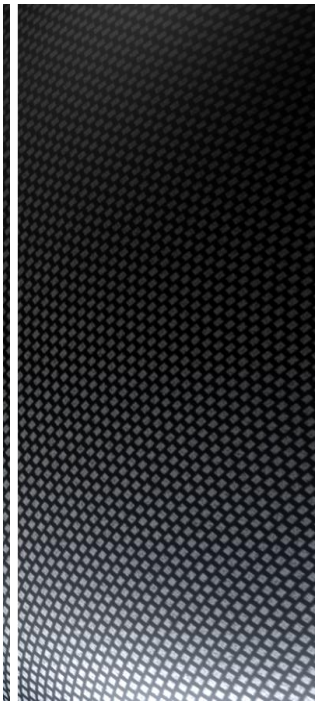


CAD/CAM (21-342)

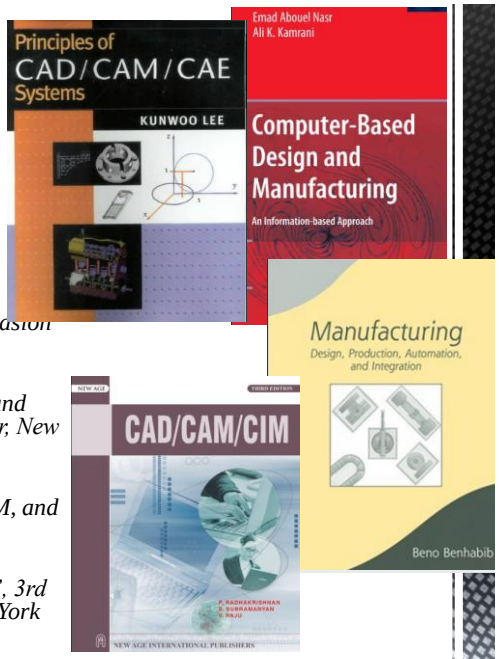
Advanced Manufacturing Laboratory
Department of Industrial Engineering
Sharif University of Technology

Session # 20

Course Description

- *Instructor*
  - *Omid Fatahi Valilai, Ph.D. Industrial Engineering Department, Sharif University of Technology*
  - *Email: FValilai@sharif.edu , Tel: 6616-5706*
  - *Website: Sharif.edu/~fvalilai*
- *Class time*
  - *Saturday- Monday* *10:30-12:00*
- *Course evaluation*
  - *Mid-term* *(25%)*
  - *Final exam* *(40%)*
  - *Quiz* *(5%)*
  - *Exercise* *(30%)*

