# Appendix: Demonstration programs for shape optimization problems

Hideyuki Azegami

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Department of Complex Systems Science
Graduate School of Informatics
Nagoya University

## Program installation and operating instructions

(Common)

1. Install **FreeFem** from https://freefem.org/.
   - Click **Download** button and download the install program for your OS.
   - Run the install program.
2. Run **FreeFEM** programs.
   - Click a **EDP file (.edp)**.

(In the case of program outputting VTK files)

3. Install **ParaView** from https://www.paraview.org/.
4. Run **ParaView** and open **shape..vkt** or **deform..vtk** in **File** → **Open** → **plots** folder.
5. Click the **Eye icon** on the left of **shape..vkt** or **deform..vtk** in **Pipeline Browser**.
6. Select **Coloring** → **potential**.
7. Make the object easy to see by mouse, and click the **Video play button** (right-pointing triangle icon).
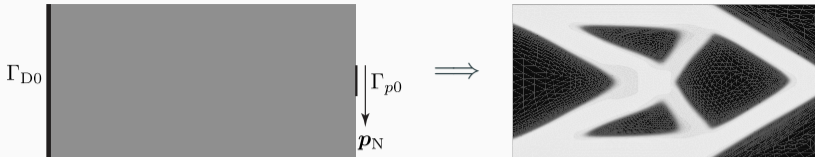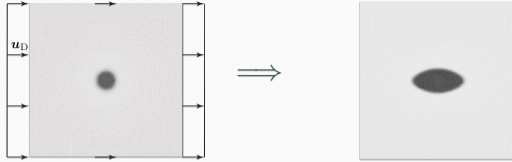
(a) topo_elastic_2d-cantilever_grad.edp
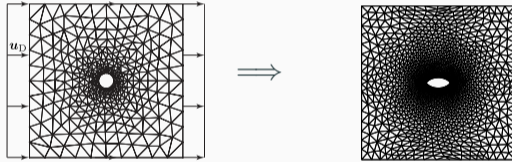(Save the linked **EDP file** your PC and click it.)
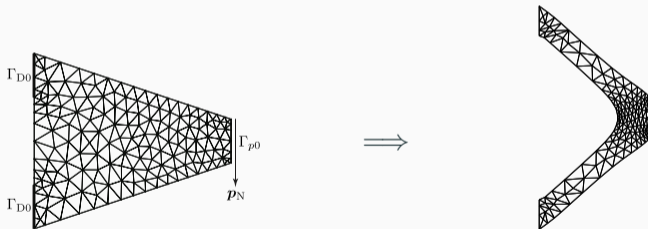


(b) shape_elastic_2d-hook_grad.edp

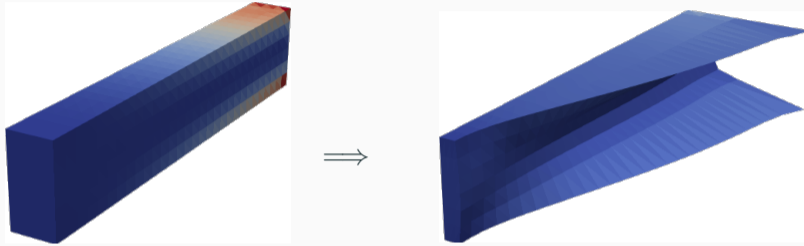**Fig. 1:** Mean compliance minimization of linear elastic body.

(b) `topo_stokes2d-iso-body_grad.edp`



(b) `shape_stokes_2d-iso-body_grad.edp`

**Fig. 2:** Mean flow resistance minimization of a 2D Stokes flow field.

`shape_elastic_3d_cantilever_grad.edp` (Outputting VTK files)

**Fig. 3:** Mean compliance minimization of a 3D linear elastic body

## Supplementary materials in Book

[1] Azegami, H.
   **Shape optimization problems.**
   Springer, Singapore, 2020.
   doi:10.1007/978-981-15-7618-8.

Chapter 8:
https://rd.springer.com/chapter/10.1007/978-981-15-7618-8_8 →
480136_1_En_8_MOESM1_ESM.zip

Chapter 9:
https://rd.springer.com/chapter/10.1007/978-981-15-7618-8_9 →
480136_1_En_9_MOESM1_ESM.zip