

Zeyu Fang

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EDUCATION BACKGROUND

The University of Science and Technology of China (USTC), China

expected Jun. 2023

M.S. in Information and Communication Engineering

- Thesis: Deep Reinforcement Learning Based Active Tracking and Navigation
- Advisor: Prof. Houqiang Li and Prof. Wengang Zhou
- Overall GPA: 3.49/4.3 or 85.23/100

The University of Science and Technology of China (USTC), China

Jun. 2020

B.S. in Computer Science and Technology (**Gifted Class**)

- Thesis: Research on end-to-end video frame interpolation based on deep learning
- Advisor: Prof. Guiquan Liu
- Overall GPA: 3.58/4.3 or 86.25/100

RESEARCH EXPERIENCES

Graduate Research Assistant, Institute of Advanced Technology, USTC

Department of Electronic Engineering and Information Science | Advisor: Prof. Houqiang Li and Prof. Wengang Zhou

- **Active Tracking and Navigation in Complicated 3D Scenes with Obstacles** Jan.2022 - Present
 - Employed both visual and temporal methods detect the obstacles and inaccessible paths, mapping the local circumstance and obstacle distribution in the virtual environment.
 - Designed reinforcement learning network to navigate, trained and optimized it with PPO algorithm. Applied traditional navigation algorithm like A* to provide legal action space on the policy generated by the reinforcement learning policy network.
 - Compared our method with rule-based agent in navigation task. Added auxiliary function as supply gathering and battling, winning as the 1st place in all 3 tracks in open world FPS game ai challenge hold by IEEE Conference on Games in 2022.
- **Active Tracking with Multiple Cameras and Multiple Objects** Jan.2022 - Present
 - Formulated the Active Multi-Object Tracking (AMOT) problem as a POMDP problem
 - Established a vivid virtual environment simulating a football court in real world with multiple players randomly walking in the field using Unreal Engine 4.
 - Combined traditional tracking algorithm Yolov4 in computer vision field with a centralized deep q-learning network in multi-agent reinforcement learning field; designed a novel framework to control the movement and posture of multiple cameras in the virtual to actively and cooperatively track players.
 - Leveraged inverse projection transformation technique to integrate different observations received from each camera into global features as aligned coordinates, which are further used as the input of the deep Q-learning network.
 - Empirical results show that our method outperforms the traditional method with fixed cameras by achieving a higher coverage rate.

Undergraduate Research Assistant, Institute of Advanced Technology, USTC

Department of Computer Science | Advisor: Prof. Guiquan Liu

- **Generative adversarial networks Based video frame interpolation** Sep.2019 - June.2020
 - Built generative adversarial networks for video frame interpolation, which contains a generative network with autoencoder structure and a discriminative network.

- Set the sum of gradient difference loss, L1 norm and adversarial loss as the loss function of the generative network, while set the sum of Wasserstein distance and gradient penalty as the loss function of the discriminative network.
- Trained and tested the network model on UCF101 dataset. Evaluated our model in peak signal-to-noise ratio (PSNR), Structural Similarity (SSIM) and Sharpness difference.

Summer Research Assistant, Stevens Institute of Technology, U.S.

Department of Computer Science | Advisor: Prof. Philippos Mordohai

➤ **Performed a comparative study on an array of approaches for generating disparity map for stereo matching;** Jul.2019 - Sep.2019

- Applied slide window to a ground truth dataset to build an eigenvector matrix based on pixels.
- Leveraged PCA to enable dimensionality reduction; optimized the number of dimensions based on the quality of images reconstructed from processed eigenvector matrix.
- Employed SGBM algorithm to generate disparity map from data, covering matching cost calculation, directional cost calculation and post-processing; compared the reconstructed disparity map to the ground truth image, focusing on accuracy, resolution loss, and sensitivity to background noise.
- Replaced the PCA with autoencoder neural network for dimensionality reduction, and evaluated the corresponding quality of the generated disparity map.

Summer Research Assistant, Imperial College London, U.K.

The Hamlyn Centre

➤ **Developed an autonomous workflow to enable a robotic arm to detect, locate and grasp specific objects;** Aug. 2018

- Designed, trained and validated a convolutional neural network model to detect the object; performed hyperparameter tuning and cross-validation to enhance the performance, focusing on the balance between variance and bias.
- Integrated hardware (a 2M stereo camera, a PYNQ platform for embedded system development, and a 7-inch LCD display for control and visualization) and software (image processing and depth calculation) to locate the object.
- Built a control algorithm to manipulate a 6-DOF robotic arm for object grasping based on object geometry and 3D coordinates derived from the stereo camera, focusing on motion planning and inverse kinematics calculation.

PUBLICATIONS

Fang, Z., Zhao, J., Yang, M., Zhou, W., Lu, Z. and Li, H., “Coordinate-Aligned Multi-Camera Collaboration for Active Multi-Object Tracking” IEEE Transactions on Multimedia, under review, Jan. 2022

SKILL

Programming Languages: Python (Frequently-used) | C/C++ | MATLAB

Python Libraries: Pytorch | OpenCV | Numpy | SciPy | Pillow | Gym | Matplotlib

Other Software: Docker | Unreal Engine 4 | Adobe After Effects | Adobe Premiere | Photoshop

AWARDS AND HONORS

1st Place in all 3 Tracks in WildScav: 3D Open World FPS Game AI Challenge, Inspir.ai & IEEE Conference on Games 2022

Aug.2022

The 3rd Prize, Academic Excellence Scholarship, USTC

Oct.2018

The 3rd Prize, Academic Excellence Scholarship, USTC

Oct.2017