Tristan K. Schuler

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Clearance: "Secret"

Research Interests

Unmanned Autonomous Systems, Robotics, Lighter Than Air Vehicles, High Altitude Balloons, Simulation, Reinforcement Learning, Planetary Exploration

Education

University of Arizona	M.S.	Aerospace Engineering **Thesis:** *Solar Balloons - An Aerial Platform for Planetary Exploration* Advisor: Jekan Thangavelautham	2020
George Mason University	B.S.	Mechanical Engineering *Minor: Computer Science*	2019

Work Experience

U.S. Naval Research Laboratory
Research Scientist
Washington D.C., USA

- Designed and manufactured small Lighter than Air Autonomous Agents (LTA3)
- Developed software for operating LTA3's manually and autonomously.
- Researched lightweight indoor localization solutions.
- Led SWAT-C development in partnership with the USNA

2018 - Present

University of Arizona Graduate Research Assistant
Tucson, AZ, USA

- Designed, manufactured, and conducted terrestrial solar balloon flight experiments
- Developed software for predicting solar balloon trajectories on Earth, Venus, and Mars
- Developed CubeSat System Design for an aerial exploration mission to Mars

2019 - 2020

NASA - MSFC
Intern *Huntsville, AL, USA*

- Adapted April Tags OpenCV library to localize robots (open source release on software.nasa.gov)
- Tested tether deployment and braking dynamics for an electric tether CubeSat
- Developed programs to interface with several GPS receivers including: JAVAD TR-G2, Novatel SpaceQuest, GNSS-SDR
- Designed tools for parsing and analyzing GPS receiver output

2017 - 2018

George Mason University
Undergraduate Research Assistant
Fairfax, VA, USA

- Developed algorithms to generate CNC machinable furniture parts from 2D vector drawings and customization parameters provided by a user.

2017

U.S. Airforce Research Laboratory	• Developed autonomous ground rover platform using COTS equipment and assessed usability of opensource Pixhawk ArduPilot software for navigation	2016
Intern *Eglin AFB, USA*		

Awards, Honors, and Professional Recognition

U.S. Naval Research Laboratory	Awarded a fully funded two year Karles Distinguished Scholar's Fellowship to research autonomous solar high altitude balloons (SHABs) for Naval applications	2021 - 2023
Washington D.C., USA		
Best Paper Award IEEE CIS-RAM	Received a best paper award for our paper entitled "Multi-agent Time-based A* Path Planning on Lighter Thank Air Autonomous Agents" at IEEE-CIS-RAM 2019	2019

Publications

Referred Journal Papers

[1] **T. K. Schuler**, D. C. Bowman, J. S. Izraelevitz, D. Sofge, and J. Thangavelautham, "Long duration flights in venus' atmosphere using passive solar hot air balloons," *Acta Astronautica*, vol. 191, pp. 160–168, 2022

[2] A. Bouskela, A. Kling, **T. K. Schuler**, S. Shkarayev, H. Kalita, and J. Thangavelautham, "Mars exploration using sailplanes," *Aerospace*, vol. 9, no. 6, p. 306, 2022

[3] L. McGuire, **T. K. Schuler**, M. Otte, and D. Sofge, "Viscoelastic fluid-inspired swarm behavior to reduce susceptibility to local minima: The chain siphon algorithm," *IEEE Robotics and Automation Letters*, vol. 7, no. 2, pp. 1000–1007, 2021

[4] J. Gibson, **T. K. Schuler**, L. McGuire, D. M. Lofaro, and D. Sofge, "Swarm and multi-agent time-based a* path planning for lighter-than-air systems," *Unmanned Systems*, vol. 8, no. 03, pp. 253–260, 2020

Referred Conference/Workshop Proceedings

[1] **T. K. Schuler**, M. Debbins, M. Cobar, J. Thangavelautham, and D. Sofge, "Altitude control with vented solar high altitude balloons (shab-vs)," in *Proceedings of 2023 IEEE/AIAA Aerospace Conference*, 2023

[2] **T. K. Schuler**, D. M. Kabacinski, Cameron Lofaro, D. Bhanderi, J. Nguyen, and D. Sofge, "Wall climbing emergent behavior in a swarm of real-world miniature autonomous blimps," in *Proceedings of 2023 ICAART Conference*, 2023

[3] T. X. Lin, **T. K. Schuler**, D. M. Lofaro, D. Sofge, and F. Zhang, "Assisted blimp piloting using wind-field mapping and the open-blimp platform," in *AIAA SCITECH 2023 Forum*, 2023, p. 0695

[4] **T. K. Schuler**, M. Debbins, D. Bowman, D. Goolsby, J. Crest, I. Pimienta, S. Fitch, E. Roesler, L. Wheeler, D. A. Sofge *et al.*, "Solar high altitude balloons as a long duration controllable aerial platform," in *AIAA SCITECH 2022 Forum*, 2022, p. 0282

