FANGZHENG LIU

fzliu@mit.edu ⋄ Fangzheng's github ⋄ Portfolio

EDUCATION

Massachusetts Institute of Technology   September 2021 — Present
Ph.D. in Media Arts and Sciences   *Responsive Environments Group, MIT Media Lab*

Massachusetts Institute of Technology   September 2019 — Aug 2021
M.S. in Media Arts and Sciences   *Responsive Environments Group, MIT Media Lab*

Beijing Institute of Technology   September 2015 — Apr 2018
M.S. in Information and Communication Engineering

Beijing Institute of Technology   September 2011 — Jun 2015
B.S. in Information Engineering

WORK EXPERIENCE

CERN (the European Organization for Nuclear Research)
Engineer   Apr 2018 — Apr 2019

· I was an engineer in the AMS-02 (Alpha Magnetic Spectrometer, a high-energy particle Spectrometer operating on the International Space Station) at CERN. During the year there, my main job was supporting the development of the new thermal system (UTTPS) of one subsystem of the AMS-02. The UTTPS is the Upgraded Tracker Thermal Pump System of the AMS02. I developed the control and monitoring software for the thermal vacuum test of the UTTPS. The software is designed by using LabVIEW.
· The UTTPS has been installed to the AMS-02 by the end of Jan 2020 through four spacewalks.

PROJECTS

AstroAnt   Jan 2021 — Mar 2023
MIT Media Lab

· The AstroAnt is a miniature robotic swarm for servicing on in-orbit spacecraft external surfaces.
· Designed two different kinds of autonomous miniature wheeled robotic swarms for servicing on the external surfaces of in-orbit spacecraft. The robots are equipped with magnetic wheels and can move on magnetic surfaces. With a modular design, each robot can carry different sensor payloads and perform inspection sensing to help with in-orbit maintenance.
· Finished four zero-gravity flights to test the mobility and sensing capabilities of the AstroAnt in microgravity and lunar gravity environments. The work reached Technology Readiness Level 6.
· One AstroAnt robot will be sent to the Lunar South Pole with the MAPP-1 rover developed by the Lunar Outpost around the middle of 2024. I'm the lead engineer of the AstroAnt Lunar mission.

LunarWSN   Nov 2020 — Aug 2021
MIT Media Lab

· LunarWSN is a Wireless Sensor Network node designed for In-Situ lunar water ice detection.
· Designed a fully functional cubic sensor node prototype that can be ballistically deployed from a rover or lander to regions of interest that might be unsafe or impractical for rovers or landers. The node is a light ($< 170g$), miniaturized ($5cm \times 5cm \times 5cm$), modular design, that allows sensor payloads to be customized to different scientific missions. As a representative case study, the node is equipped with an impedance sensor designed to measure the permittivity of the lunar soil, which infers water content.
· Finished the system function tests (wireless localization, wireless communication, and sensing capability) in a lab environment. The work reached Technology Readiness Level 4 (TRL4).

· I Finished my Master's thesis based on this work.

WOSNA Aug 2020 — Present

MIT Media Lab

· The WOSNA is short for Work Out on-body Sensor Network Assistant.
· Designed an on-body sensor network that monitors workout performance. The sensor network is composed of multiple miniature sensor nodes, and each node is a tiny suction cup equipped with a pulse sensor and Bluetooth low-energy communication. The sensor nodes can suck on the desired part of the body to monitor the performance of some specific muscle. The sensor nodes are very small and can adapt to the irregular body surface.

PCBPT Aug 2019 — Oct 2019

MIT Media Lab

· The PCBPT is a PCB automatic probe tester for in-circuit debugging.
· Designed an automatic PCB probe system to help with PCB debugging. With the help of PCBPT, users can choose desired signals in the schematic, and the PCBPT will choose proper pads on the PCB for the selected signals and place probes on the pads. All the users need to do is select signals and check the waveforms on an oscilloscope.

