Yihui Mao

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EDUCATION

Oregon State University   Sep. 2015 - Jun. 2020
School of Electrical Engineering and Computer Science(EECS)
Bachelor of Science in Computer Science
Minor in Actuarial Science
GPA:3.9/4.0

University of Pennsylvania   Sep. 2020 - Jun. 2023
School of Engineering and Applied Science(SEAS)
Master of Science and Engineering in Computer Graphics
Master of Science and Engineering in Robotics in GRASP
GPA:3.72/4.0

RESEARCH EXPERIENCE

3D Spatial decomposition for trajectory Generation in Dynamic Environment   Jun. 2022 - ongoing
Collaborators: Yuwei Wu
It is a new method for formulating trajectory generation using Safe Flight Corridors built by convex decomposition, allowing real-time motion planning in large and clustered maps. Our algorithm could implement the environment decomposition more efficiently for motion planning, supported by parallel computation. The volume of each SFCs is controllable during the generation without any extra steps. In the dynamic env, since our algorithm only focuses on the changing local region, the whole map does not need to be built again and could always be reusable.

• The advantage compared to the IRIS is that our algorithm does not need a couple of iterations to build the SFC and allows real-time motion planning in dynamically clustered environments.

• The advantage compared to the RILS is that our algorithm supports the parallel computation to build SFC.Our algorithm can perform a complete decomposition of the global map only once to obtain a representation . In dynamic environments, our algorithm only modifies the representation locally to update the global representation.

• Conducted mathematics proof, algorithm design, optimization code implementation and paper writing

Sample efficient tree-based planning for learned prediction models   Sept. 2021 - ongoing
Collaborators: Karl Schmeckpeper, Dr. Georgios Georgakis
It is a new method for planning for object-centric video prediction models. By incorporating a tree-based planner into our system, that explores in latent space and samples states that an inverse model uses for predicting actions to generate actionable plans in long-horizon planning.
• Introducing a new planner for object-centric video prediction.

• Taking advantage of an efficient tree-based sampling method that is informed by learned inverse and dynamics models

• demonstrating the effectiveness of the proposed method when compared to CEM and other tree-based visual planing methods in an object pushing task.

• Conducted code implementation in planning, experiments and algorithm optimization

An Integrated Social Science and Agent-based Modeling Approach to   Sept. 2018 - Jun. 2019
Improve Life Safety from Near-field Tsunami Hazards, Funded by the
National Science Foundation: CMMI-HDBE #1563618, and #1826407.
Professor: Dr.Haizhong Wang,Civil and Construction Engineering, Oregon State University
Using a alternative tool, Unity 3D, in the multi-modal evacuation simulation for a near-field tsunami and studies how individual behaviors make an impact on the crowd groups in evacuation through the simulation with real physical collision

• Established the road network of Seaside City with OSM file using Unity 3D game engine

• Instantiated the agents and implemented the normal distribution of the agent's coordinates on the road network

• Simulated real evacuation situation with A Star algorithm to determine each person's shortest evacuation route

• Introduced a new type of social force model in the evacuation process to achieve force based individual interaction (physical collision) and equipped agents with the ability of handling dynamic interactive relations

• Observed the mortality rate change generated in the simulation model, and analyzed outcomes of the modified parameters

UNDERGRADUATE PROJECTS

Go Peasants Apr. 2021 – May. 2021

A strategy game based on Unreal Engine. Players can purchase props in the game, based on the resources currently on hand, use different strategies, and sell crops through farming to maximize profits. Players can not only choose to buy different kinds of seeds at different prices, and plant their own plants by watering them in exchange for rewards, but they can also harvest other people's crops to hinder others from planting. video link

Path Tracer Apr. 2021 – May. 2021

Path trace rendering based on QT and OpenGl
- Global Illumination with thin lens, ares lights, point light, and spot light
- thin lens microfacet mirror surface and glass materials

Minecraft Nov 2020 – Dec 2020

A project using OpenGL and QT to create an interactive 3D world exploration and alteration program in the style of the popular computer game Minecraft.
- Using noise functions create a heightfield for your terrain representing different biomes, including a rolling grassland hills biome, a jagged mountain biome, and a desert biome. Using a 3D noise function, carve out caverns beneath the surface of the terrain.
- Efficient Terrain Rendering, and Chunking.
- Implement a complete physics engine, including the transformation of the character's perspective, the movement, such as flying, jumping, walking, and swimming, and collision detection
- Create procedural rivers and lava in your terrain using L-Systems, and using Blinn Phong to implement the very realistic water reflection effects.
- Texturing and Texture animation. In the vertex shader, distort the surface of the WATER block such that they appear to move up and down as though distorted by waves. Meanwhile, water's surface normals to accurately reflect their surface displacement using the Blinn Phong reflection model.
- Implement a creation mode, which allows players to remove or place blocks using ray casting and store the removed blocks as material in the inventory for later use.
- Add multithreading functionality to prevent the gameplay from slowing down when new terrain is generated to expand the world.
- Create basic NPCs, such as sheep, that wander around the world. They should be able to navigate terrain, such as jumping whenever they encounter a wall.
- Create a procedural sky background (Day and night cycle) using the raycasting method. Achieve a "fog" effect based on the distance terrain is from the camera. video link

Chat APP, Mobile Software Development Mar. 2018

Based on third-party API information reading, Android Studio is used to develop a chat software based on the Android system
- The software has the functions of setting password, modifying profile, sending and receiving information, notifications, sending and receiving mail, displaying the previous information, setting online offline status, searching for users

SKILLS & TOOLS

Programming Language: C++, Python, C, C#, Java, Intel X86 Assembly Language, Haskell, Prolog
Computer Graphics: OpenGL(GLSL), Maya, Houdini, Unity and Unreal Engine
Robotics: Pytorch, TensorFlow, OpenCV, Ros, Docker
Robotics: Parallel computation :OpenMP, CUDA
Web Development: HTML, CSS, JavaScript, Node.js, MySQL, MongoDB

RELEVANT COURSES

Operating Systems	Analysis of Algorithms	Parallel Programming
Computer Graphics	Advanced Rendering	3D Modeling
Game Design Practicum	Computer Animation	Computer Vision
Artificial Intelligence	Principles of Deep Learning	Machine Learning & Data Mining
Robotic	Learning in Robotics	F1/10 Autonomous Racing Cars

HONORS & AWARDS

- Oregon State University Honor Roll for several consecutive terms
- Computer Science Dean's List for several consecutive terms