[5] T. X. Lin, M. Rossouw, A. B. Maxseiner, **T. K. Schuler**, M. A. Garratt, S. Ravi, F. Zhang, D. M. Lofaro, and D. A. Sofge, "Miniature autonomous blimps for indoor applications," in *AIAA SCITECH 2022 Forum*, 2022, p. 1834

[6] L. Wheeler, E. Roesler, D. Bowman, A. Glen, P. Miller, A. Sanchez, and **T. K. Schuler**, "Stratospheric sampling strategies for balloon-borne datasets of aerosols and gases," in *AGU Fall Meeting Abstracts*, vol. 2021, 2021, pp. GC35E–0751

[7] J. Thangavelautham, **T. K. Schuler**, M. Debbins, K. Kukkala, V. Vilvanathan, C. Bukowski, and H. Kalita, "Tethered robotic explorer for accessing cliffs, canyons, and craters on the surface of mars," in *Proceedings of AAS Space Flight Mechanics Conference*, 2021

[8] **T. K. Schuler**, S. Shkarayev, and J. Thangavelautham, "Altitude control of a solar balloon for mars exploration," in *AAS Guidance Navigation and Control Conference*, 2020

[9] **T. K. Schuler**, K. Kukkala, V. Vilvanathan, and J. Thangavelautham, "Cubesat system design for mars exploratory balloon (meb)," in *Proceedings of the International Symposium on Artificial Intelligence, Robotics and Automation in Space (i-SAIRIS), Virtual Conference*, 2020, pp. 19–21

[10] R. teja Nallapu, Y. Xu, A. Marquez, **T. K. Schuler**, and J. Thangavelautham, "The design of a space-based observation and tracking system for interstellar objects," in *AAS Guidance Navigation and Control Conference*, 2020

[11] D. Srivastava, D. M. Lofaro, **T. K. Schuler**, D. Sofge, and D. W. Aha, "Case-based gesture interface for multiagent formation control," in *International Conference on Case-Based Reasoning.* Springer, 2020, pp. 295–306

[12] J. Thangavelautham, R. Moses, P. Gee, **T. K. Schuler**, H. Kalita, and S. Shkarayev, "Gnc of shape morphing microbots for planetary exploration," in *AAS Guidance Navigation and Control Conference*, 2020

[13] **T. K. Schuler**, D. Lofaro, L. McGuire, A. Schroer, T. Lin, and D. Sofge, "A study of robotic swarms and emergent behaviors using 25+ realworld lighter-than-air autonomous agents (lta3)," in *2019 3rd International Symposium on Swarm Behavior and Bio-Inspired Robotics (SWARM)*, 2019

[14] A. Bouskela, A. Kling, A. Chandra, **T. K. Schuler**, S. Shkarayev, and J. Thangavelautham, "Planetary exploration using cubesat deployed sailplanes," in *International Astronautical Congress*, 2019

Patents

[1] M. Debbins, **T. K. Schuler**, D. Goolsby, J. Crest, and J. Thangavelautham, "Solar hot air balloon vent," U.S. Patent Pending, 2022

Invited Talks and Demonstrations and Workshops

[1] T. Lin, , J. Wang, T. Schuler, D. Sofge, and F. Zhang, "Workshop series on lighter-than-air autonomous agent," in *American Controls Conference Workshop*, 2023

[2] T. Schuler, "Solar high altitude balloons (shab) as a long duration controllable aerial platform," in *Pusan National University, Busan, Korea*, 2022

[3] T. Lin, T. Schuler, D. Lofaro, D. Sofge, and F. Zhang, "Lighter-than-air autonomous agents: A hands-on tutorial," in *American Controls Conference Workshop*, 2022

[4] T. K. Schuler, "Altitude control with vented solar high altitude balloons (shab-vs)," in *Family robotics day: Reactive hexapod robots*, 2022

[5] T. Schuler and A. Roth, "Hexapod robots for reinforcement learning algorithm development," in *Navy League - Sea Air Space, Washington DC Metro Area*, 2022

[6] T. Schuler, "Modeling and terrestrial flight experiments of solar balloons," in *Scientific Ballooning Technologies Workshop*, 2021

[7] T. Schuler and D. Lofaro, "Reactive autonomous agents," in *Navy League - Sea Air Space, Washington DC Metro Area*, 2021

[8] T. K. Schuler and D. Lofaro, "Reactive swarming autonomy," in *Chief of Naval Research (CNR) Demo, Washington, DC*, 2019

[9] T. Schuler and D. Lofaro, "Lighter than air autonomous agents," in *Navy League - Sea Air Space, Washington DC Metro Area*, 2019