



Minority University Research and Education Project (MUREP)

Institution: Arizona State University

City/State: Tempe, AZ

Award Name: MUREP Partnership Learning Annual Notification (MPLAN)

Award Number: N/A

Title: Drones for Contact-inclusive Planetary Exploration/ STRG-2: Extreme Access

PI: Wenlong Zhang

PI Email: N/A

Award Fiscal Year: FY2024

Summary:

The overall goal of this project is to enable autonomous planetary exploration using aerial robots. The Mars helicopter, *Ingenuity*, completed 72 flights as part of the Mars 2020 mission and it demonstrated high resilience for various scouting tasks in harsh Mars environment. However, utilizing aerial robots is currently limited to open areas, as navigating unknown environments (e.g., lava tubes and subsurface voids) poses a high risk of collision and demands fast onboard detection and (re-)planning. In this project, we will explore three approaches to improve the level of stability, flexibility, and autonomy of aerial robots in extra-terrestrial flights: 1) real-time force/torque estimation and robust flight control, 2) onboard computer vision for object recognition and localization, and 3) autonomous motion planning for precision landing and contact-based exploration. This project builds upon the PI's past work on aerial robots, and we plan to engage stakeholders from NASA and industry to refine the functional requirement and value proposition of this technology, develop a roadmap for improving the TRL, and engage students from underrepresented groups in space robotics research.