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Comparison between multiobjective optimization algorithms

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This research aims to investigate the optimum geometry of weldments created by laser welding to minimize the stress concentration and maximize the fatigue strength of the joints under combined loading. In order to achieve the goal mentioned above, the Evolutionary Multi-objective Optimization software (modeFRONTIER) integrated with a mechanical model implemented in the F. E. Code (ABAQUS) will be used.

Optimization software (modeFRONTIER) • Performed a comprehensive comparison between multi-objective optimization algorithms (MOGA-II, ARMOGA, NSGA-II, FMOGA, MOSA, MOPSO) in mechanical, convex and concave problems.
• Different metrics are used to evaluate algorithms (Hit-rate, Convergence, Spacing metrics) and graphical representation of results.

Experimental Investigation • Material of welded joints.
• Tensile test
• Vickers hardness of base metal and (HAZ)
• Fatigue test
• Geometrical measurement of welded joints by using dental molding technique to identify the weld parameters (weld toe radius, weld toe angle, weld width)

Integration between (ABAQUS) and (modeFRONTIER)

Fig. 1 Circular arc modelling of welded joint under tensile load
Fig. 2 Spline modelling of welded joint under tensile load

Fig. 3 Flow chart of optimization process