

3D Based Parametric Modeling for Automatic Fitting of Longitudinal Girder Shape and Placing Rebar in FCM Bridge

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Summary

This study proposes a parametric modeling method for efficient design in early step of FCM (Free Cantilever Method) bridges which has variational section. Parameters for forming longitudinal shape of box girder are defined, and then constraints and functional relation between the parameters are defined according to some design guidelines and statics of parameters in existing FCM bridge designs. In addition, the relations between longitudinal shape and placing rebar are defined. Some case studies are demonstrated to show how to model the sample bridge with the constraints and relations by changing only one or a few parameters. Finally, material quantity of the sample bridge model generated by parametric modeling is calculated and comparing to real quantity to validate the accuracy of the model by parametric modeling.

Keywords: parametric modeling, FCM bridge, variational section, box girder, constraints

1. Introduction

To introduce 3D based BIM (Building Information Modeling) technology in AEC (Architecture, Engineering and Construction) area is innovative. BIM with 3D model facilitates works such as quantity estimation, interference check, and virtual construction, which are difficult with 2D model. The technology contributes to reduce cost, duration, and errors in construction projects. Yabuki and Shitani(2003) checked spatial interference between rebar and sheath tube in slab of concrete bridge with 3D model. Sacks (2004) proved positive economic effect from a result of decreasing errors, cost, and construction duration for precast concrete structures. In addition, Lee and Jeong (2006) developed integrated system for 3D shape model and structural analysis model about steel bridge. Lee *et al.* (2008) showed the possibility of quantity estimation and structural analysis with 3D based information model.

Superstructure of FCM bridge has variational section shape and it depends on span length. The length is varied according to location of piers. Designers should repeat the work to regenerate 3D model when design like the location of piers is changed. The repeated work wastes time and manpower. Besides, much of cost is wasted. Therefore, parametric modeling method, the core function of BIM is necessary for efficient design process. Parametric modeling is a modeling method in