

## **Stability Analysis of Pantograph under Sliding Friction**

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The friction force due to sliding of the pantograph head and contact wire acts to the traveling pantograph head in horizontal direction. Therefore, vertical motion of the pantograph head is generated by link mechanism of the pantograph. This study proposes a 2-dimensional pantograph model that considers friction characteristics of the pantograph head based on the multi-body dynamics (MBD) approach. Furthermore, a stability analysis method for the pantograph model is proposed. Results of the stability analysis of the developed MBD pantograph models are shown. Then the obtained stability is validated based on the time history simulation of the pantograph models.