A new optimisation strategy based on the use of IOSO, a new generation optimisation technology

"For since the fabric of the universe is most perfect and the work of a most wise Creator, nothing at all takes place in the universe in which some rule of maximum or minimum does not appear." Leonard EULER

IOSO PM

Software Package for Parallel Optimization with Multiple Criteria

IOSO PM is a hands-on tool for a considerable shortening of the time required to solve practical problems which also enables solution of "extra large" problems in Industry, Engineering, Science and other areas.

ENABLES:

- Maximum use of the potential of multiprocessor systems and local area networks
- Efficient use of difficult-to-parallelise applications and computation models
- Solution of complex problems which have to the present time been thought impracticable to target

SPECIAL FEATURES:

Among the great diversity of problems being solved today with the help of modern multiprocessor systems, so-called "large" or even "extra large" problems play a special role. The characteristic feature of such problems is that a significant amount of time and, accordingly, money is required to find the solution. However, computation models used in such problems can by far not always be efficiently parallelised. This is due to the fact that not all algorithmic processes can easily be parallelised or that the number of internal parallel branches of a computation model is smaller than the number of processors available for computation.

A significant effect in this case can be achieved by using parallel optimization technologies, which requires no change to computation models. Parallel optimization implies that the computation model is launched with different vectors of input variables as many times as there are processors available for computation. Computation experiments have shown that for most problems the total solution time is reduced proportionally to the number of parallel processors being used.
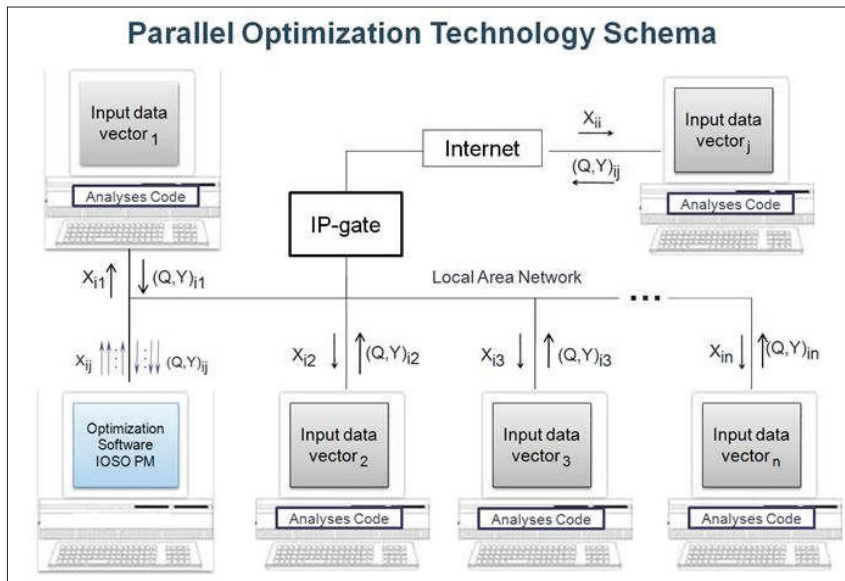
Parallel Optimization Technology Schema

Application Example

Improve the aerodynamic characteristics of a threestage fan in cruise mode

Objective: To identify the geometry of the six blades of the fan so as to enable maximum aerodynamic efficiency in cruise mode, while maintaining the same (or better) efficiency in design mode and the same air consumption and sustainable operation time.

- The 3D CFD code was used to identify the aerodynamic characteristics (21 hours are required for one iteration)
- The geometry of the blades of the threestage fan was described with 65 independent variables

Output: Total amount of iterations is 340. The increase in the aerodynamic efficiency of the fan amounted to 1.2%. There were involved 12 calculation nodes for solving Parallel Optimization Task. Total time consumption was decreased more then 10 times in comparison with traditional approaches in optimization.

Integration:

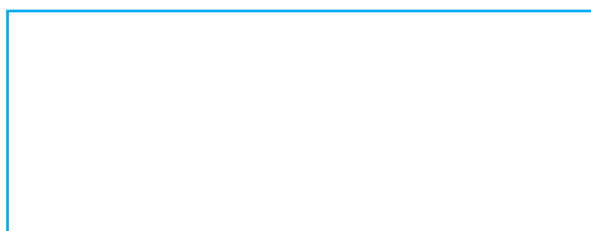IOSO PM is compatible with various CAE/CFD/FEM applications, commercial and corporate.

Users:

IOSO PM is used by the leading companies and engineering centres in Russia and throughout the World

Participation in Conferences:

The high efficiency of the IOSO technology is recognised by leading Western specialists. Works related to its use have been published by AIAA, ASME, EUROGEN, CCOMAS, and others.

No analogues of solving this problem have been published