



<i>Project Title:</i>	BIM-based Rebar Design Optimization and Prefabrication Automation
<i>Principal Investigator:</i>	Dr. Jack CHENG
<i>Project ID:</i>	CICR/02/19
<i>Research Institution:</i>	The Hong Kong University of Science and Technology
<i>Subject Area:</i>	Building Information Modelling
<i>Duration:</i>	18 months

Background

Reinforced concrete (RC) is widely used in building construction, with an annual worldwide consumption rate approaching 10 billion metric tons. The design and fabrication of steel reinforcement bars (rebar) are important and necessary tasks for the construction of RC building structures. Currently, steel reinforcement design is performed manually or semi-automatically with little consideration for clashes of steel reinforcement, which is error-prone, time consuming, and possibly over- or under-designed. In addition, designers rely heavily on computer-aided design tools, experience, and trial-and-error methods to generate detailing drawings and fabrication machine codes for the production of rebar. Additional time and manpower are often required to generate the drawings and machine codes in an ad hoc manner. This proposed project aims to develop a highly specialized building information modeling (BIM)-based platform for automated clash-free design optimization and prefabrication of steel rebar in typical RC building structures. An optimization approach will be developed to support the automated clash-free steel reinforcement design and to generate the three-dimensional rebar BIM model. An automated BIM-based framework will also be developed to generate the rebar detailing drawings and fabrication machine codes for rebar auto-bending. The advanced BIM-based platform differs from the semi-automated approaches available on the market and can greatly improve productivity and cost-effectiveness in construction.

Objectives

This project aims to develop a BIM-based platform for automated clash-free design optimisation and prefabrication of steel rebar in typical reinforced concrete (RC) building structures. Specific objectives are given below:

- ♦ To develop an optimisation approach for automated clash-free steel reinforcement design and to generate the three-dimensional rebar BIM model.
- ♦ To develop an automated BIM-based framework to generate the rebar detail drawings and factory machine codes for rebar prefabrication.

Key Deliverables

- ♦ A BIM-based approach for automated clash-free rebar design optimization
 - A plug-in program interfaced within BIM system to be developed for automated clash-free design optimization of steel reinforcement
- ♦ A BIM-based framework for automated generation of rebar detailing drawings and fabrication machine codes for rebar bending
 - An automated drawing generation tool in BIM to be developed to automatically identify the best arrangement of rebar detailing drawings



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- A BIM-based quantity take-off tool, complying with the Hong Kong bill of quantity measurement rule, to be developed to help determine the material demand for BQ preparation
 - A customized program to be developed to generate the fabrication machine codes from the rebar detailing model for automated rebar bending
- ◆ Other academic publications

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