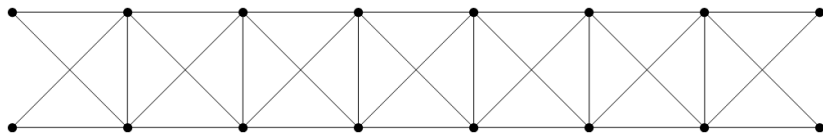


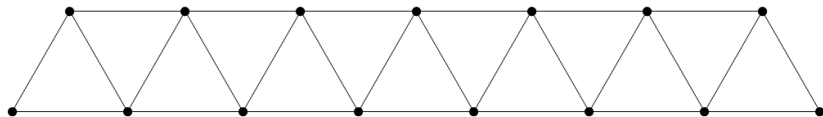
Homework 10 (25 points)

Optimization

Consider the following two 2D trusses:



The four outermost nodes are fixed (no translations).



The leftmost bottom node is fixed (no translations). The rightmost node is fixed in vertical direction only (no vertical translations).

Homework 10 (25 points)

Optimization



Assume both trusses are statically loaded with unit vertical loads:

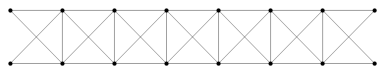
1. the 1st truss in all non-fixed nodes,
2. the 2nd truss in all non-fixed bottom nodes.

Minimize the objective function F (square sum of element stresses) with respect to:

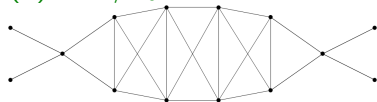
- (1) The 1st truss: vertical co-ordinates of all loaded nodes,
 - (2) The 2nd truss: vertical co-ordinates of all upper nodes,
 - (3) The 2nd truss: both co-ordinates of all upper nodes,
- while the total volume of the structures is constant and all elements have the same cross-section.

Homework 10 (25 points)

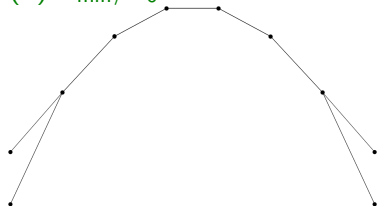
Optimization



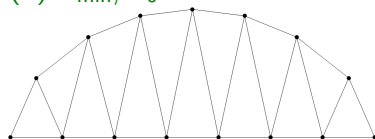
(1) $F_{\min}/F_0 = 73.4\%$



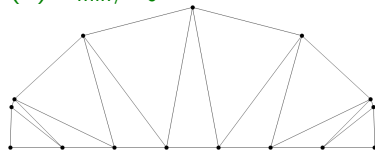
(1) $F_{\min}/F_0 = 19.6\%$



(2) $F_{\min}/F_0 = 51.9\%$



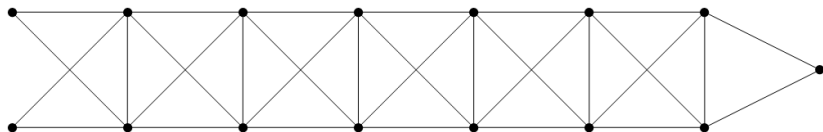
(3) $F_{\min}/F_0 = 41.7\%$



Homework 10 (25 points)

Optimization

Consider the following 2D truss:



The leftmost nodes are fixed.

Assume the truss is statically loaded with unit vertical load at the rightmost node. Minimize the objective function F (square sum of element stresses) with respect to vertical co-ordinates of all nodes besides the tip and the fixed nodes. Keep the total volume of the structures constant. Assume that all elements have the same cross-section. Use any method and software you like. E-mail the resulting truss and the source code to ljank@ippt.pan.pl.