Course Description *(Continued ...)*

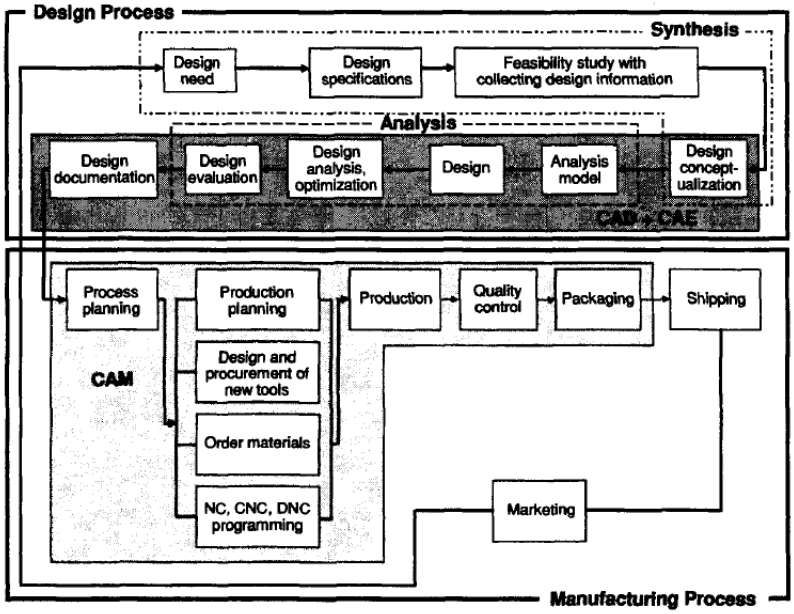


- *Mid-term session:*
  - *Monday: 8th Ordibehesht 1393, 10:30 ~ 12:30*
- *Final Exam:*
  - *Saturday: 24th Khordad 1393, 15:00 ~ 17:30*
- *Reference:*
  - *Lee, Kunwoo; "Principles of CAD/CAM/CAE systems", 1999, Addison Wesley*
  - *Abouel Nasr, Emad; Kamrani, Ali K.; "Computer-Based Design and Manufacturing: An Information-Based Approach", 2007, Springer, New York*
  - *Benhabib, Beno; "Manufacturing: Design, Production, CAD/CAM, and Integration", 2003, Marcel Dekker Inc, New York*
  - *Radhakrishnan, P.; Subramanian, S.; Raju, V.; "CAD/CAM/CIM", 3rd edition, 2005, New age international (P) limited publishers, New York*

Course Description *(Continued..)*

- *Contents:*
  - *Introduction to CAD/CAM/CAE systems* *(5 sessions)*
  - *Components of CAD/CAM/CAE systems* *(2 sessions)*
  - *Geometric modeling systems* *(3 sessions)*
  - *Optimization in CAD* *(5 sessions)*
  - *Rapid prototyping and manufacturing* *(3 sessions)*
  - *Virtual engineering* *(2 sessions)*
  - *Product Life Cycle Cost Model* *(2 sessions)*
  - *Computer-Based Design and Features/Methodologies of Feature Representations* *(5 sessions)*
  - *Feature-Based Process Planning and Techniques* *(3 sessions)*
  - *Collaborative Engineering* *(2 sessions)*

Introduction to CAD/CAM/CAE systems



6

Session Schedule

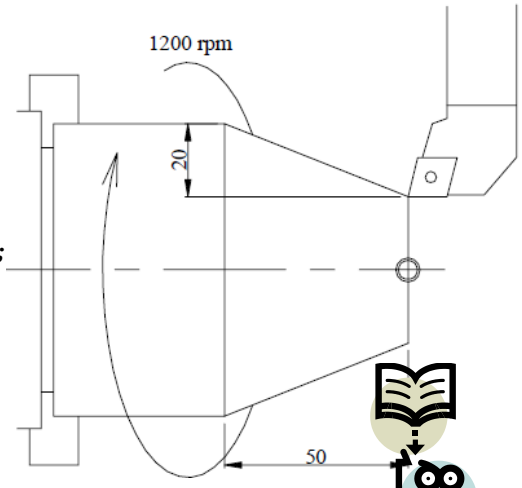
- *Computer-Aided Manufacturing (CAM)*
  - *Case studies*
    - *Design of a STEP compliant system for turning operations*
    - *Architecture and implementation of a shop-floor programming system for STEP-compliant CNC*

Computer-Aided Manufacturing (CAM)

- *Manufacturing automation primitives*
  - *CNC machining*
    - *Numerical control (NC) was developed in early 50's to meet the critical requirements of aerospace Industry.*
    - *Since the information required to actuate and control slides was coded numerically, this technology came to be known as numerical control.*
    - *Early numerically controlled machines were fully hardwired machines as the entire control logic was implemented in hardware.*

Computer-Aided Manufacturing (CAM)

- *Manufacturing automation primitives*
  - *Coding of information in NC machines*
    - *NC is control by information contained in a part program, which is a set of coded instructions given as numbers for the automatic control of a machine in a pre-determined sequence.*
    - ***N005 G01 U20 W-50 S1200 F0.2 M08;***



Computer-Aided Manufacturing (CAM)

- *Manufacturing automation primitives*
  - *Design of a STEP compliant system for turning operations*

