FANGZHENG LIU

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

SUMMARY

- Main research is about miniature robotic and wireless sensor networks for planetary explorations. One of my designed tiny robots will be sent to the moon in 2024.
- Side projects include human-computer interaction design and on-body sensor networks.
- Background in electronics engineering, signal processing, mechanical system design, and so on.

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

Engineer   Apr 2018 — Apr 2019

CERN (the European Organization for Nuclear Research)

- Designed a control and monitoring software for the thermal vacuum test of the UTTPS (Upgraded Tracker Thermal Pump System). The UTTPS is an upgraded thermal system for the AMS-02 (Alpha Magnetic Spectrometer, a high-energy particle Spectrometer operating on the International Space Station).
- The UTTPS has been installed to the AMS-02 by the end of Jan 2020 through four spacewalks.

ACADEMIC RESEARCH EXPERIENCE

AstroAnt - to the moon!   Jan 2021 — Mar 2023
MIT Media Lab

- Designed a miniature robot that will be sent to the Lunar South Pole in 2024. The robot will be working on the top panel of a Lunar rover to collect thermal data.
- Finished four parabolic flights, a total of 120 parabolas.
- Finished all space-grade tests for the AstroAnt, and achieved the TRL 8 level.

LunarWSN   Nov 2020 — Aug 2021
MIT Media Lab

- Designed a miniature cubic wireless sensor node, that we named LunarWSN, that can be ballistically deployed from rovers/landers or dropped from a fly-by satellite to the Lunar surface.
- The LunarWSN node is designed for In-Situ lunar water ice detection.
- Finished all the system function tests in a lab environment and achieved the TRL 4 level.

HexSense   May 2023 — Jul 2023
MIT Media Lab

· Designed a miniature hexagon-shaped wireless sensor node, that we named HexSense, that can be ballistically deployed from rovers/landers or dropped from a fly-by satellite to the Lunar surface.
· After deployment, the HexSense can automatically stand up and start working.
· Finished all the system function tests in a lab environment and achieved the TRL 4 level.
· Finished a 10-day field experiment in Svalbard in July 2023.

LunarDeltaT   Feb 2023 — Jun 2023
MIT Media Lab

· Designed a new approach to harvest energy through temperature gradient across the surface of wireless sensor nodes working on the Lunar surface.
· Finished all tests in a lab environment. LunarDeltaT shows an advantage over solar cells in a dusty environment.

PCBPT   Aug 2019 — Oct 2019
MIT Media Lab

· Designed a bench-top tool to streamline the in-circuit debugging.
· With the help of the PCBPT, when debugging PCB, all users need to do is select signals and check the output without the need to do anything else.

CircuitScout   Jun 2023 — Aug 2023
MIT Media Lab

· An upgraded version of the PCBPT with a web-based GUI.

IO-Touch   Oct 2023
MIT Media Lab

· Designed a pure software approach that can turn almost every GPIO into a capacitive sensor.

PUBLICATIONS

· **Fangzheng Liu**, Kerri Cahoy, Ariel Ekblaw, and Joseph A Paradiso. "A Wireless Lunar Sensor Node Powered by Temperature Gradients across the Device's Surface". In The 45th International IEEE Aerospace Conference (2024).[Accepted]

· **Fangzheng Liu** and Joseph A Paradiso. 2023. PrintedCircuit Board (PCB) Probe Tester (PCBPT) - a Compact Desktop system that 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.

· **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

- **Electronics** - Embedded system (nRF52, STM32, ATSAMD), FPGA (Xlinix 7 series), analog circuit
- **Programming languages and related** - C, C++, VHDL, Python, Git, 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, PCB milling, PCB soldering, Laser cutting, water jet cutting.
- **Others** - Zero gravity flight certificates !!! :)
- **Space grade tests** - thermal vacuum test.

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

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

INTERESTS

| Hiking | Cycling | rock climbing | Basketball | Electronics |