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FEM Based Meshing Principles and Practices in Mechanical and Civil Projects

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ABSTRACT

Almost every sector, like civil, has as many buildings and structures as mechanical, starting from engine components such as pistons, cylinders, crankshafts, connecting rods, etc., so every sector's project scheduling utilizes meshing as discretization, fixing, loading, and deformation plots from analyzing the pre-printed, pre-manufactured models. Further in civil models is meshing whether the roof holds good for domestic, commercial, or workshop purposes. These are the analysis results, which clearly indicate that mesh generation yields better results as required. This paper obtains some meshing principles after nodes and elements increase, then only the roof gives maximum load withstanding capacities, either for civil or mechanical projects.

Keywords : Mesh, Civil Structures, Mechanical Models

I. INTRODUCTION

Mesh applicable to mechanical 3d components models : As a case of example engine components from two wheelers or multiwheelers automobiles are the parts like piston, cylinder, connecting rod , crankshaft etc. which showing specific material base with factor of safety, here the meshing discretization with high nodes and high elements increase in numbers yields better loading and better deformation results. The main function of nodes are carrying loads if you increase nodes load withstanding capacity also more enhancing manufacturing cost as the material cost also required more.

The meshing equation and its conjugated spatial curve under the motion law were derived for a specific spatial curve.The conjugatecurve pair was used to build general internal tooth profiles models while taking into account the equidistant kinematic technique.In accordance with gear parameters, a numerical example of an internal gear pair was created, and MATLAB and UG software were used to create solid gear models.The output of the motion simulation demonstrates that the gear pair fits the design specifications and point contact condition.Utilizing the FEA approach, mesh analysis of tooth profiles was performed.Results of the stress analysis were obtained for tooth profiles with a single point of contact and two points of contact,

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respectively. The findings set the groundwork for the development of multi-point contacts.

Mesh applicable to civil 3d components models: As a case of example roof design for the structural the material considered selected as iron. if the nodes, elements are in increasing in number then load withstanding capacity will be more which suggesting from preprint, before scheduling, whether the roof holds good for domestic building residential building or commercial building or garage or workshop purpose . so all these results analysis are to be set by ansys software from by generating meshes, checking meshes applying boundary conditions . Further the material cost of that particular project will be decided by mesh, elements, nodes numbering.

