GAANN- GOSTARS Fellowship Project.

Adviser: Cheng Zhu, Ph.D., P.E.

Title: UAV-Based Assessment of Geotechnical Infrastructure under Climate Influences

Description: This project aims to integrate unmanned aerial vehicle (UAV) and novel image processing techniques to perform reliable assessment of geotechnical infrastructure for the improved understanding of soil-atmosphere interactions. UAV-based photogrammetry will be conducted to generate the high-resolution 3D elevation model of levees and slopes in New Jersey. Novel image data processing techniques will be developed to support the fast and reliable generation of the 3D model. These models will be used to evaluate the stability and resilience of geotechnical infrastructure under extreme weather events such as flooding and drought. The detailed breakdown of research tasks includes the following:
Task 1: Identify surveying site locations and carry out multiple UAV-based site surveying
Task 2: Analyze survey results and develop data processing algorithms to generate 3D models
Task 3: Establish and validate infrastructure assessment system based on 3D models

Impact on GAANN: A large amount of the geotechnical infrastructure in developed countries is old and constructed using historic construction methods, but play a critical role in ensuring the safety of transportation. Maintaining such pervasive infrastructure requires high costs, and even higher in the event of failure. This project will directly focus on the timely and accurate assessment of geotechnical infrastructure and provide quantitative analysis of the infrastructure performance. The valuable information obtained from this project will serve the national need in infrastructure rehabilitation.

Impact on GOSTAR: This project will allow the graduate student to learn novel site surveying techniques and develop skills in the area of infrastructure asset assessment and management. Graduate student will also have the chance to publish in top-ranking journals and present in prestigious conferences. Working in this area will provide numerous opportunities to the graduate student to work in either industry or academia.

Tentative Plan									
Semester	1	2	3	4	5	6	7	8	9
Task	Identify surveying site locations and carry out multiple UAV-based site surveying			Analyze survey results and develop data processing algorithms to generate 3D models			Establish and validate infrastructure assessment system based on 3D models		
Outcome	Establish the procedure for airborne site surveying			Develop a data processing algorithm for 3D model generation			Develop a standardized system for infrastructure assessment		
Deliverable	Publish in a refereed conference proceeding and journal			Publish in a refereed conference proceeding and journal			Publish in a refereed conference proceeding and journal		
Graduation									Summer 2025