SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
COLLEGE OF DESIGN AND ENGINEERING
Website: https://cde.nus.edu.sg/ece

Area: Microwave & Radio Frequency [Satellite Technology]

Host: Professor Low Kay Soon

TOPIC	:	**ROEKF-MPC Estimator for Satellite Attitude and Gyroscope Bias Estimation**
SPEAKER	:	**Mr. Mihindukulasooriya Sheral Crescent Tissera** **Graduate Student, ECE Dept, NUS**
DATE	:	**Tuesday, 25 October 2022**
TIME	:	**11.00AM to 11.45AM**
WEBINAR	:	**Join Zoom Meeting:** **https://nus-sg.zoom.us/j/87680581824?pwd=NVdRTlZRVU1IN3pVL0tKRkUzNU9aUT09** **Meeting ID: 876 8058 1824** **Passcode: 624981**

ABSTRACT

Micro-electro-mechanical system (MEMS) based gyroscopes are commonly used for satellite's attitude determination and control system in recent years. They are packaged in a small form factor and have lower power consumption. They provide a low-cost solution to the emerging NewSpace industry. MEMS gyroscopes exhibit time-zero null bias with variation over temperature. To overcome this problem, this seminar presents a new technique for self-calibration of gyroscope bias based on reduced order Extended Kalman Filter (EKF) working alongside an estimator based on the model predictive control (MPC) approach. The proposed technique is referred as the ROEKF-MPC Estimator. Both simulation results and experimental verification using an in-house developed spacecraft simulator will be presented. Unlike the EKF method, the proposed method can estimate the gyroscope bias instantly and it is robust against changes in temperature. Results show that the pointing performance is better than 0.35deg making the proposed method very attractive for most NewSpace applications. While the proposed method allows for self-calibration of gyroscope bias, its performance is affected by the gyroscope noise and requires the satellite's attitude to be nearly in steady state. This limitation will be addressed in detail.

BIOGRAPHY

Mr. Mihindukulasooriya Sheral Crescent Tissera received the B. Eng. degree in Aerospace Engineering and M. Eng degree (part-time) in Electrical and Electronic Engineering from Nanyang Technological University (NTU), Singapore, in 2013 and 2017, respectively.

He is currently a Research Fellow at Satellite Technology and Research Centre (STAR), National University of Singapore working for the Lumelite satellite team while pursuing a Ph.D. (part-time) in Electrical and Computer Engineering. Before his present appointment, he was a Research Engineer at Satellite Research Centre (SaRC) of NTU from 2013 to 2017 working for the VELOX satellite team.

His research interests include mechanical design of satellite systems, control and estimation of spacecraft attitude and spacecraft momentum management.