Jared Floersch

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Personal Statement

As a versatile and innovative engineer with extensive experience in research and development, I excel in creating concepts and turning them into revolutionary products. Known for my quick development pace and pragmatic approach, my work has fueled scientific publications, patent applications, and medical devices that are excelling in the field today.

Experience

Senior Mechatronics Engineer

Innovative Design Labs – Minneapolis, Minnesota
December 2022 - Present

- Lead research and development on cutting-edge mechatronic and robotic products through NIH-funded SBIR grants as the team's primary mechanical and control systems expert.
- Independently invented a novel electromechanical ankle actuator for an adaptive-terrain version of Ekso Bionics' EksoNR exoskeleton. Created dynamic control system simulations in Python and MATLAB to investigate system stability and inform design requirements. Created detailed CAD models in Solidworks, manufactured prototypes, and evaluated them in a laboratory setting.
- Designed anatomically accurate simulators of human joints for training physical therapists and combat medics in musculoskeletal injury diagnosis. Created the most physiologically accurate model of robotically-driven human joints on the market, capable of simulating injuries with great accuracy.
- Independently designed a mechanical heart that generates pulsatile flow for use in combat training simulators. Designed a novel centrifugal pump that can achieve physiologically accurate flow rate and blood pressure waveforms, as well as an anatomically accurate pulse.

Senior Research and Development Engineer

Abbott Laboratories – St. Paul, Minnesota
July 2020 - December 2022

- Worked in a startup-like environment to develop Cephea - one of the world's first transcatheter and transseptal mitral valve replacements. Major contributor in prototyping preclinical prosthetic valve designs to optimize for durability, anchoring, hydrodynamic performance, and manufacturability.
- Invented novel solutions to drastically lower strain on nitinol and fabric components, resolving critical fatigue-based failure modes. Devices using these designs were proven very successful in animal studies and EFS human clinical trials, leading to two patent applications.
- Led investigation into inherent issues in mitral valve fluid dynamic evaluation. Wrote Monte Carlo simulation in MATLAB to characterize the problem and published the results with my colleagues in *Cardiovascular Engineering Technology,* which has been cited in a textbook on heart valve design.[3]
- Heavily utilized MATLAB to solve difficult problems in heart valve research and development. Created image processing pipelines to analyze high-speed video of heart valve prototypes, allowing for data-driven decision making in durability and performance. Developed 3D device deployment simulations in MATLAB to predict optimal catheter trajectories. Techniques that were invented with these learnings have been adopted by interventional cardiologists during implantation.

Engineering Consultant

Floersch Engineering LLC – Minneapolis, Minnesota

August 2019 - Present

- Collaborated with researchers in pediatrics at the U of MN to increase equity in healthcare access by inventing innovative low-cost medical devices for use in low-to-middle income countries.
- Designed a first-of-its-kind bCPAP-compatible oxygen blender that can be assembled on-site using readily available hospital supplies. This device has been used in clinical trials in rural Cambodia and has been shown to effectively replace expensive oxygenators in treating children with pneumonia at a material cost of $5 USD. Published papers on the design of the device in the *ASME Journal of Medical Devices* and *American Journal of Tropical Health and Hygiene.*[1, 4]
- Created a low-cost humidifier that is 10 times cheaper than the gold-standard device, using ultrasonic agitation to humidify oxygen without need for a heating element - a method that has never been used commercially. Lead the mechanical, electrical, and firmware design of the device. Managed team of three undergraduate research assistants during the design and evaluation of prototypes.

Graduate Researcher

Dr. Perry Li Lab – University of Minnesota, Department of Mechanical Engineering

August 2019 - May 2020

- Developed a glove-mounted device to intuitively control a robotic arm through the use of point-and-follow control, utilizing an in-palm accelerometer and computer vision system. Derived a novel pose estimation algorithm using a fusion of information from these two sensors to control robotic arms. Implemented algorithm on a Raspberry Pi Zero W using OpenCV for image processing, presented results at the *IFAC Modeling, Estimation, and Control Conference* in 2021.[2]

Education

Master of Science in Mechanical Engineering

University of Minnesota, Twin Cities – GPA: 4.0

Bachelor of Science in Mechanical Engineering

University of Minnesota, Twin Cities – GPA: 3.5

Skills

Tools: SolidWorks, OnShape, ANSYS, KiCad, Python, C/C++, MATLAB, 3D Printing, CNC, Machining
Design: Medical Devices, Mechanisms, Circuits, Control Systems, Algorithms, Embedded Systems
Industries: Medical Devices, Cardiovascular Implants, Exoskeletons, Robotics, Computer Vision

Publications

1. Wu, A.G, Luch, S., et al. (2022). A Low-Resource Oxygen Blender Prototype for Use in Modified Bubble CPAP Circuits: Results from Design Feasibility Workshops. *American Journal of Tropical Medicine and Hygiene.*
2. Floersch, J. and Li, P. Y. (2021). Human Gesture Robot Control Using a Camera/Accelerometer-in-Palm Sensor. *IFAC-PapersOnLine.*
3. Floersch, J., Evans, M. C., Midha, P. A. (2021). Ineffective Orifice Area: Practical Limitations of Accurate EOA Assessment for Low-Gradient Heart Valve Prostheses. *Cardiovascular Engineering Technology.*
4. Floersch, J., Hauschildt, E., et al. (2020). A Low-Resource Oxygen Blender Prototype for Use in Modified Bubble CPAP Circuits. *ASME Journal of Medical Devices.*