Generating timber truss bridges – examining the potential of an interdisciplinary parametric framework for architectural engineering

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Abstract

Even though Nordic glulam truss-bridges are at large extent standardized, applying dowels and parallel slotted-in steel plates, the process making them are still separated and slowed down by redundant work. This paper examines the potential of architects, engineers and manufacturers using a shared parametric framework when building truss-bridges. How could redundant work be automated and let designers spend more time on actual project development? How could collaboration between disciplines be improved using a parametric framework? An interdicipinary parametric framework might be the next step into mass customization in architectural engineering.

Keywords: parametric framework, glulam bridge, truss, collaboration, architectural engineering

1 Introduction

When Lillehammer, Norway, was chosen to host the 1994 Winter Olympics, the Norwegian Wood industry used the opportunity to evolve and demonstrate the glulam truss principle[1]. Same tecniques were futher improved when building Oslo's new main airport construction, Gardermoen[2]. Since then, traffic bridges have been built in various types: Evenstad bridge[3] ,Tynset Bridge, Flisa Bridge and Kjøllsaeter Bridge[4]. Furthermore, the just finished timber high-rise, Treet in Bergen, Norway, have structural wise seen as a tilted timber truss bridge[5].

Common to all mentioned projects are the use of dowels and parallel slotted-in steel plates as connections[4], which has become a rational and standardized system when building large timber structures. However, despite the standardization of the logical system, the process of designing the bridges are mostly based on manual tasks.

These tasks are dominated by redundant work and have the potential of being better exploited. To main challenges are identified:

1) Advanced architectural engineering demands collaboration between architect, engineer and manufacturer. Different disciplines are often using different CAD software, potentially leading to bad transfer of data. Furthermore, 3D-modelling have different purposes and therefore also have different output geometries. Typical purposes are visual feedback, structural calculations and computer aided manufacturing (CAM). Thus a project is often redrawn several times to suit the different purposes.

2) The geometries' relation is not connected: if

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