Improved metaheuristic approach to skew reinforcement optimization in concrete shells

Authors
Bertagnoli G., Giordano L., Mancini S.

Abstract
In this paper the authors deal with the optimization of reinforcement in concrete shell elements.
A metaheuristic approach based on a genetic algorithm is presented and called SRDCFMLC: it is an evolution of a method developed by the same authors and called SRD2DMLC Skew Reinforcement Design in Reinforced Concrete Two Dimensional Elements under Multiple Loading Conditions.
It is a design tool written in C++ that could be linked as a post processor to any commercial finite element structural analysis program. The internal actions obtained from elastic analysis of the structure are used to calculate the minimum reinforcement able to guarantee structural safety.
The designers use different load arrangement in order to envelope all the possible situations the structure can undergo in its life. SRD2DMLC was able to determine the minimum reinforcement required to envelope all the simultaneous load cases used in the design of a structural element, i.e. the combinations of maximum/minimum internal actions used in the design.
SRDCFMLC is an evolution based on the application of a “closed form” (CF) solution for a part of the optimization process that was completely handled by the genetic algorithm in the previous release. Improvements in computational time are achieved and shown in the present work.

Keywords
concrete shells, optimization, heuristic