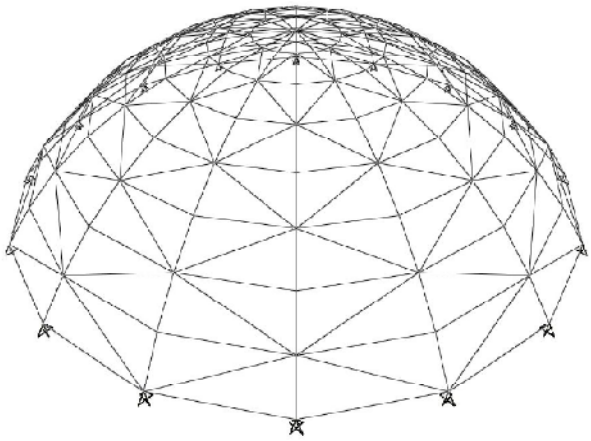
BRIGHT OPTIMIZER

Optimization problem of the ISCSO 2014

Consider the sizing optimization of the 368-member space truss structure shown below. Here, the truss members are to be selected from a discrete set of 37 ready sections. For the sake of simplicity the objective function of this optimization problem is given as a MATLAB code function (iscso) and you are asked to minimize this function using discrete solution variables.



368-member truss dome

In order to use the given objective function, first you need to propose your solution vector (X) as:

$$X= [x_1 , x_2 , x_3 , \ldots , x_{368}]$$

where x_1 to x_{368} can take only integer values ranging from 1 through 37 (including both 1 and 37).

Next, using the following MATLAB command you can get the corresponding objective function value which is the penalized weight of the truss structure.

```
[Objective_Function] = iscso(X)
```

You can choose any optimization technique to minimize this function. Further, you may propose a new optimization algorithm or a hybrid form of previously proposed algorithms. Please note that member grouping is not allowed, and therefore the problem should be solved using all the 368 solution variables.

Please do the following steps:

1) Stop running your algorithm when it finds a solution vector (X) having an objective function value smaller than 4900 and report the solution found.

Note: Only reporting a solution having an objective function value smaller than 4900 is enough for this step. Better solutions will not be given any priority.

2) Report the number of objective function evaluations of your algorithm to obtain the solution you reported.

Note: You can perform numerous runs with your algorithm and report the best one. In this case please submit the results of five independent runs of the algorithm.

3) For your reported solution present an optimization history graph which shows the value of objective function (vertical axis) versus the number of objective function evaluations (horizontal axis) in the course of optimization.

4) Submit the optimization results, the MATLAB code of your algorithm, and a brief description of the employed method (maximum five A4 pages in English) in a PDF format before the deadline.

The Born Bright Team reported an objective function value of 4897.62 obtained through 1010 function evaluations. The reported solution vector, composed of the final values for all the 368 solution variables, can be provided upon request.

The winner of ISCSO 2014, Born Bright team, from
Technical University of Denmark & Technical University of Munich

Currently, I'm doing my master's degree in mechanical engineering at the Technical University of Munich specializing in numerical mechanics and automotive. An industrial internship and the lecture multidisciplinary design optimization showed me the versatility and fascination of optimization. After a project in topology I'm looking forward to writing my master thesis in this field as well.

Erik Günther

I am currently on my master degree in mechanical engineering at the Technical University of Denmark. I just finished an exchange semester at Technische Universität München in which I took a course on optimization. I find the field of optimization very interesting and I currently plan to write my master thesis within the field of topology optimization. My studies have otherwise focused on finite element analysis and vibration analysis.

Morten M. Kaastrup

Following my bachelor degree in Aerospace Engineering, I am currently doing my master degree in the same field of study at the Technische Universität München. After having attended a lecture about multidisciplinary design optimization last semester, I am very interested in this topic and I also plan to write a term paper on a related topic in the coming semester. Further, I get involved with the student club "Akaflieg München e.V.", which brings students together who are interested in the construction, building and flying gliders on their own.

Thomas Lumpe