Robotics and Computer-Integrated Manufacturing 26 (2010) 753–758

Contents lists available at ScienceDirect

Robotics and Computer-Integrated Manufacturing

journal homepage: www.elsevier.com/locate/rcim

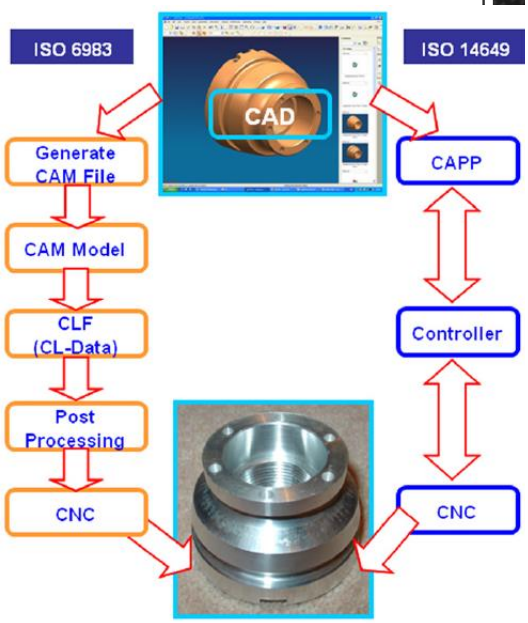
Design of a STEP compliant system for turning operations

Yusri Yusof [a,*], Keith Case [b,1]

[a] Faculty of Mechanical and Manufacturing Engineering, Universiti Tun Hussein Onn Malaysia Johor (UTHM), Parit Raja, 86400 Batu Pahat, Johor, Malaysia
[b] School of Mechanical Engineering, Loughborough University, Loughborough LE11 3TU, United Kingdom

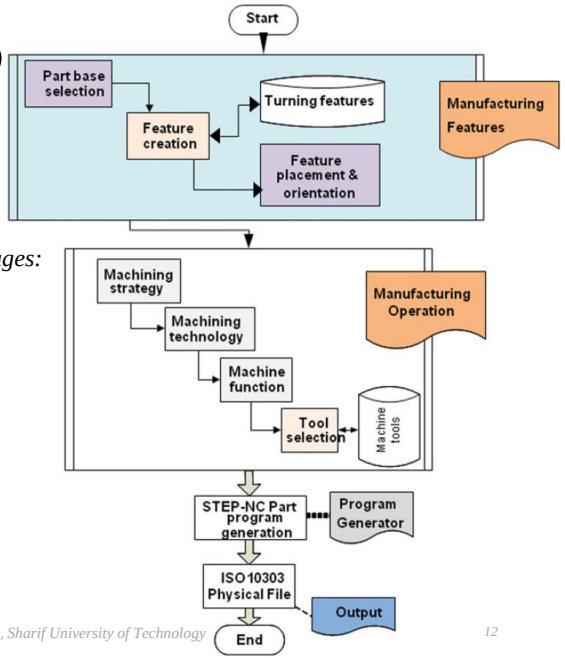
Computer-Aided Manufacturing (CAM)

- *Manufacturing automation primitives*
  - *Design of a STEP compliant system for turning operations*
    - *The use of ISO 6983 (G&M codes) for programming CNC machines requires NC part programs to be specific to a machine and CNC controller.*
    - *To satisfy the latest requirements and demands with respect to bidirectional process chains of machining modeling, several different technology-specific process models are necessary within STEP-NC*



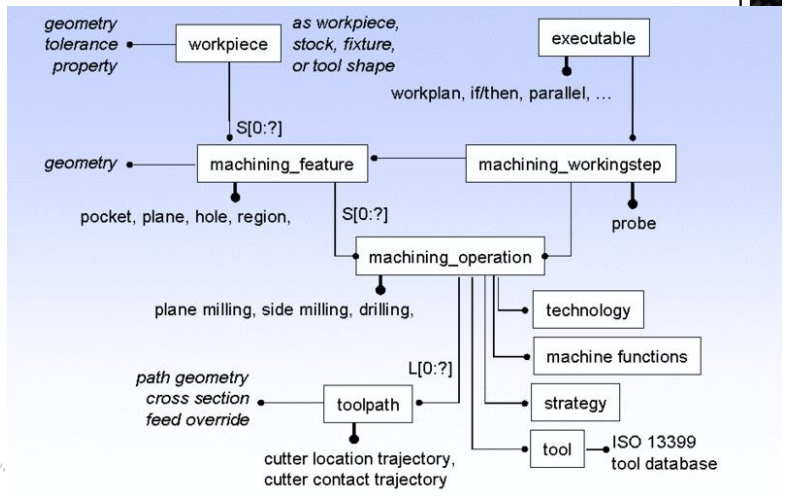
Computer-Aided Manufacturing (CAM)

