Matthew Phillip Ruffner

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Education

University of Kentucky — Lexington, KY
Ph.D. in Electrical Engineering, Advisor: Daniel L. Lau — 2020–Current

University of Kentucky — Lexington, KY
M.S. in Electrical Engineering, GPA: 3.56/4.00 — 2017–2019

- Thesis: "Design of a Machine Vision Camera for Spatial Augmented Reality"

University of Kentucky — Lexington, KY
B.S. in Electrical Engineering, Computer Engineering and Computer Science, GPA: 3.48/4.00 — 2013–2017

Experience

Badger Technologies — Nicholasville, KY
ROS Intern — Summer 2019

- Update aisle navigation and add support for multiple depth cameras to mitigate sun blinding

University of Kentucky — Lexington, KY
Graduate Research Assistant in Electrical and Computer Engineering — Summer 2017

- PCB design for machine vision camera synchronization

University of Kentucky — Lexington, KY
Undergraduate Research Assistant in Electrical and Computer Engineering — 2016 - 2017

- Assembled an engineering model of the University's third cubesat for a re-fly mission
- Developed and implemented firmware for the Electronic Power Supply in the cubesat

MosquitoMate, Inc. — Lexington, KY
Undergraduate Hardware/Software Research Engineer — 2016 - 2017

- Created WiFi enabled heating and temperature logging solution for feeding mosquitoes
- Created custom hardware for collecting audio data from mosquitoes

University of Kentucky — Lexington, KY
Undergraduate Research Assistant in Computer Science — 2013 - 2015

- Created web scheduler for faculty/student advising meetings
- Setup, configured, and maintained machines with Ubuntu Linux

Skills

- **Embedded/Desktop Programming:** 8 years experience with C/C++. Proficient in Qt, Python, MATLAB and LaTeX. Very quick to learn new APIs and software. Comfortable with Linux/OSX/Windows as daily driver.
- **Linux:** 12 years experience. Proficient with Git, Emacs, and Make. Comfortable on a CLI as well as using Bash scripts, dotfiles and aliases to expedite routine workflows.
- **ECAD/MCAD:** 5 years experience with Autodesk EAGLE, 2 and 4 layer designs. Proficient in Autodesk Inventor.
- **Rapid Prototyping:** 6 years experience with FDM/FFF 3D printing, oscilloscopes, logic analyzers, and other electronic analysis equipment. 11 years experience with Arduino programming and low level sensor interfacing and assembly. 15 years experience soldering and circuit assembly.

Projects

- **AMTPS FTA Avionics** - github.com/krups/amtps-fta-hardware 2021-
  Additive Manufacturing of Thermal Protective Systems Flight Test Article Avionics
  Electronic hardware design for the avionics of a hypersonic re-entry capsule.
- **Small Robot Control PCB** - github.com/UKyKORA/SBMCS_PCB 2020
  Dual motor controller with encoder-based speed control, 9-axis IMU, battery regulation and current monitoring
- **Small Robot Control Firmware** - github.com/UKyKORA/SBMCS_Firmware 2020
  A FreeRTOS based telemetry publishing and motor control system using ROS serial interface
- **KREPE Flight Computer** - github.com/krups/iss-hardware 2019
  Electronic hardware design of the avionics which flew in the successful KREPE mission. First time a university-built entry capsule has successfully transited a planetary atmosphere.
  First known 3D-printed heat shield to fly an entry mission.
- **Wireless Monitoring Node** - github.com/ruffner/measure-mesh 2018
  Sensor node and gateway electrical design, firmware plus SQL logging and plotting

Scholarships and Awards

- Awarded the Graduate Assistance in Areas of National Need (GAANN) fellowship, providing up to 5 years of funding for doctoral studies. Spring 2021
- Graduated Cum Laude from the University of Kentucky Spring 2017
- Awarded Dean's List for Fall 2013 Spring 2014
- UK Presidential Scholarship (full tuition) Spring 2013
- UK William C. Parker Scholarship (yearly stipend) Spring 2013
- Kentucky Educational Excellence Scholarship (yearly stipend) Spring 2013
- Jackson Energy Scholarship (one time stipend award) Fall 2012

Patents

- Matthew P. Ruffner, Kevin D. Donohue, Michael J. Sikora, U.S. Utility Patent Application No. 16/843,542 A MOTION FEEDBACK DEVICE, submitted April 8, 2020

Publications

[1] J. D. Schmidt, J. T. Nichols, M. P. Ruffner, R. D. Nolin, W. T. Smith, and A. Martin, "Kentucky re-entry universal payload system (krups): Design and testing for hypersonic re-entry flight", in *AIAA SCITECH 2022 Forum*. eprint: https://arc.aiaa.org/doi/pdf/10.2514/6.2022-1576.

[2] J. D. Schmidt, J. T. Nichols, M. P. Ruffner, R. G. Nolin, W. T. Smith, and A. Martin, "Kentucky re-entry universal payload system (krups): Design and testing for orbital flight", in *AIAA AVIATION 2021 FORUM*. eprint: https://arc.aiaa.org/doi/pdf/10.2514/6.2021-3129.

[3] Y. Yu, D. L. Lau, M. P. Ruffner, and K. Liu, "Dual-projector structured light 3d shape measurement", *Appl. Opt.*, vol. 59, no. 4, pp. 964–974, Feb. 2020.

[4] M. P. Ruffner, Y. Yu, and D. L. Lau, "Structured light smart camera for spatial augmented reality applications", in *Emerging Digital Micromirror Device Based Systems and Applications XI*, M. R. Douglass, J. Ehmke, and B. L. Lee, Eds., International Society for Optics and Photonics, vol. 10932, SPIE, 2019, pp. 85–95.

[5] Y. Yu, D. L. Lau, and M. P. Ruffner, "3D scanning by means of dual-projector structured light illumination", in *Emerging Digital Micromirror Device Based Systems and Applications XI*, M. R. Douglass, J. Ehmke, and B. L. Lee, Eds., International Society for Optics and Photonics, vol. 10932, SPIE, 2019, pp. 117–125.

Extracurricular Activities

- EE/Firmware lead and co-founder of the Kentucky Organization of Robotics and Automation 2019–Current
  Creating robots for competitive events as well as promoting STEM education in the Lexington community through outreach, ukykora.org
- Co-founder of MoveTones, LLC 2018-Current
  Developing electronic hardware kits to promote musical education and exploration, as well as provide an intuitive, interactive microprocessor learning platform, movetones.com
- Best solo project: University of Kentucky CatHacks Hackathon Spring 2015
  Artistic persistence of vision display piece
- Volunteer at 2018 Kentucky Derby Spring 2018
  Helped collect refuse in the in-field