FACULTY MENTOR
Prasad Gudem

PROJECT TITLE
Hardware Emulation of 5G Wireless Communication Link

PROJECT DESCRIPTION
In this project, students will be working as a group and building 5G Wireless Communication Hardware to Emulate Bits-to-Bits Data Transfer between Base station (BS) and User Equipment (UE).

This project can accommodate both remote and in-person students.

INTERNS NEEDED
- 4

PREREQUISITES
- GPA > 3.5.
- Experience in building hardware and working with measurement equipment.

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PROJECT TITLE
Tracking Boomerangs Using Wireless Positioning, IMUs, and Video Imaging Using Drones

PROJECT DESCRIPTION
Boomerang is a simple and ingenious device invented by man thousands of years ago. Despite the simplicity of the device, the flight dynamics of a boomerang are rather complex as it experiences significant translational and rotational velocity. In our research, the flight trajectory of the boomerang will be measured using an ultra-wideband (UWB) wireless position location system, Inertial Measurement Units (IMU), and video imaging using Drones. In our recent publications, we extended Vassberg's work [1] on the flight dynamics of boomerangs using the recently developed measurement techniques. Our research group is in the process of expanding on our earlier research on the aerodynamics of boomerangs and measurement techniques. This is a unique opportunity for undergraduate student groups to do research and publish papers at reputable AIAA & IEEE conferences. See references 2-6 highlighting UCSD undergraduate student authors.

References:
[1] John Vassberg, "Boomerang Flight Dynamics," 30th AIAA Applied Aerodynamics Conference, 2012.
[2] P. Gudem, M. Schütz and K. Holland, "Flight Dynamics of Boomerangs: Impact of reversal of airflow and reversal of angle of attack," AIAA Aviation Forum and Exposition, 2019.
[3] G. Carfano, H. Murguia, P. Gudem and P. Mercier, "Impact of FR1 5G NR Jammers on UWB Indoor Position Location Systems," 2019 IEEE International Conference on Indoor Positioning and Indoor Navigation, 2019.
[4] P. Gudem, M. Laslett, G. Carfano, M. Schütz, K. Holland and H. Murguia, "Flight Dynamics of Boomerangs: Impact of Drag Force and Drag Torque," AIAA Aviation Forum and Exposition, 2020.
[5] J. Tahmassebpur, M. Laslett, M. Schultz and P. Gudem, "Wind Tunnel Measurements of Non-Dimensional Lift Coefficient of a Boomerang and Comparison to Theory," AIAA Aviation Forum and Exposition, 2021.
[6] E. Foss, W. Beatty, C. Lu, J. Alvarez, T. Hunt and P. Gudem, "Flight Dynamics of Boomerangs: Impact of Joint Angle," AIAA Aviation Forum and Exposition, 2023.

This project can accommodate both remote and in-person students.

INTERNS NEEDED
➢ 2

PREREQUISITES
➢ GPA > 3.5.
➢ Experience in building hardware and working with measurement equipment.

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PROJECT TITLE
5G Transceiver IC Design

PROJECT DESCRIPTION
Students will be working on the design of various blocks in 5G transceivers (LNA, PA, DnC, UpC Synthesizer, ADC, and DAC).

This project can accommodate both remote and in-person students.

INTERNS NEEDED
➢ 4

PREREQUISITES
➢ GPA > 3.5.
➢ Student must be scheduled to take ECE265 (A,B,C,D) course sequence.
➢ Prior experience in using Cadence, publications in IEEE, and/or prior industry experience in analog/RF/mmWave IC design is an asset.