INDUSTRIAL SOLUTIONS LABORATORY

Department Project Information

Department Name	*System Engineering and Engineering Management*	**Date Submitted**	*04/15/2022*
Project Title	*Comprehensive Transportation Sensing Systems Perception and Data Fusion* **(UNCC_TRAN3)**	**Planned Starting Semester**	*Fall 2022*

Funding

What is the source of funds that will be used to cover all direct costs of this project? _SEEM Department__

Is this source of funds already secured? Yes_ X___ No____

Work Space

Have you secured a lab/work space for the project to be built? Yes__X__ No____

Faculty Mentor/Grading Instructors *

	Name	Email	Phone
1	Lei Zhu	Lei.Zhu@uncc.edu	704-687-6054
2	Churlzu Lim	clim2@uncc.edu	704-687-1954
3			

*List any graduate student that will be working on the project as a grading instructor so that they may be added to Canvas.

Senior Design Project Description

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. Assume 10 hours per week per student.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills:

Discipline	Number	Discipline	Number
Mechanical		Electrical	1
Computer	2	Systems	2-4
Other ( )			

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Project Overview:

Transportation perception and spatial sensing technologies, such as LiDAR, Radar, RGB camera, Thermal camera, and Stereo camera, deployed on vehicles and infrastructure, play a critical role in improving the safety and mobility of existing transportation systems by providing complete traffic flow observations. Sensing data processing using Artificial Intelligent (AI) technologies for data fusion, object classification, and tracking, and new mobility (such as Urban Air Mobility (UAM), drone), lay a foundation for smart infrastructure and intelligent mobility applications and transportation perception from infrastructure and roadside. The project will collect data from multiple advanced sensors/devices in the real world and conduct data processing and research using AI technologies and open-source/commercial software tools.

Project Requirements:

This project will process and analyze raw data collected from multiple sensors and apply AI and machine learning (AI/ML) technologies for improving transportation systems and energy estimation by generating situation awareness, object classification, localization, and tracking. The primary tasks include devices (LiDAR, radar, thermal camera, and drone) setup, system test running, data collection, and data processing by using AI technologies. 4-5 students with experience in image processing, 3D point cloud data processing, and AI/ML technology will be desired. More specific tasks,

- Traffic data collection from the real-world pilots and tests
- Drone operation and data collection/processing
- Sensing data process for object classification, localization, and tracking
    - LiDAR data collection and processing for car and pedestrian detection
    - Radar data collection and process for car and pedestrian detection
    - Thermal camera data collection and processing using state-of-the-art technologies (e.g., YOLO)
    - 360/Stereo camera data collection and process

Expected Deliverables/Results:

- A comprehensive transportation sensing platform (e.g., LiDAR and stereo camera) will be established and set up
- Different types of raw datasets will be collected and stored in the server. And a cleansed dataset for research will be produced by data pre-processing, data fusion, and data analysis.
    - LiDAR 3-D data processing
    - Radar data processing
    - Thermal, stereo, and RGB image data processing
- Drone operation and energy estimation

Disposition of Deliverables at the End of the Project:

- A database storing all raw and processed data from devices (sensors and drones)
- Technical reports and pilot instruction manual for data collection, schema, format, and processing
- Research on AI/ML technology application on traffic data from all devices

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

- knowledge of computer programming (such as python, Java, C++) and coding skills

- Familiar with or interested in data processing, statistics, and AI/ML technologies (e.g., neural network)
- Computer and communication network system
- Self-motivated and good communication skills
- Be able to travel to nearby cities to test the sensors and collect data