PUBLICATIONS

· **Fangzheng Liu** and Joseph A Paradiso. 2023. PrintedCircuit Board (PCB) Probe Tester (PCBPT) - a Compact Desktop Systemthat Helps with Automatic PCB Debugging. In The 36th Annual ACM Symposium on User Interface Software and Technology (UIST '23 Adjunct), October 29–November 01, 2023, San Francisco, CA, USA. ACM, New York, NY, USA 3 Pages. https://doi.org/10.1145/3586182.3615800 [Accepted and to appear]

· **Fangzheng Liu**, Ariel Ekblaw, Joseph Paradiso. "LunarWSN node - a Wireless Sensor Network node designed for In-Situ lunar water ice detection." SmallSat conference 2022 (Aug 2022).

· Ariel Ekblaw, Juliana Cherston, **Fangzheng Liu**, Irmandy Wicaksono, Don Derek Haddad, Valentina Sumini, Joseph A. Paradiso. "From UbiComp to Universe – Moving Pervasive Computing Research Into Space Applications." IEEE Pervasive Computing 2022.

· B Haghighat, J Boghaert, Z Minsky-Primus, J Ebert, **F Liu**, M Nisser, A Ekblaw, and R Nagpal. "An Approach Based on Particle Swarm Optimization for Inspection of Spacecraft Hulls by a Swarm of Miniaturized Robots." In 13th International Conference on Swarm Intelligence (ANTS 2022).

· LUO Qing-sheng, ZHOU Chen-yang, JIA Yan, GAO Jian-feng, **LIU Fang-zheng**: "CPG-Based Control Scheme for Quadruped Robot to Withstand the Lateral Impact." 2015. Journal of Beijing Institute of Technology, 35(4), pp.384-390.

PATENTS

· CUI Wei, HOU Jian-gang, **LIU Fang-zheng**, SHEN Qing, XIANG Jing-zhi, WU Si-liang: "A Radar Echo Delay Coherent Simulation Method Based on Digital Radio Frequency Signal Storage." Chinese patent: 2017104551967 (G01S7/40). Filed on Jun 16, 2017, and issued on Dec 18, 2018. [LINK] (Advisors: CUI Wei, HOU Jian-gang)

· CUI Wei, SHEN Qing, HOU Jian-gang, **LIU Fang-zheng**, XIANG Jing-zhi, WU Si-liang: "A Doppler Frequency Coherent Simulation Method for Radar Echoes Based on Real-time Frequency Measurement." Chinese patent: 2017104552014 (G01S7/40). Filed on Jun 16, 2017, and issued on Oct 9, 2018. [LINK] (Advisors: CUI Wei, HOU Jian-gang)

TECHNICAL SKILLS

- **Programming languages and related** - C, C++, VHDL, Python, JavaScript, Git, MATLAB, LabVIEW, Arduino
- **Computer-aided design/engineering** - Altium Designer, KiCAD, EasyEDA, Mentor Graphics PADS, SolidWorks, Fusion 360, Inventor, Onshape.
- **Manufacturing skills** - 3D modeling/printing, Molding & Casting, CNC machining, Laser cutting.
- **Others** - Zero gravity flight certificates !!! :)

TEACHINGS AND ACTIVITIES

- **Teaching Assistant** (2023 Fall) - MIT course "MAS.863/4.140/6.9020 How To Make (almost) Anything"
- **Head Teaching Assistant** (2022 Spring) - MIT course "MAS.836 Sensing Technologies for Interact Environments"
- **Teaching Assistant** (2021 Spring) - MIT course "MAS.S76 Adventures in Sensing"

AWARDS

- **China National Scholarship** (2011) - Top 0.2%
- **Intel Cup Undergraduate Electronic Design Contest - Embedded System Design Invitation Contest** (2014) - Second prize
- **Angela Leong Fund Fellowship** (2022-2023 academic year) - 1 student/year in MIT

INTERESTS

Hiking   Cycling   Basketball   Electronics Hobbyist