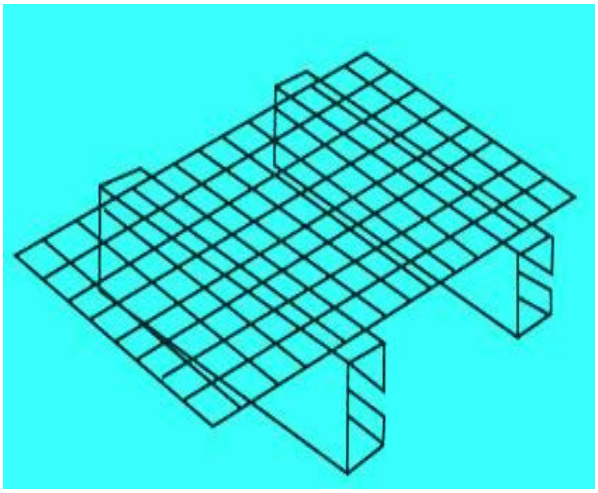

Fig. 1 mesh of roof with beam

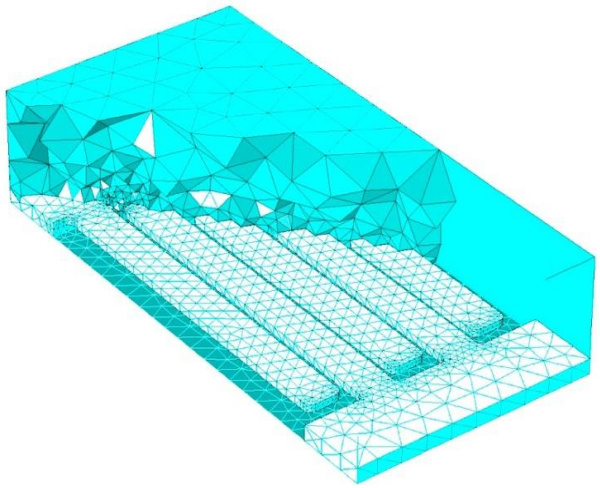

Fig. 2 mesh with elements

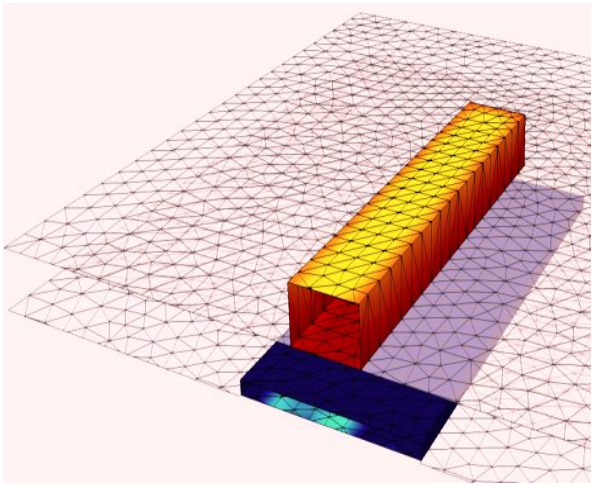

Fig. 3 elements analysis

Fig. 4 structure of roof

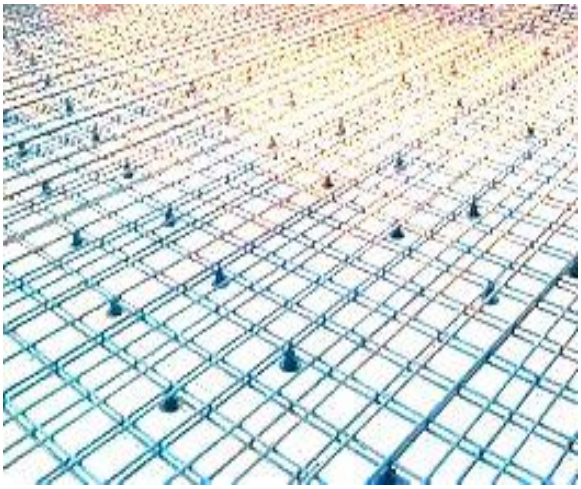

Fig. 5 roof showing elements of meshing

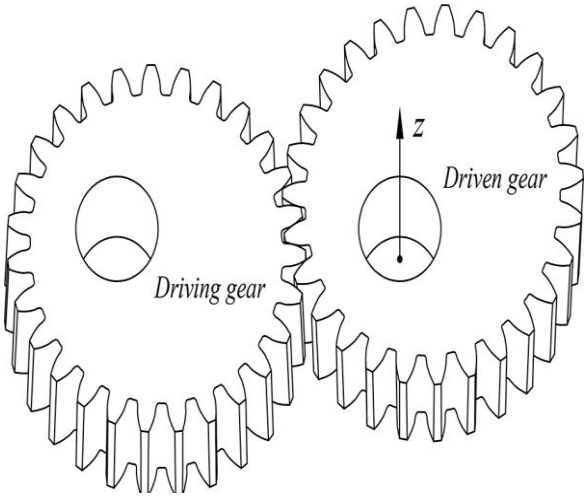

Fig. 6 mechanical component gear

Fig. 7 mating gaer 3d model

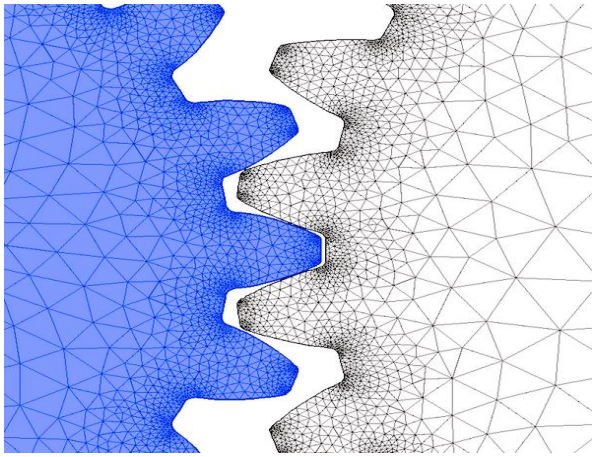

Fig. 8 mating gear mesh

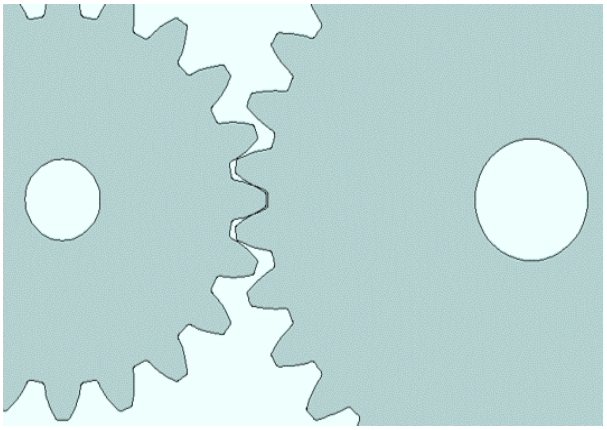

Fig. 9. mating gear 3d model drafting

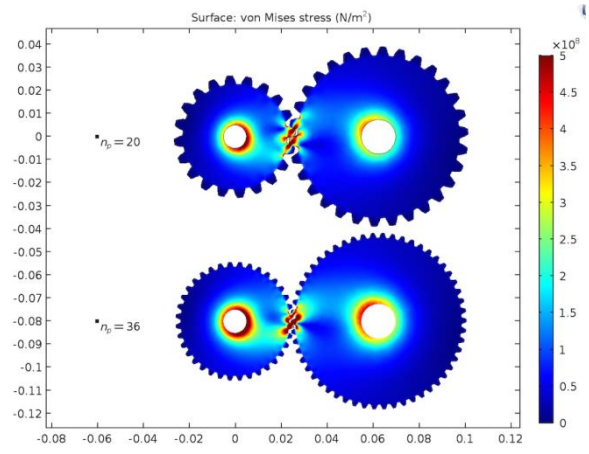

Fig. 10. von mises stress of mating gear

II. CONCLUSION

1. Mesh determines load withstanding capacity of components of civil or mechanical
2. increasing nodes, elements material cost manufacturing cost enhances
3. High FOS results better specification standards with load bearing capacities
4. However the material selection is also important as the basic design step
5. There will be matching between theoretical and practical analysis
6. There will be pre selection as different materials and analyzed frequently as as many iterations
7. in boundary conditions elements not clearly geometry elements seeing for that some breakage in meshing this will be cleared by using PATCH test for number of meshes.

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