Easy-to-use Ride Comfort Measuring Device

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1. Introduction

We developed a low-cost compact system that easily measures vibrations experienced by passengers on a running train, and also developed easy-to-use software that can evaluate ride comfort using acceleration data obtained through measurements performed using the system.

2. System configuration

2.1 Overall system

Fig. 1 shows the component parts of the easy-to-use ride comfort measuring system: a digital device to measure sway, a running motion data generator, and a laptop computer.

2.2 Acceleration sensor

Fig. 2 shows the digital device we developed to measure sway. The device is compact, inexpensive, uses little electricity and combines a number of functions: a 3-axis acceleration sensor (using silicon semiconductors and the piezoresistance effect), a digital signal processor, a power source connector, and a USB interface. Vibration data is transmitted through the USB cable and recorded on the laptop computer's hard disk.

2.3 Running motion data generator

Fig. 3 shows the running motion data generator. Speed data and vehicle location data are required as incidental data when conducting performance tests of rolling stock and motor vehicles. The running motion data generator generates speed and vehicle location data after receiving signals input by the marker, speed generator and GPS. The speed and vehicle location data are recorded in multiplex on one channel by double scaling, to eliminate the need for multiple recording channels.

3. Ride comfort evaluation

Use of the recorded acceleration data permits an evaluation of ride comfort, a frequency analysis, and a display of sway wave patterns. Results are output onto a spreadsheet, and the layout can be modified at will when compiling reports.

4. Track improvement

Obtained vibration data is filtered for each spectrum and plotted on a time axis, and a list is made ranking locations, speeds and ride comfort coefficients that exceed target values. The compiled list is then transmitted to create a spreadsheet. Time sampled vibration data can be plotted on a distance axis, and data can be easily transferred to a track improvement database system such as MicroLABOCS. Integrated data management is possible.

5. Future development

We also intend to develop a system that will permit unmanned measurements at many locations.

Fig. 2 Digital device to measure sway

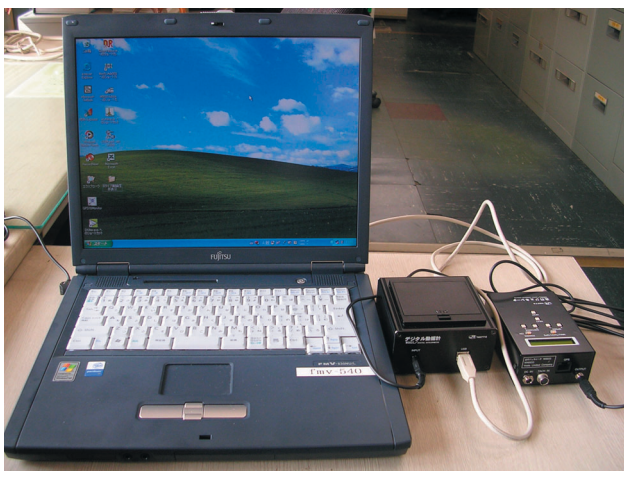

Fig. 1 Component parts of the ride comfort evaluation system

Fig. 3 Running motion data generator