RULE-BASED WORKPLAN GENERATION PIPELINE FOR MILLTURN MACHINING - A SHAFT CASE STUDY

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AutoCAM | M&A, MPRO, CodesignS

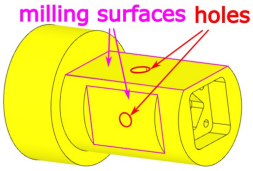
TD2 Mechanical Components and Systems, and Manufacturing

GOAL

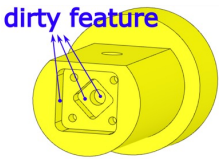
The primary objective is developing the **Work Plan Generator** for turning and mill-turn cases where the blank is a shaft. The generator is a process planning pipeline utilizing **maximal volume decomposition** and **machining-rule-based volume optimization** to derive optimal machining sequences with intermediate part models and setup reports for virtual machine (NX) verification directly from 3D CAD data.

MOTIVATION

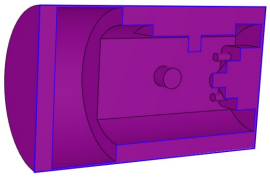
- Current feature-based CAM software **identifies features in isolation**.



- Challenge of **'dirty feature'** interpretation as it can be the intersection of several features.



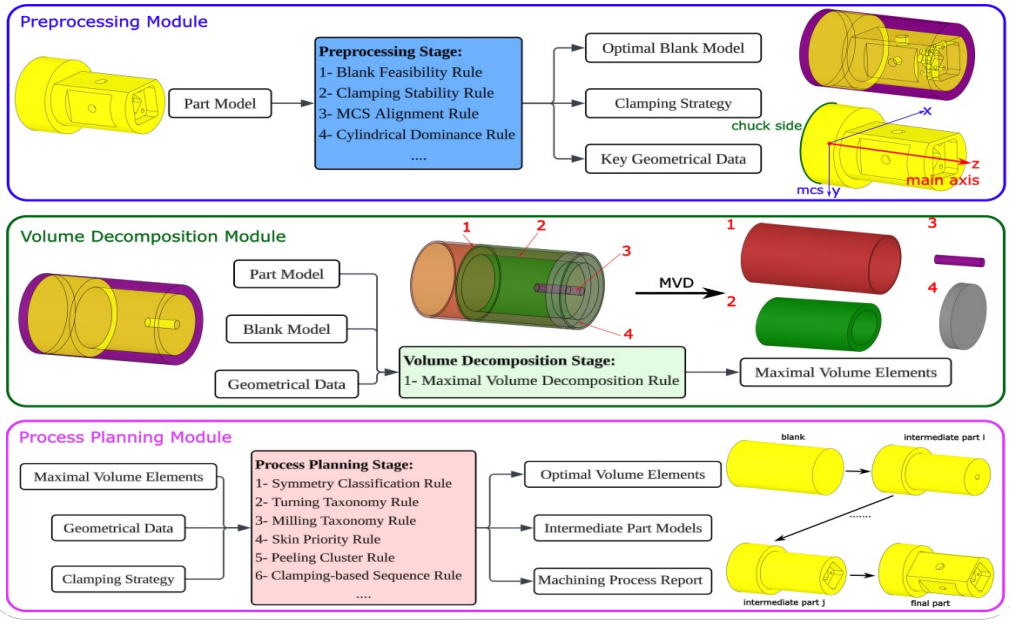
- **Rule-based volume-centric pipeline** filters out infeasible sequences.



- The intermediate features with **interpretability** is **human-centric**.

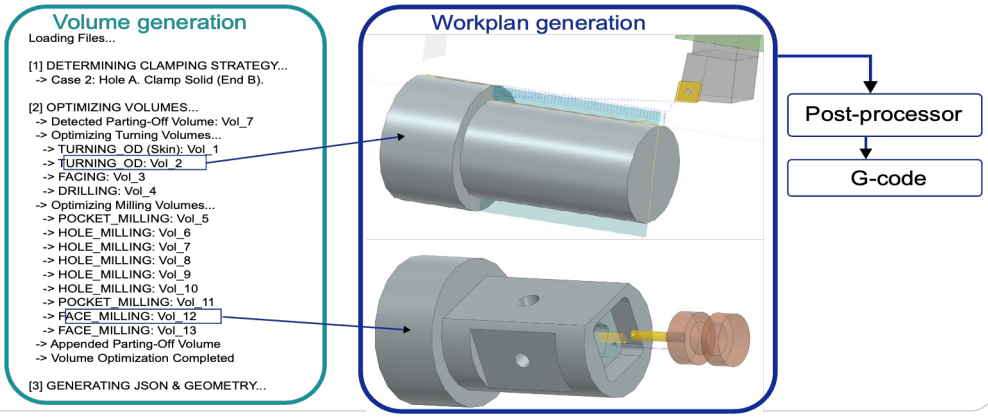
APPROACH

A rule-based & volume-centric manufacturing work plan generator was developed utilizing Python-based CadQuery and Open Cascade kernels.



RESULTS

Generated workplan in NX translatable to machine-readable code



KEY TAKE-AWAYS

- **Volume-centric method** offers robustness for handling complex geometries compared to feature-based methods.
- **Hybrid technology segregation** analyze geometry and enable efficient, automated planning for 3(+1) axis machines.
- **Mimics expert machinist through hierarchical rules** to automate clamping, sequencing, and collision avoidance.

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