



## Center for Navigation

**Center Director:**

Dr. Jidong Huang  
Professor and Chair, Electrical and Computer Engineering Department  
College of Engineering and Computer Science  
Office: E-100B  
Telephone: 657-278-3013  
Email: [jhuang@fullerton.edu](mailto:jhuang@fullerton.edu)

**Year Established:**

2019

**Year of Last Review:**

N/A

**Date of Review:**

June 14, 2023 (Abbreviated Interim Report)

## **1. Mission and Goals**

In line with the growth of workforce and technology development needs in the area of Navigation, the mission of the center is to grow and develop College of Engineering and Computer Science (ECS)'s involvement in curriculum support, applied research, and community outreach in the area of Navigation.

The Center aims to serve as a hub, creating opportunities for faculty and students to collaborate and partner with industry on inter-disciplinary applied research projects, and engage in curricular leadership in the area of Navigation. In addition, the Center aims to serve as a point of contact for both public organizations and private sector industry interested in working with and/or hiring ECS students and collaborating on research/design projects in related areas.

Specific goals of the center include: 1) Provide instructional and curricula support for the area of Navigation; 2) Promote research activities in Navigation; and 3) Provide professional engagement and community outreach services in Navigation.

## **2. Activities**

Since its establishment in November 2019, the center has continuously supported its faculty collaborators and their students in Navigation-related activities. In the first one and a half years from Spring 2020 to Spring 2021, due to the pandemic, the center was under limited operations as most of the campus operations were conducted virtually. After Fall 2021, as the campus gradually resumed in-person operations, the center has become more active in supporting faculty research and student design projects as well as organizing professional outreach activities with a focus on the following topic areas.

- Navigation Sensor Integration and Advanced Navigation Algorithms
- Robotics and Autonomous Systems
- Connected Vehicles and Intelligent Transportation System
- AI and Cyber Security in Navigation, Guidance and Control Applications

## **3. Organizational Structure and Governance**

The Center is led by a director, Dr. Jidong Huang, Professor of Electrical and Computer Engineering (ECE), who is responsible for overall management of the center activities. Additionally, the center activities including curriculum support, research and student design projects, and outreach events are currently supported by several center faculty collaborators from various ECS departments including Drs. Bai and George from ECE, Dr. Bein from Computer Science, and Dr. Robson from Mechanical Engineering.

The center has an advisory board consisting of Dean of ECS, ECS Executive Director of Development, and 8 external experts and professionals from well known organizations in the field of Navigation, including Raytheon Technologies (2 members), Northrop Grumman (2 members), The Aerospace Corporation (1 member), L3 Harris (1 member), John Deere (1 member) and UC Riverside (1 member). The advisory board meets twice a year to review, provide advisory inputs and feedback on the center activities.

The center is also supported by a student club, the CSUF Chapter of Institute of Navigation. In the long run, the center plans to name three assistant directors for assisting the director with curriculum development, research and grants acquisition, and outreach activities respectively.

## **4. Resources and Sustainability**

The Center is housed in the College of ECS, with academic support mainly from the ECE Department. The center currently has two dedicated lab space: GPS Lab (E-402B) and Robotics Lab (E-301), in addition to the access of general ECE student design project lab (E-302).

In the past three years, the center has consistently received both internal and external funds to support its activities.

- Awarded \$15K: “GPS Related Design Projects”, IRA Grant, ASI, February 2023
- Awarded \$40K: “CSUF Navigation Center”, Raytheon Technologies, June 2022
- Awarded \$13.5K: “GPS Related Design Projects”, IRA Grant, ASI, February 2022
- Awarded \$40K: “CSUF Navigation Center”, Raytheon Technologies, June 2021
- Awarded \$12K: “GPS Related Design Projects”, IRA Grant, ASI, May 2021
- Awarded \$10K, with Dr. Nina Robson as PI: “Robotics: Learning Through Discovery and Technology” , GI 2025 Grant, CSUF, July 2020
- Awarded \$15K: “GPS Related Design Projects”, IRA Grant, ASI, June 2020

These funds had been used by the center to compensate faculty efforts, purchase project supplies and organize professional engagement activities. In the long run, the center plans to seek additional external funds for providing direct support such as stipend or scholarship to students.

## **5. Highlights and Accomplishments**

In the past three years, the center faculty collaborators had actively conducted research and supervised multiple student design projects in Navigation-related areas, including the following,

- Design of the controls algorithm for smart intersections
- Applying machine learning for recognition of traffic signs in intelligent transportation
- Using GPS in a sensor network for wildfire monitoring and early warning
- Design of Intelligent Ground Robot (IGR) and Autonomous Underwater Vehicle (AUV)
- LiDar-based Synchronous Localization And Mapping (SLAM) algorithms
- AI-enabled Vision Aided Navigation system
- Design of Sigma-Rho Kalman Filter

In addition, the center has actively engaged in professional engagement activities. The center has organized two advisory board meetings, one in April 2022 and another one in December 2022 to seek inputs from its industry advisors on professional engagements. As a result, a student field trip was organized in December 2022 with 15 ECS students visiting the Fullerton location of Raytheon. Additionally, a session with 4 student design projects was presented virtually to over 100 attendees from Raytheon in May 2023. Furthermore, the center director has consistently relayed internship and job opportunities in navigation-related fields to students.

## **6. Planning and Strategic Outlook**

Over the next three years, the center plans to a) identify three faculty members to serve as center assistant directors for curriculum support, research and grant development, and professional outreach; b) collaborate with industry partners to seek additional external funds to support student learning; c) work with faculty collaborators in updating navigation-related courses; d) collaborate with industry partners to organize regular professional engagement and outreach activities; e) work with faculty collaborators and their students in submitting research publications; and f) promote center nationally via interacting with professional society: the Institution of Navigation and attending its international conferences.