I-SE03

Guidance Navigation & Control 3

15:20-17:20
Room : C202

Chair :   Hwang Myung Shin (Hankuk Aviation Univ.)
Co-Chair :   Kim Jin Ho (Inha Univ.)

15:20 – 15:40   I-SE03-1

Lateral Stability/Control Derivatives Estimation of Canard Type Airplane form Flight Test

Hwang Myoung-shin, Eun Hee-bong, Park Wook-je, Kim Yeong-cheol(Hankuk Aviation Univ.), Seong Ki-jeong, Kim Eung-tae, Lee Jong-won(Korea Aerospace Research Institute)

Although computational-fluid-dynamic methods and wind-tunnel testing can provide data about the aerodynamic characteristics of an aircraft, the determination of these and other characteristics from flight data plays and important role. The object of this study is the verification of overall aircraft system performance to improve the stability of vehicle. We have test the Velocity-173, canard-type airplane to obtain the stability data. We adopt the two identifications method, EKF and MLE, for the parameter estimation. The results are compared with those of conventional type airplane.

15:40 – 16:00   I-SE03-2

Optimal Guidance and Nonlinear Tracking Control for a Lunar Lander

Shingo Nakajima, Kenji Uchiyama, Yuzo Shimada
(Nihon Univ.)

This paper presents guidance and control laws which guarantee a minimum fuel consumption and have obustness against various disturbances during a terminal-landing phase on the lunar surface. The nonlinear robust tracking control system is designed to track the reference profiles, which are expressed by exponential functions. An adjustment law in the tracking controller is given in the form of the differential equations with respect to the controller's variable gains. Computer simulations are performed to examine the tracking accuracy, the robustness in a thrust failure mode, and the vertical soft landing at a pre-assigned point on the lunar surface. The results of numerical simulation show the effectiveness of the present control law.

16:00 – 16:20   I-SE03-3

Design of a Gimbal-Structured Micro Gyroscope and Signal Processing Part

J.W. Song, J.G. Lee, W.T. Sung, H.T. Lim, and Y.K Kim(seoul Nationall Univ.), T. Kang(Konkuk Univ.)

In this paper, a single degree-of freedom gimbal-structured micro gyroscope and signal processing part including capacitive sensing circuits and filters are designed, fabricated and experimented. We use capacitive sensing method with excitation signal, i.e. sensing excitation signal, to measure the displacement of the moving plate. So, sensing output signal is modulated twice by the excitation signal and driving signal, which is profitable to decouple the driving and sensing mode, to reduce the effect of the acceleration, and to curtail the noises due to parasitic capacitance and driving signal. To reduce driving noises and to improve linearity, the excitation signals and driving signals are modified. Through frequency response analyses …

16:20 – 16:40   I-SE03-4

Dynamic and Stochastic Modeling of Litton's space Inertial Reference Unit(SIRU)

H.T. Choi, K.Y. Yong, B.S. Suk
(Korea Aerospace Research Institute)

Accurate mathematical models of spacecraft components are an essential of spacecraft attitude control system design, analysis and simulation. Gyro is one of the most important spacecraft components used for attitude propagation and control. Gyro errors may seriously degrade the accuracy of the calculated spacecraft angular rate and of attitude estimates due to inherent drift and bias errors. In this paper, a detailed mathematical model of gyro containing the relationships for predicting spacecraft angular rate and disturbances is proposed. Stochastic model describing random drift behavior is discussed in frequency domain and time domain. In order to illustrate this approach, we analyze the behavior for Litton's Space Inertial Reference Uint(SIRU).

16:40 – 17:00   I-SE03-5

Windowed Quaternion Estimator For Gyroless Spacecraft Attitude Determination

Injung Kim
(Seoul National Univ.)

Single point attitude determination method provides an optimal attitude minimizing the Wahba loss function. However, for the insufficient number of measurement vectors, the conventional single point methods has no unique solution. Thus, we introduce the sequential method to and an optimal attitude minimizing the windowed loss function. In this paper, this function is de¯ned as the sum of square errors for all measurement vectors within the axed sliding window. For simple implementation, the proposed algorithm is rewritten as a recursive form. Moreover, the covariance matrix is derived and expressed as a recursive form. Finally, we apply this algorithm to the attitude determination system with three LOS measurement sensors.

17:00 – 17:20   I-SE03-6

Navigation based on Multi Cylindrical Environment Map

Youngsup Park, Hyekyung Ko, Cheungwoon Cho , Kyunghyun Yoon
(Chung-Ang Univ.)

The cylindrical environment maps of image-based representation methods make high-quality, simple and low-price real-time navigation possible. In this paper, we propose a method to navigate from one viewpoint to the next in the virtual inside space, composed of several cylindrical environment maps. Our system is classified into the two modules. first of all, the panoramic image viewer that employs the rotation and zoom-in/out methods to navigate the virtual inside space, such as the QuickTime VR. The other is smooth real-time navigation using cubic mesh interpolation when the viewpoint moves from one environment map to another in the virtual space.