Zhirui Dai

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EDUCATION

M.S., Electrical and Computer Engineering, UC San Diego 06/2021 (Expected)
- Current GPA: 4.0/4.0

B.S., Physics, Fudan University 06/2019
- Graduated with Excellent Student Award

Exchange, Computer Science, Humboldt Universität 04/2018 – 08/2018

Research Experience

BEV-Net: Social Distancing Detection with Geometric Reasoning 2020

Statistical Visual Computing Lab, UC San Diego

This project makes real-time accurate detection of high contagious risk area become possible.
- Designed a multi-task privacy-preserved network for detecting area where people are violating social distancing restriction with a monocular surveillance system
- Developed a unified framework based on PyTorch, which supports training and testing networks of different configurations and optimal hyper-parameter searching
- Worked with teammates to create a new dataset, CityUHK-X-BEV, for the social distancing task
- Defined and solved the geometry problem of reasoning people's ground position
- Developed the user interface for geometry calibration with PyQt5
- Developed and verified the proposed differentiable homography transformation module at different input scales

Faster Neural Path Planner (FNPP) based on MPNet 03/2020 – 06/2020

Course Research Project. MPNet is a neural network for path planning in environments with obstacles. FNPP reaches a real-time performance on the same dataset by proposing an improved neural path planning framework.
- Designed the FNPP algorithm
- Trained and tested the network, the success rate is higher and the running time is similar to the C++ version of MPNet when FNPP is implemented by Python

Autonomous Driving System for Mail Delivery in UC San Diego 10/2019 – 12/2019

Autonomous Vehicle Lab, UC San Diego
- Developed script tools for quick deployment and maintenance of autonomous vehicle software

R&D of Commercial Low-power SoC Software 2018-2019

Camel Microelectronics Inc., San Jose, CA
- CamelStudioX, an IDE for software development of targeted low-power SoC. This project enables the users to develop SoC software on a robust and efficient platform. It includes
  - Designed the user interface and program all the functional modules
  - Developed a hardware abstract layer library to provide users with concise APIs to manipulate modules on SoC
  - Developed essential standard GCC library functions, such as soft-float library, stdio, etc.
  - Developed cross compiler toolchains, including the GNU C/C++ compilers, custom make system, an ELF analyzer and converter which generates firmwares for bare metal systems
  - Designed robust serial-port software for the communication between the SoC and the upper PC, e.g. uploading firmware, debugging interface
  - Deployed the IDE on servers for software distribution and update release
- Worked with teammates to test SoC and developed software patches for hardware hotfix

Prototype Ultrasonic System for Measuring Blood Flow Field 2018-2019
- Used AutoCAD and SolidWorks to design the system
- Designed and established the electronic system for measurement
- Collected and analyzed the data to reconstruct the blood flow velocity distribution

Robot Capable of Self-balancing on a Pivot 2017-2018
- Designed and built the mechanical system using SolidWorks
- Implemented the PID controller and finished the hyper-parameter tuning

For more exciting projects and details (e.g. SLAM etc.), please visit: https://daizhirui.github.io/projects

Teaching Experience

Teaching Assistant, Physics Department, Fudan University 01/2019 – 07/2019
- Physics Modelling

Teacher, the Second Affiliated Junior School of Fudan Univeristy 01/2019 – 07/2019
- Arduino Programming

Teaching Assistant, School of Information Science and Technology, Fudan University 2018-2019
- SoC: Theory and Implementation

Publication

- Zhirui Dai, Yi Li, Bo Liu, Nuno Vasconcelos. BEV-Net: Social Distancing Detection with Geometric Reasoning. CVPR 2021, Under review
- DAI Zhi-rui, BAI Cui-qin. Study of the physical process of the pipette hot fountain[J].College Physics, 2019, 38(4): 42-44

Skills

- **Programming**: C, C++, Python, Assembly, Swift, Java, Shell Script, HTML, CSS, Javascript
- **Software Development**: Qt5, macOS App, iOS App, Android App
- **Machine Learning**: PyTorch, MXNet, Tensorflow
- **Virtualization**: Docker, VMWare
- **Math Software**: MATLAB, Mathematica
- **Design Software**: AutoCAD, SolidWorks
- **Circuit Design**: Verilog, Cadence, Quartus, Modelsim
- **Hardware**: STM32, Arduino, Raspberry Pi, FPGA
- **Other**: Git, Latex

Multi-discipline Abilities

- Robotics
  - Machine Learning, Deep Learning, Reinforcement Learning
  - Computer Vision
  - Probabilistic Robotics, SLAM
  - Path Planning
  - Robot Manipulation
- Software and Circuit
  - SoC Software Development
  - VLSI Digital Circuit Design
  - VLSI High-level Synthesis
- Physics
  - Classical Mechanics
  - Thermal Dynamics
  - Electrodynamics
  - Quantum Mechanics

HONORS & AWARDS

- Excellent Graduated Student Award 06/2019
- Scholarship for Outstanding Students at Fudan University 12/2018 & 12/2017
- 2017 Hornors Student Award in Physics 07/2017
- Xu Zeng-shou Scholarship 12/2016
- The first prize of China Undergraduate Physics Tournament(CUPT) 08/2016
- The champion of Shanghai Undergraduate Physics Tournament(SUPT) 07/2016