

Addendum - Layout optimization of structures

GIN Rozvany

FB 10, Essen University, Postfach 10 37 64, D-45117 Essen, Germany

MP Bendsøe

Math. Inst., Techn. Univ. of Denmark, Bldg. 303, DK-2800 Lyngby, Denmark

U Kirsch

Department of Civil Engineering, Technion, Technion City, Haifa 32000, Israel

Introduction

After the publication of the above article in *Applied Mechanics Reviews* (February, 1995), it was brought to the authors' attention that some important results in this field have been omitted from the review. This omission is being corrected in a brief Addendum.

Dynamic stiffening

The optimal location and layout of stiffeners in dynamic problems was studied by Laura *et al* (1991, 1992, 1994), Rossi and Laura (1993), and Laura (1994).

Optimal design of trusses

Truss optimization for multiple loads was also discussed by McKeown (1974, 1977, 1989), who solved these problems via sequences of optimal fixed displacement structures.

Generalized shape optimization of bars in torsion

It has been brought to the authors' attention that some important early work on generalized shape optimization was not mentioned in the original review. The earliest publication was a paper on nonhomogeneous bars of maximum rigidity in torsion (Lurie and Cherkayev 1978), with an extended version by Lavrov *et al* (1980).

Another important development in elastic torsion was presented by Gibianski and Cherkayev (1988), who introduced a very special type of elasto-plastic laminate composed of entirely elastic and entirely plastic layers.

Orthotropic plates

One of the first successful attempts to obtain necessary conditions in optimizing anisotropic plates is due to Fedorov and Cherkayev (1983).

General aspects of structural optimization

In an early book of Lurie (1975), many original results obtained in 1970-1971 were presented, including the basic idea of composites as artificial formations arising from what we now call generalized shape optimization. This approach was discussed extensively in this book, together with an effective mathematical implementation of optimizing the generalized shape of conducting material in two dimensions.

Qualifications of a statement

In including the above Russian research group amongst the "research associates" of Olhoff *et al* (p 88 of the original article), the authors merely meant to say that there was some joint research activity between Lurie's group and the Danish team, which can also be seen from publications. This was not meant to imply administrative

superiority, let alone intellectual leadership, of the Danish group.

REFERENCES

Books

Lurie KA 1975: *Optimal control in problems of mathematical physics*, Nauka, Moscow.

Research Papers

Fedorov AV and Cherkayev AV 1983: Search of an optimal orientation of the axes of elastic symmetry in an orthotropic plate, *Izvestiya Akademii Nauk SSSR, Mekhanika Tverdogo Tela*, No 3.

Gibianski LV and Cherkayev AV 1988: Optimal design of non-linear elastic and elasto-plastic bars in torsion. *Izvestiya Akademii Nauk SSSR, Mekhanika Tverdogo Tela*, No 5.

Laura PAA 1994: Dynamic stiffening of beams, arches and plates. Institute of Applied Mechanics (Bahia Blanca, Argentina). Publication IMA N° 94-11.

Laura PAA, Ercoli L, and La Malfa S 1994: Dynamic stiffening of a printed circuit board. Institute of Applied Mechanics (Bahia Blanca, Argentina). Publication IMA N° 94-15.

Laura PAA, Rossi RE, and Maurizi MJ 1991: Dynamic stiffening of structural elements. *The shock and vibration digest* **23**, 307-312.

Laura PAA, Rossi RE, and Maurizi MJ 1992: Comments on "Influence of material distribution on vibration of plates". *J. Sound Vib.* **156**, 188-??.

Lavrov NA, Lurie KA, and Cherkayev AV 1980: Non-homogeneous bar of extremal rigidity in torsion. *Izvestiya Akademii Nauk SSSR, Mekhanika Tverdogo Tela*, No 6.

Lurie KA and Cherkayev AV 1978: Non-homogeneous bar of extremal rigidity in torsion. In: *Non-linear problems in structural mechanics*, pp 64-68. Kiev Institute of Civil Engineering, Kiev, 1978.

McKeown JJ 1974: A note on the maximum member and density of distribution of members in elastic structures of minimum weight under multiple loading conditions. *Int J Solids Struct* **10**, 309-312.

McKeown JJ 1977: Optimal composite structures by deflection-variable programming. *Comp Meth Appl Mech Eng* **12**, 155-179.

McKeown JJ 1989: The design of optimal trusses via sequences of optimal fixed displacement structures. *Eng Opt* **14**, 159-178.

Rossi RE and Laura PAA 1993: Dynamic stiffening of an arch clamped at one end and free at the other. *J. Sound Vib.* **160**, 190-192.