camera system, basic lighting

Roller Coaster Simulator Skills: C++, OpenGL

- Built a roller coaster track using Catmull-Rom Splines
- Implemented a camera system to follow the roller coaster as if users are riding it

Ray Caster Skills: C++, OpenGL

- Implemented a ray caster to illuminate 3D objects and render shadows
- Shot light rays to the view plane and calculated color for each pixel

Jello Cube Skills: C++, OpenGL

- Implemented a **mass-spring system** on a 3D cube to make the cube stretchable like jelly
- Implemented **collision**, the cube rebounds using penalty method after hitting a wall

3D Character Deformation Skills: C++, OpenGL

- Implemented **forward kinematics, inverse kinematics** to deform a 3D character
- Implemented linear blend **skinning** for the character

RESEARCH EXPERIENCE

Undergraduate Research, Multimedia Information Networking Lab, National Central University, Taiwan

Virtual Violin Skills: C#, KinectV2, MIDI

- Used a **KinectV2** device to simulate the motion of violin-playing and produce music signals from MIDI protocol
- Formed a band with other virtual instruments in lab and held a music concert in college
- Won second place in 2020 Undergraduate Research Competition in Department of Electrical Engineering & Computer Science of National Central University

Virtual Concert Stage Skills: Unity, C#, KinectV2

- Used a **KinectV2** device to project the real concert performer's skeleton onto a 3D virtual avatar, the avatar could follow the performer's body movement
- Created a 3D virtual concert stage scene using **Unity**