

A Software Tool to Support the Processing and Analysis of Trucks' Weigh-in-Motion Data

By: Zubair Ghafoor, CDM Smith, Inc.

As part of a study for the Federal Highway Administration (FHWA) involving their highway revenue forecasting model, CDM Smith developed a tool to process and analyze WIM data. This tool is designed to use a consistent set of rules to classify trucks based on their axle weights and spacing. In addition to classification, it also provides a weight distribution for each class at 5,000-pound increments. The tool's output is a state-level summary of WIM data in the form of self-contained Excel reports, which can be used to perform various analyses at state and/or national level.

Background

WIM data is collected by states using sensors installed in the pavement. Depending on the vendor, states may have variations in the classification algorithms embedded within their equipment. From a national-level analysis standpoint, there is a need to use a common criteria for truck classification. FHWA uses the standard 13-class system for most reporting and analysis. Another classification system used by FHWA for cost allocation purposes is based on the FHWA Highway Cost Allocation Study (HCAS) and includes 20 vehicle classes. The HCAS classification includes further breakdown of trucks based on number of axles and vehicle configuration. As part of another study, FHWA developed a set of rules to identify about 38 different types of vehicles using WIM data (FHWA Publication No. FHWA-HRT-13-091). These rules are generally referred to as LTPP rules and are used in this tool.

Capabilities

For the purposes of the tool being presented, the LTPP rules were modified in such a way that they can be used to represent HCAS classifications. This information was coded into the tool's software, which reads the WIM data containing number of axles, axle spacing and weight of each axle. For each WIM data record, a class is determined and the appropriate weight bin is identified based on the gross vehicle weight. The tool was developed to require minimal user intervention and benefits from a file-naming hierarchy available in the WIM data files, which contain weight data files in state-specific folders. Each state's WIM data is processed and automatically placed in a state-specific tab of a pre-designed spreadsheet. The report includes graphs and tabulations of WIM data based on the standard 13-class and HCAS system. The weight distribution can be generated based on a user-selected classification system, which provides additional flexibility.

The tool was used to process large quantities of WIM data for the years 2013-2015, which included almost a billion records. The simple design and standard Windows desktop platform facilitated running this on a cloud-server. Using Citrix-based connectivity, the users were also able to access the tool from a smartphone, which greatly enhanced user experience. Being a work in progress, this tool may be further enhanced depending on the needs of the project that it is part of or to add more analytical functionality to support general use.