

Feature-based CIM Model to Describe Products and the Entire Product Creation Process

Computer-Integrated Manufacturing (CIM) describes computer-aided production preparation and manufacturing. By breaking down components into basic geometric elements, known as features, a feature-based (FB) language is developed to represent the product and its associated product creation process, utilizing only 20% of the most frequently occurring features. This leads to a significant reduction in lead times and costs and enables the automation and standardization of nearly all processes in industrial production.

BACKGROUND

In industrial production, only 10% of the total lead time is spent on component manufacturing, while the remaining 90% is attributed to production preparation, which includes production planning and production control. This is primarily because production control relies on experiential data as input, which is often unavailable. As a result, these data must be collected with considerable effort, leading to significant time losses. This becomes particularly critical with complex components and/or lot size 1.

TECHNOLOGY

Each component is considered the sum of basic geometric elements (e.g., flat surfaces, holes, slots, chamfers). These basic geometric elements (so-called features) are the basis for a feature-based language used in CIM for recognition and interpretation. As the frequency distribution of the features corresponds to Zipf's Law, the most frequent 20% of features are sufficient to describe the entire product and its associated creation process. Figure 1 illustrates a feature-based CIM model that interconnects production planning and production control via direct interfaces or integrations. Instead of relying on a central database, data exchange between the systems is facilitated through APIs, middleware, or other integration mechanisms.

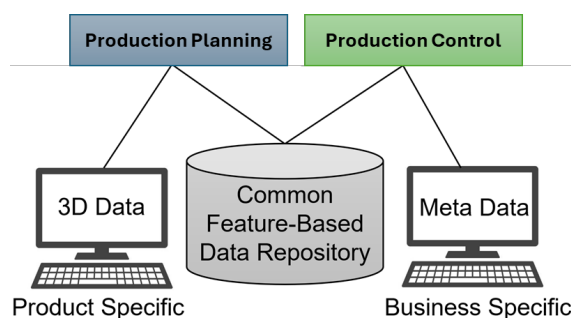


Figure 1

BENEFITS

- Front-Loading: Resources, lead time, costs, and quality are already known in design and development.
- Standardization and automation for a deep value chain in design and development, manufacturing, and quality inspection.
- Production automation, even with a lot size of 1.

REFERENCE:
M032/22

APPLICATIONS:
CIM Model with consistent use of feature technology in production planning (3D data) and production control (meta data).

DEVELOPMENT STATUS:
Proof of the functionality of the feature-based CIM Model

KEYWORDS:
Computer-Integrated Manufacturing ; Feature Technology; Frequency Distribution; Power Law; Computer-aided Process Planning ; Model-Based Definition

IPR:
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INVENTORS:
Amir AGOVIC
Christoph GABRIEL
Thomas TRAUTNER
Friedrich BLEICHER

CONTACT:

Karin HOFMANN

TU Wien
Research and Transfer Support
Karlsplatz 13/E058-02, Wien
T: +43 1 58801 415241
karin.hofmann@tuwien.ac.at