講演番号	288

文献番号	20225288

Analysis of the Effect of Motorcycle Structural Flexibility on Weave Mode 2nd Report

— Estimation of Individual Flexibility Effects from Pseudo 10 Degree Frame Model —

Katayama Tsuyoshi [1)] Furusawa Kenta [2)] Takahashi Akira [2)] Yoshino Takahiko [2)]

1) Kurume Institute of Tecnology, Intelligent Mobility Laboratory,
2228-66 Kamitsu , Kurumea, Fukuoka, 830-0052, Japan
2) Kurume Institute of Tecnology,
2228-66 Kamitsu , Kurumea, Fukuoka, 830-0052, Japan

KEY WORDS: **Vehicle Dynamics, Motorcycle, Driving Stability,** Vibrational Mode, Frame Flexibility (B1)

Straight running stability is one of the most important characteristics for motorcycles. There are three types of unstable modes when traveling straight, and among them, suppression of vibration called weave mode and wobble mode is important. These modes are greatly affected by the frame flexibility of the two-wheeled vehicle. Traditionally, mathematical models of frame stiffness have been used to calculate frame flexibility in many countries. Six models of twist and bend freedom for the mainframe, front fork, and rear swing arm are common. A simple method for examining the effect of a single frame rigidity using a 10-degree-of-freedom model that integrates 6 types of mathematical models proposed in Japan causes a discrepancy with the analysis results using the 5-degree-of-freedom model. This divergence is due to the separation of the mass of the rear frame from the mass of the mainframe when modeling the rear frame.

In this paper, a pseudo 10-degree-of-freedom model is proposed in which the cause of the dissociation is corrected by the simple method using the above 10-degree-of-freedom model. Then, an analysis method of the effect of a single frame rigidity on the weave mode is shown using this pseudo 10-degree-of-freedom model.

The pseudo 10-degree-of-freedom model is introduced shown in Fig. 1. The eigenvalues are the same as the 4-degree-of-freedom values when the stiffness values of all frame rigidities are infinite, in this pseudo 10-degree-of-freedom model. Although this condition is a basic property that the analytical model satisfies, this model is named here as a pseudo model. As shown in Fig. 1, all frame stiffness values with infinity are named as pseudo 10 degrees of freedom 1000. Next, a normal value is substituted for a specific frame stiffness value of this pseudo 10 degrees of freedom 1000. This model is named a pseudo 10 degree of freedom specific model. For example, a pseudo 10-degree-of-freedom front-frame torsional model with a normal value for the front-frame torsional rigidity is called a pseudo-10-degree-of-freedom front-frame twist model.

Here, it is shown that the analysis using the pseudo 10-degree-of-freedom specific model has the same value as the analysis of the frame rigidity by the 5-degree-of-freedom model alone. Fig. 2 shows an example of analysis of the frame rigidity of the front frame affecting the stability of the weave mode.

Based on the concept of the pseudo model introduced here, the possibility of a new model regarding the twist of the rear frame that constitutes the basis of the pseudo model is proposed. It is shown that this newly proposed model can eliminate the mechanical defects of the conventionally used Sharp model.

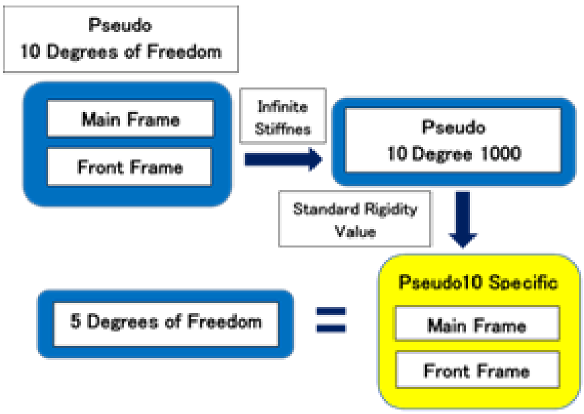

Fig. 1 Conceptual diagram of pseudo 10 degree model

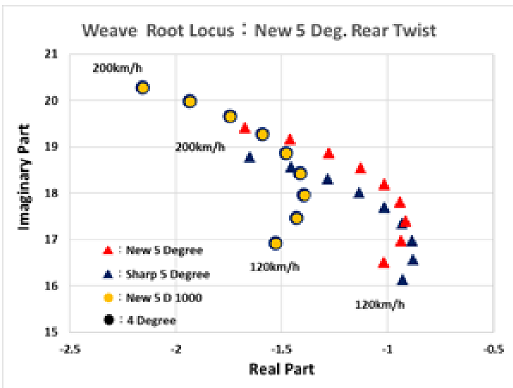

Fig.2 Eigenvalues of a pseudo 10 degree model