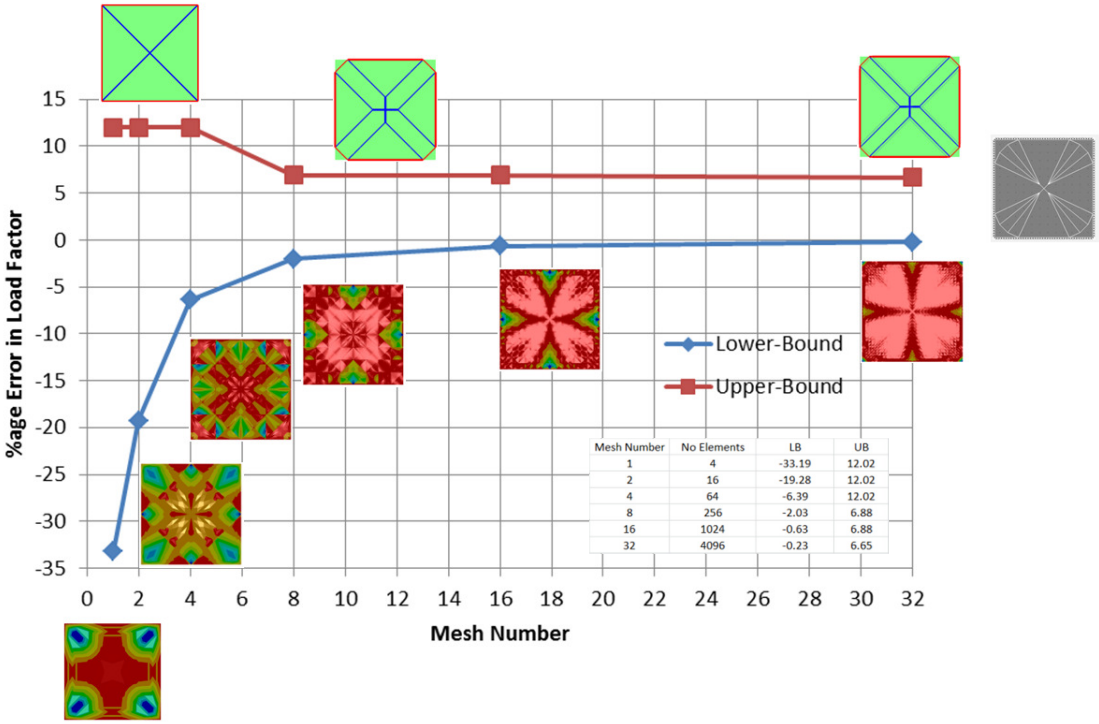
Verification of EFE on the Fox Problem

The Fox Problem is a square isotropic reinforced concrete slab, fixed around the perimeter and loaded with a UDL. It is a problem that has a theoretically exact solution for the load factor [1]. As such it is a good problem on which to test the performance of EFE and thereby add to the verification of the software.

Uniformly refined structured meshes of nxnx4 elements were used for the analysis starting with n=1. Yield line (upper-bound) solutions were generated together with lower-bound solutions and the convergence of the load factor, in terms of percentage error, is presented in figure 1.



Mesh Number	No Elements	LB	UB
1	4	-33.19	12.02
2	16	-19.28	12.02
4	64	-6.39	12.02
8	256	-2.03	6.88
16	1024	-0.63	6.88
32	4096	-0.23	6.65

Figure 1: Convergence of Load Factor for Upper-Bound and Lower-Bound Solutions

The figure includes images of the yield line pattern for the upper-bound solution and utilisation for the lower-bound solution. An additional image shows a yield line solution using the DLO geometric optimisation approach, [2], which has a load factor with an error of +0.94%.

References

[1] Fox EN 1974 Limit analysis for plates: the exact solution for a clamped square plate of isotropic homogeneous material obeying the square yield criterion and loaded by uniform pressure. Phil. Trans. R. Soc. Lond. A **227**,121–155. (**doi:10.1098/rsta.1974.0047**)

[2] http://www.limitstate.com/slab/validation