

## The NORAD Type Orbit Determination of LEO Satellites Using the GPS Navigation Measurements

Chang-Hwa Cho<sup>1</sup>, Jae-Cheol Yoon<sup>1</sup>, Kyu-Hong Choi<sup>1</sup>,  
Byoung-Sun Lee<sup>2</sup>, Jeong-Sook Lee<sup>2</sup>, Jae-Hoon Kim<sup>2</sup>

<sup>1</sup>Department of Astronomy, Yonsei University

<sup>2</sup>Communication Satellite Development Center, ETRI

NORAD two line elements is widely used for the increasing number of small satellite mission operations and analysis. However, due to the periodicity of generation of NORAD two line elements, two line elements independent of NORAD gathers strength. Considering moderate accuracy requirements, the NORAD SGP4, an analytic method to propagate a satellite orbit, is available to make a new orbit determination system. The purpose of this study is to generate two line elements independent of NORAD two line elements and to provide an antenna control unit in a two line element form, which makes a current antenna control system with more simplicity for the KOMPSAT-2 mission operations. Using the GPS navigation measurements of KOMPSAT-1, first of all, a batch algorithm is constructed for the orbit determination and afterwards is compared with an algorithm using the extended Kalman filter(EKF). In addition, we make a comparative study of ETRI MAPS(Mission Analysis and Planning Subsystem), orbit determination system using numerical orbit propagation method.