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AN ENHANCED INVERSE KINEMATIC AND DYNAMIC MODEL OF A 6-SBU STEWART PLATFORM

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In last several years, there has been an increasing interest in applications of the Stewart Platform, the most popular parallel manipulator with six degrees-of-freedom. These manipulators generally possess high positioning accuracy and are control-integrated for imparting a desired motion with specified static and dynamic limits to a large payload.

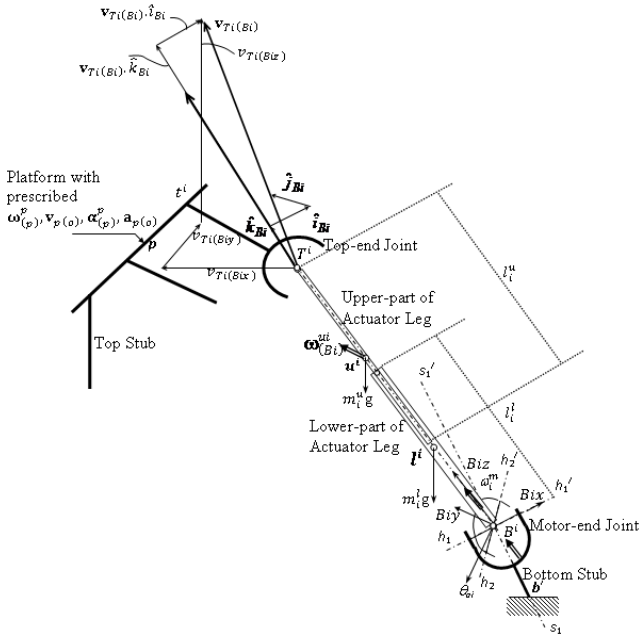

Figure 1: Schematic of a single leg of a Stewart Platform

The main objective of the work is to develop a feedforward model in MATLAB/SIMULINK framework for the 6-SBU Stewart Platform with current-driven variable-speed brussless DC

motor to each of the six linearly extensible legs having ball-screw joint. The feedforward model will be enhanced by considering nominal friction coefficients at spherical, universal and ball-screw joints along with the nominal leg inertia A PD feedback controller has been integrated to take care of uncertainties in parameter.

The coupling displacement is reduced by incorporating a compensation scheme developed to frame out compensating demand in terms of main pose demand to the platform with respect to residual tracking error.

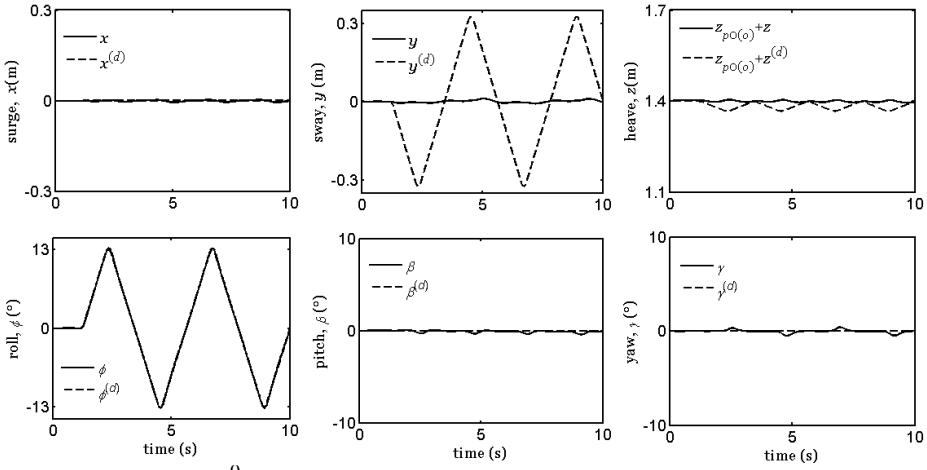

Figure 2: For $\pm 13^0$ pure roll demand, with specific rate limits, the solid and dash lines represents different pose response and demand from feedforward model respectively.

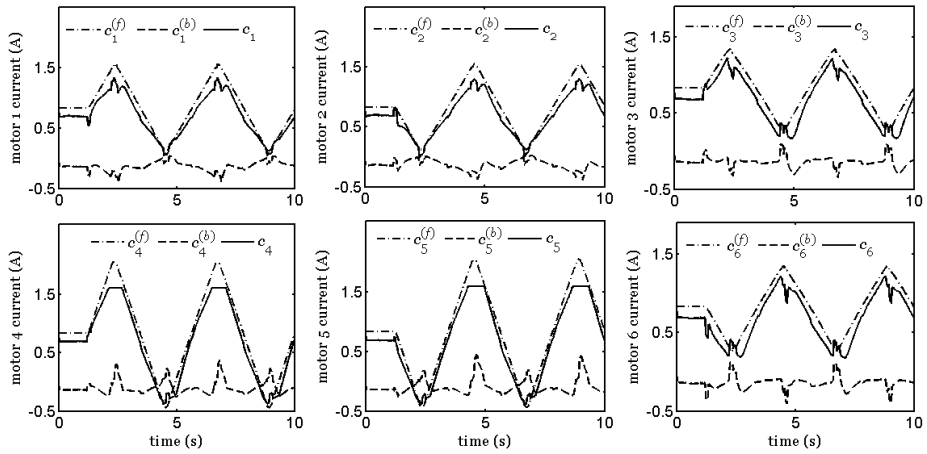

Figure 3: Currents $c_i^{(f)}$, $c_i^{(b)}$ and c_i are demanded by feedforward controller, feedback controller and combination of both respectively for $\pm 13^0$ pure roll demand.

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