- *Manufacturing automation primitives*
  - *Design of a STEP compliant system for turning operations*
    - *The implementation of SCSTO consists of three main stages:*
      - *The representation of the information model,*
      - *The development of the tool database and*
      - *The construction of the system application*



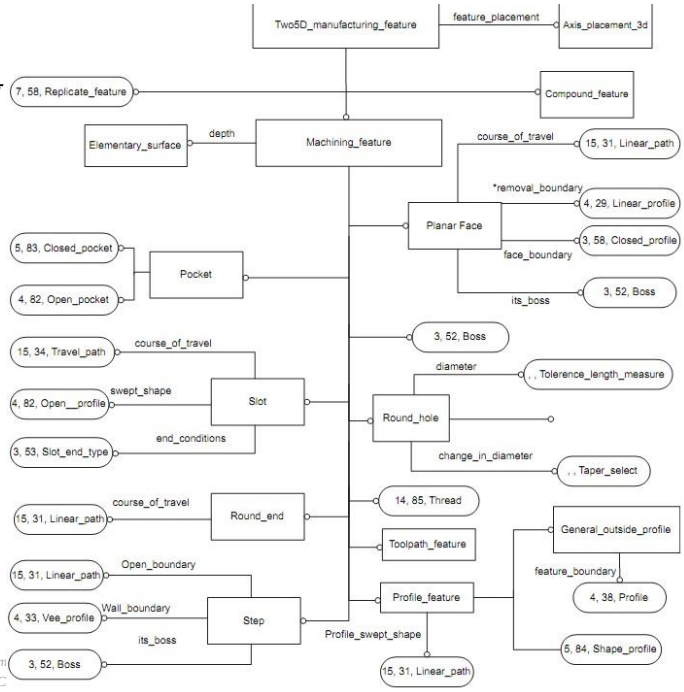
Computer-Aided Manufacturing (CAM)

- *Manufacturing automation primitives*
  - *Design of a STEP compliant system for turning operations*



Computer-Aided Manufacturing

- *Manufacturing automation primitives*
  - *Design of a STEP compliant system for turning operations*



Computer-Aided Manufacturing (CAM)

- *Manufacturing automation primitives*
  - *Architecture and implementation of a shop-floor programming system for STEP-compliant*

Computer-Aided Design 35 (2003) 1069–1083

COMPUTER-AIDED DESIGN

www.elsevier.com/locate/cad

Architecture and implementation of a shop-floor programming system for STEP-compliant CNC

S.H. Suh*, B.E. Lee, D.H. Chung, S.U. Cheon

National Research Laboratory for STEP-NC Technology, School of Mechanical and Industrial Engineering, POSTECH, San 31 Hyoja-dong, Pohang 790-784, South Korea

Received 9 July 2002; received in revised form 28 September 2002; accepted 7 October 2002

Computer-Aided Manufacturing (CAM)

- *Manufacturing automation primitives*
  - *Architecture and implementation of a shop-floor programming system for STEP-compliant*
    - *Depending on how (ISO 14649) ISO 10303 AP238 is implemented on CNC, there are three types:*
      - *(1) conventional control,*
      - *(2) new control, and*
      - *(3) new intelligent control*
        - *Some examples for intelligent functions are*
          - *Automatic feature recognition,*
          - *Automatic collision-free tool path generation including approach and retract motion,*
          - *Automatic tool selection,*
          - *Automatic cutting condition selection*

