Dynamic Compensation in Measurments and Identification of Reaction Wheel Disturbance Model

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The disturbance torque and force produced by reaction wheel, an actuator for satellite attitude control, have an influence on the pointing stability of high precision satellite and make a measurement of disturbances necessary for such a satellite. The measurement table equipped with several loadcells is usually used as one of the favorite types of measurement devices. The disturbance, however, stimulates the elasticity of the loadcells and inducesthe vibration of the table. This then causes the measurement error, which is especially large near the resonance frequencies of the table. In order to reduce this type of error, a calibration process with frequency compensation is suggested in this paper. The disturbance power spectrum is calibrated by the dynamic frequency compensation process, from which the precision model of disturbance can be obtained. Since the degradation of data accuracy caused by the table vibration is well alleviated even in the resonance area, the measurement range can be expanded up to the frequency area including the resonance frequencies. The measurement and compensation method is verified through the experiments for HAU reaction wheel, the development model for STSAT-1. The compensation method has been adopted for the HAU measurement table where three uni-directional loadcells are used.