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# Automated Minimum Cost Design of Continuous Bridge Girders

Plan de frais minima réalisés par automation pour poutres continues de ponts

Durch Automation ermittelte Minimalkosten für durchlaufende Brückenträger

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The word optimization has been heard frequently at this meeting. It has a variety of meanings depending on the speaker. I have used the word to imply the application of mathematical programming in the systematic solution of the design problem. I have been involved in studies of this type with my colleagues at Case Institute of Technology for ten years. During this time my experience has led to conclusions which may be of use to others interested in this area.

Why does one wish to optimize? Why does one wish to automate portions of the design process? I do not believe that the primary purpose of optimization or automation is to reduce the cost of individual elements. Experience has shown that the design space is quite flat at least for cost based designs. Therefore, it is easy for the designer to reach a design sufficiently near the optimum so that cost differences are unimportant, if he can spend sufficient effort on the task.

The availability of an automated design program can relieve the designer of much detailed work and make it possible for him to consider additional, more general problems. Only with such capabilities can the designer be freed of routine computational work so that he can consider the interaction of the various different systems. (In the case of bridges, alignment geometry, or for buildings, mechanical and electrical systems). Thus he can begin to optimize, intiutively at the third level mentioned by Prof. Faltus.

Automated design computer programs can be written using direct programmed rules. However, this approach breaks down for many structural design problems requiring a higher level of decision making. Mathematical programming methods fill this need and add considerable generality to automated design programs.

One of the best indications of the success of this approach is given by the bridge designers who use the GAD programs. They are currently requesting more such capabilities.

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