METHOD FOR EXTRACTING VOLUMETRIC FEATURES IN A MESH REPRESENTATION OF CAD MODEL USING RANDOM CUTTING PLANES AND GRAPH TRAVERSALS

IITM Technology Available for Licensing

PROBLEM STATEMENT

- Mesh representation of objects, in particular with triangles as facets are very useful when it comes to visualizing the objects and prominent in Engineering/CAD domain which can be used in finite element analysis (FEA).
- However, the mesh model **do not intrinsically capture** any high level information such as features present in a CAD model & a lot of prior art literature discussed about feature recognition which are classified into decomposition based, geometry based approaches, but unable to disclose the required features outcomes.
- Therefore, there is a requirement to address above issues in efficient manner.

TECHNOLOGY CATEGORY/ MARKET

Technology: Volumetric Features In A Mesh Representation Of CAD Model;
Industry: Automotive, Software CAD models,
Applications: Mechanical design applications, Electronics Equipment design
Market: The global CAD software market is valued at $9.3 B in 2019, & projected to reach **$18.7B** by **2030** at a **CAGR** of **6.6%** during forecast period.

TECHNOLOGY

- Patent describes about a **method for retrieving feature extraction in CAD/engineering model**, more specifically volumetric feature extraction in three-dimensional (3D) triangular meshes of CAD models.
- The extraction of volumetric features is done by using **random cutting planes and graph traversals**.
- The implemented method is described in smart chart hereinbelow and exemplary figures.

Input a CAD model & slice the CAD model by randomly oriented planes,

Collect the triangles that gave an inner loop for any plane and output the triangles which will give the features,

The features are identified by using contours generated from randomized cutting planes,

The cutting plane pass through the mesh model surrounded by an outer contour & narrow down to the set of triangles of the inner contour which contributes the features from the closed contours .

KEY FEATURES / VALUE PROPOSITION

- ***Technical Perspective:*** Claimed Patent provides closed contour which are generated due to **intersection** between the **mesh** & the plane called **rings**;
- ***Industrial Perspective:*** Patented method retrieves the volumetric features which includes **blind holes, through holes, complex hole, slots & pockets.**

INTELLECTUAL PROPERTY

IITM ID F Ref. 1367;
IN Patent No: 422251 (Granted)

TRL (TECHNOLOGY READINESS LEVEL)

TRL- 3, Proof of Concept ready & validated

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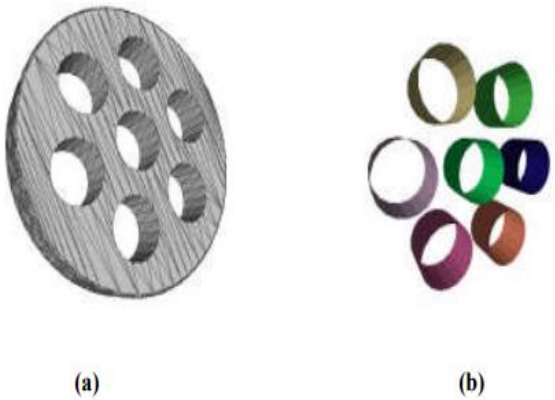
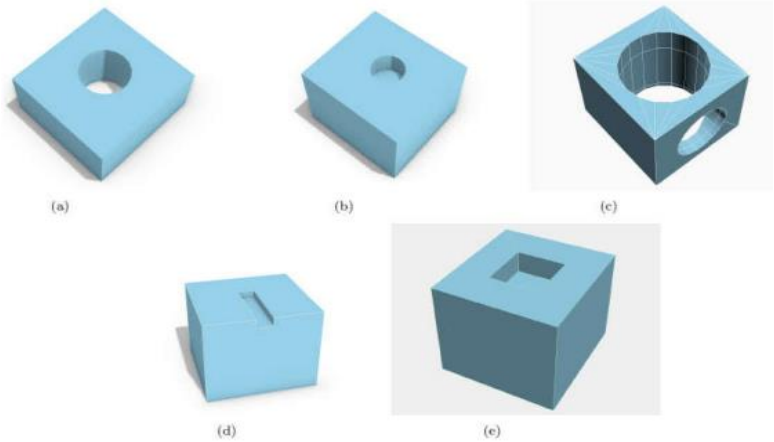
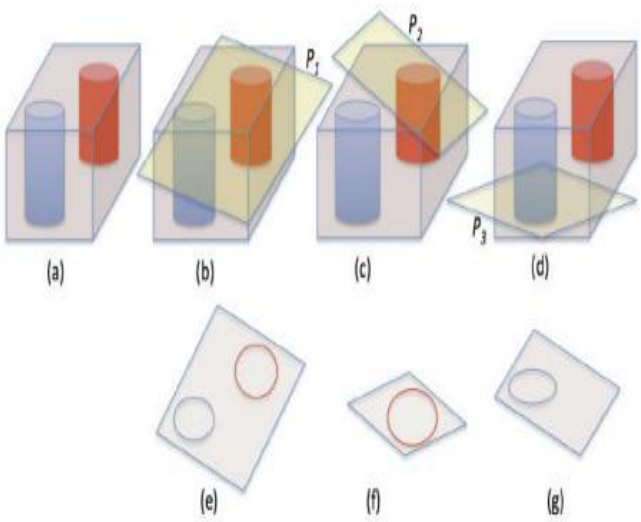
Images



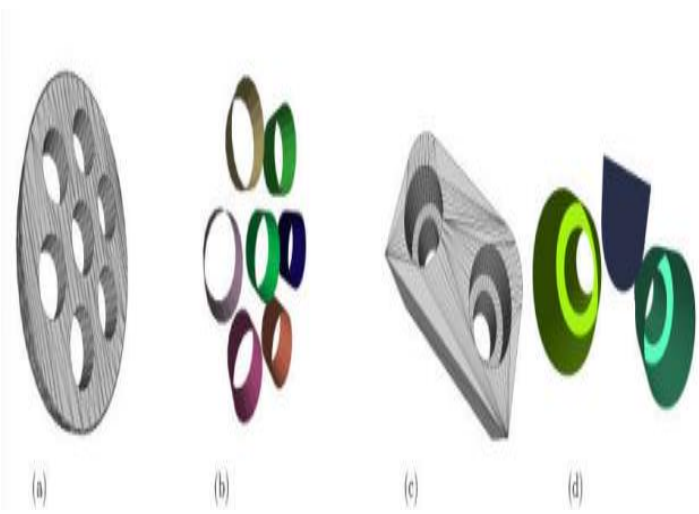
Figs. 1a & 1b: Illustrates CAD value as input and identified volumetric features



Figs. 2(a, b, c, d, e): Illustrates the volumetric features of (a) a through hole, (b) a blind hole, (c) a complex hole, (d) a slot and (e) a pocket



Figs 3(a, b, c, d, e, f, g) : Illustrates cutting planes and contour (ring) generation. (a) shows a model with two cylindrical holes. (b), (c) and (d) show a few of the cutting planes P1, P2, and P3 respectively, (e), (f) and (g) show their corresponding rings.



Figs.4 (a, b, c, d): Illustrates test results for (almost) uniform sized features. (a) Part 5: Input, (b) Part 5 Output, (c) Part 6: Input, (d) Part 6: Output.

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