

Finite element

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Finite Element Institute Finite Element Finite element method is a numerical technique for acquiring approximate solutions of integral equations as well as, partial differential equations in engineering and construction. It was first developed by R. Courant in 1943 and is employed in both the designing of new product and refinement of existing product. Finite element method enables a company to verify proposed designs, modify structure or existing products that are to be used for new service conditions, and in case of structural failure, it may be used to determine design modifications that are required to meet the deserved new condition.

Two types of analysis that are mostly used with this method in engineering and construction are 2-Dimensional modelling, and 3-Dimensional modelling. 2-Dimensional modelling tends to give less accurate results, because it safeguards simplicity and allows the analysis to be performed on a rather normal computer (Yarwood 2010, p. 224). On the contrary, 3-Dimensional modelling produces more accurate results while it sacrifices the competence to function on all but the fastest computers efficiently. The programmer can insert numerous algorithms within each of the modelling schemes, which may make the system act linearly or non-linearly. The linear systems are known to be far less complex and normally do not cater for plastic deformation. Apart from being able to cater for plastic deformation, non-linearly systems are also capable of testing a material all the way to fracture (Yarwood 2010, p. 227).

Finite element method uses an intricate system of points referred to as nodes, which create a grid known as a mesh, which is programmed to contain the structure and material properties that define how the structure would respond to certain loading conditions. Regions projected to receive

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large amounts of stress are usually allotted higher node density than the ones experiencing minimal or no stress. The mesh can be likened to a spider web because; from every node, there is an extension of a mesh element to every adjacent node. This web of vectors is what transmits the background properties to the object, hence creating many elements.

Indeed, finite element method has extensively improved the tactic of the designing process in numerous industrial applications and raised the standard of many engineering designs. Its introduction has markedly decreased the time taken between product concept formation and production line.

References

Alf Yarwood; “ Introduction to AutoCAD 2011: 2D and 3D Design.” 1st ed.
Elsevier Press 2010; pp. 221-261