Determining Accuracy of ModelSmart v1.72 Bridge Modeling Software

Bryan Danley

Mercer University School of Engineering

EXTENDED ABSTRACT

Accurately modeling a structure before construction is a key part of engineering. ModelSmart v1.72 offers the user the ability to model different balsa wood structures and perform load analysis calculations. Computer models are only useful if they accurately predict real-world behaviors of the system/structure. This project compares results obtained from ModelSmart simulations, fail-tested trusses, and hand calculated structural analysis. After modeling and evaluating the structures on ModelSmart, the bridges were analyzed by hand using basic statics concepts. Once simulations and calculations were done, the truss was constructed from 3.175 mm square balsa wood shafts cut to proper sizes and angles and wood glue, and tested to find breaking point. The Warren, Pratt, and Howe trusses were the structures modeled and tested during this experiment. These trusses were selected for the simplicity of building to allow for the most accurate physical rendition of the modeled structure. The testing apparatus consists of two buttresses positioned 25 cm apart with two vertical, clear, acrylic panels on either side of the truss to limit any horizontal deflection of the truss. The load was applied by gradually adding weight to a bucket hung from the truss and was increased until the truss failed. Applied load was measured using a Vernier Wireless Dynamics Sensor System (WDSS) and a video camera was used to capture a record of truss deflection and failure point. The trusses were tested in triplicate. Project results include presentation of predicted and measured failure loads as well as predicted and actual point of truss failure.