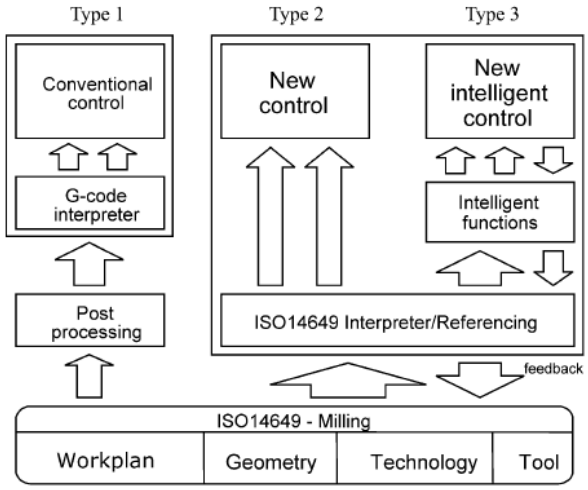
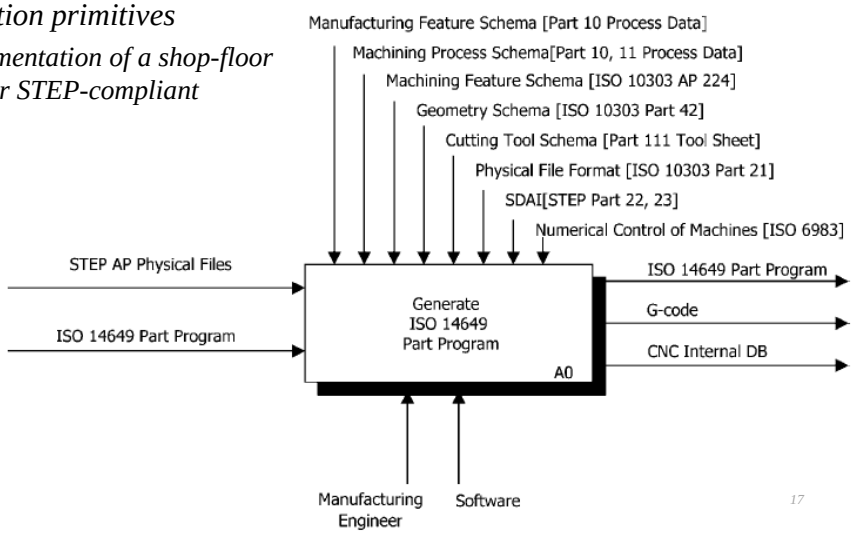
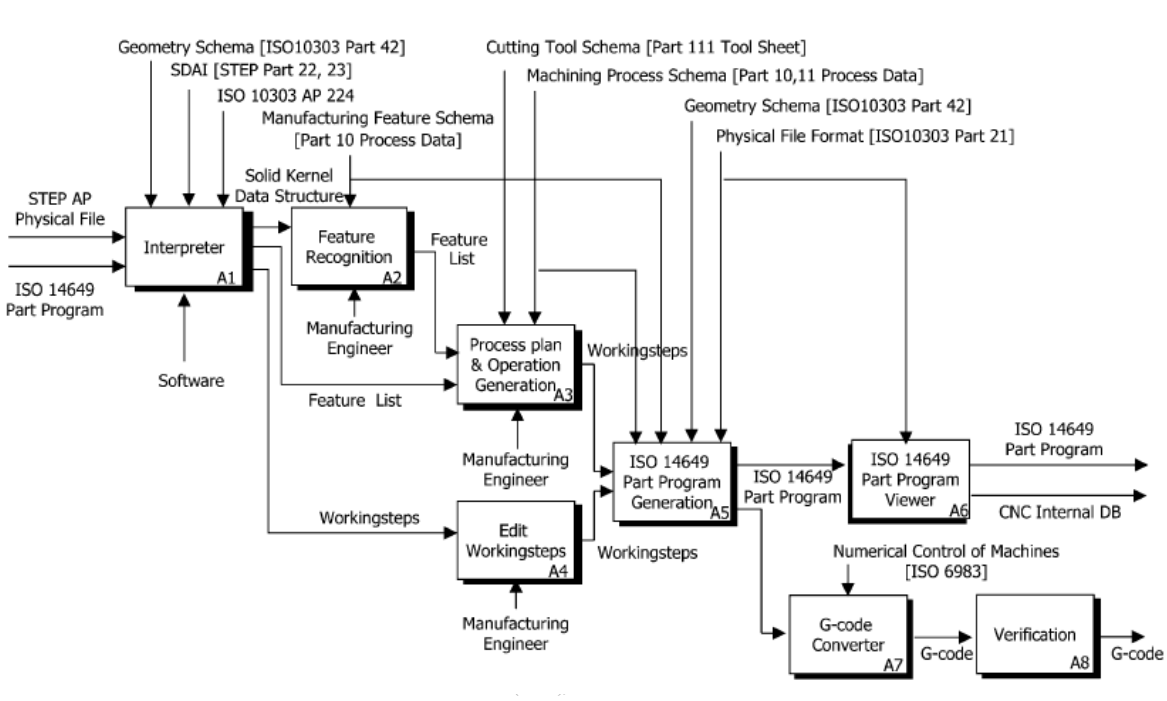


