UNMANNED AERIAL SYSTEMS (UAS) AT UNLV

The University of Nevada, Las Vegas is pursuing a number of research and education initiatives supporting state, regional, and national interests in unmanned aerial systems. The university has worked successfully with state education and research institutions as well as the governor’s office to ensure Nevada was selected by as one of six national sites for testing, research, and development of unmanned aerial systems. UNLV has an interdisciplinary team of scientists, engineers, and policy and legal experts with expertise in this area, as well as a planned undergraduate minor in UAS. All involved are poised to contribute to the UAV industry to Nevada, which could have a potential economic impact of $2.5 billion to $8 billion.

UAS Minor Program
UNLV’s new UAS minor program introduces students to basic knowledge of the field’s various components, preparing them for work in the UAS industry. The program’s core includes an introduction to UAS, UAS simulation training, and a class on privacy issues, taught by the William S. Boyd School of Law. The proposed minor program will provide students with knowledge about UAS-related technology through hands-on courses created specifically for the program. With Nevada’s recent FAA designation as one of six regional sites for unmanned aerial vehicles (UAV) development, students who complete the minor will be uniquely prepared for future UAV pilot certification, the rules and standards of which are currently being developed by the FAA.

Funded Research
Professor Woosoon Yim of the department of mechanical engineering is presently conducting research on a robotic aerial platform that operates autonomously in GPS-denied environments, such as caves, forests, and other urban structures like buildings and tunnels. The drone’s research team includes one undergraduate and one graduate student, each tasked with separate duties – custom aerial platform fabrication, on-board sensor-based autonomous flight controller design, and implementation in the mock-up flight testing facility located in the UNLV’s College of Engineering.
Additional Areas of Faculty Expertise

**UAS Design**
- Novel designs of miniature flapping wing UAV
- Adaptation of a JP-8 fueled engine to a commercial UAV
- Advanced material research for development of new UAV materials for airframes and potential smart material applications

**UAS Control Systems**
- UAV control, including fault tolerant control
- Cooperative UAVs
- Control and motion planning algorithms for indoor UAVs

**UAS Communications Systems**
- Wireless, secure communications for UAS-to-UAS and UAS-to-ground
- Asymmetric on-board encryption algorithms for communications
- Compact antenna development
- Camouflaged communication to UAV with minimal awareness to eavesdroppers
- Avoidance of signal jamming for UAS applications

**UAS Sensor Development**
- Miniature, lightweight sensors for airborne, biological, or nuclear threats

**Automatic System Operations Monitoring**
- Modeling, simulation, and in-flight testing, including under harsh conditions

**UAS Computational Platforms**
- Development of a high-performance and low-energy consumption, reconfigurable computing platform and software architecture for cooperative UAVs

**Intelligent System Health Monitoring**
- Development of a system for self-failure identification and classification as it relates to a UAV’s safety and mission success

**Law-Related Research**
- UAS and the Constitution, particularly the Fourth Amendment, and the right to privacy
- Employment and Agency law
- National Security
- Issues of private law, including nuisance, torts, and property rights
- Aerospace law and federal, state and local airspace regulations
- UAS and criminal law

**Policy Research**
- Current state of laws and policies in relation to domestic use
- Social, cultural, and political impact
- Design and administration of surveys to assess public opinion, and a civic and public engagement project to identify public concerns and opportunities

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