

# Main advantages of unstructured methods



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**Unstructured method**

This method makes use of a rational compilation of elements to load up the domain, because the engagements of elements have no visible pattern, the mesh is called unstructured. This type of grids in general makes use of triangles in 2D and tetrahedral in 3D.

With structured method, the elements are capable of twisted and stretched to well the domain. This method has the skill to be automated to a large degree. Known good CAD model, a good meshing student or person can without human intervention place triangles on the surface and tetrahedral in the volume with very small effort from the user. The automatic meshing algorithm characteristically involves meshing the boundary and then also adding elements touching the boundary or adding points in the interior and reconnecting the Delaunay elements.

**Main advantage of unstructured method**

Advantages of unstructured method is with the aim of they are very programmed and, as a result, require small user time effort but the user no need to worry about lay out block structure or relations. In addition the unstructured methods are well suitable to inexperienced users because they require small user input and will generate a suitable mesh under most circumstances.

**Unstructured method and its applications**

Triangle mesh generator makes use of 2D problems, and it produces an unstructured triangular mesh.

Tetrahedral meshing is appropriate for uses in viscous flow simulations are wished-for. The approach which is chase consists of the initial generation of a number of unstructured layers of highly rigid elements

### **Structured method**

This method of mesh generation starts with basic geometry and tensor analysis previous to moving on to identify the variety of approaches that can be employed in the generation of structured meshing. In addition structured method makes use of quadrilateral elements in 2D and hexahedral elements in 3D in a computational rectangular selection.

### **Main advantage of structured method**

Advantages of structured mesh method is their simplicity, ease of use code and is suitable for multi-mesh, it is very complicated to generate a structured mesh for complex construction of body, such as a complete aircraft.

### **Structured method and its applications**

Structured mesh, in particular multi-block structured mesh, is one of the main productions CFD tools. Multi-block means that the block topology can be from multiply connected blocks and each block is composed of 3D hexahedral, 2D quadrilateral and 1D linear or quadratic element set up in rows and columns, but this blocks can be removed, deleted or glued to others parts and also the multi-block structured mesh gives CFD user more control over the design of their meshing and make sure that quality is maintained all the way through their design and achieves the results.

**Multi-block topology**

A multi-block topology is used to build a meshing for the same geometry and this mesh is build in 6 blocks and deleting the top 2 corner blocks to complete a meshing with right aspect ratio.

**Hybrid method**

Hybrid mesh method is designed to obtain advantage of the positive aspects of both unstructured and structured mesh. Hybrid mesh makes use of some form of structured mesh in local regions while using unstructured mesh in the size of the domain.

In addition the hybrid mesh contain tetrahedral, hexahedral and pyramid elements in 3D and quadrilaterals in 2D. But hexahedral elements are excellent close to solid boundaries and can afford the user of CFD a high degree of control.

**Main advantage and disadvantage of hybrid method**

Hybrid mesh advantages method is when we can make use of the positive properties of structured mesh elements in the regions which require them the most and use automatic unstructured mesh techniques where is not much happen in the flow field.

Prismatic or hexahedral layers close to wall surfaces show good clustering capability characteristic of structured meshing approaches.

Another advantage is that the use of tetrahedral mesh to fill the rest of the domain permit single-block generation for particularly complex geometries since the tetrahedral is the simplex element in 3D.

Hybrid mesh disadvantage method is difficult to use and involve user of CFD expertise in put out the various structured mesh properties and locations to obtain the best results. The hybrid method is less strong the unstructured mesh methods.

### **Hybrid method and its applications**

Hybrid method, in particular prismatic mesh generation makes use of the visibility condition, namely, the node normal vector is able to be seen from all the triangles sharing the node. A simple and general method is included to treat walls, concaves and narrow gaps.

Tetrahedral and pyramids are integrated naturally by treating them as exceptional cases of prismatic cells and the methods is successfully applied for a entire aircraft configuration and partially slotted flap.

To describe key features of ALL existing meshing options in Ansys Mesh module and discuss their applications (please refer to build-in documentation in the software).