Fig. 2. Three types of STEP-CNC.

Computer-Aided Manufacturing (CAM)

- *Manufacturing automation primitives*
  - *Architecture and implementation of a shop-floor programming system for STEP-compliant*





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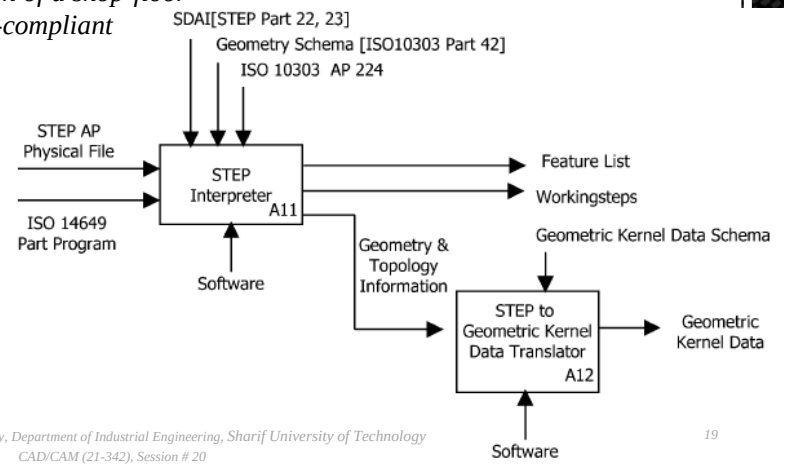

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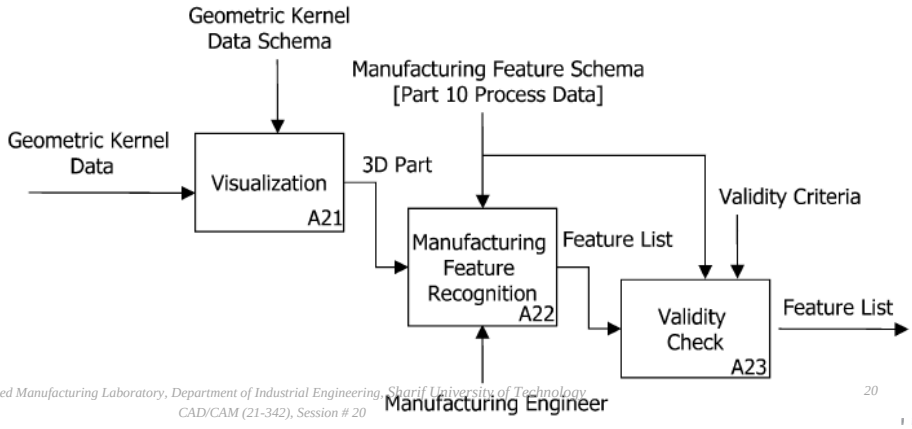

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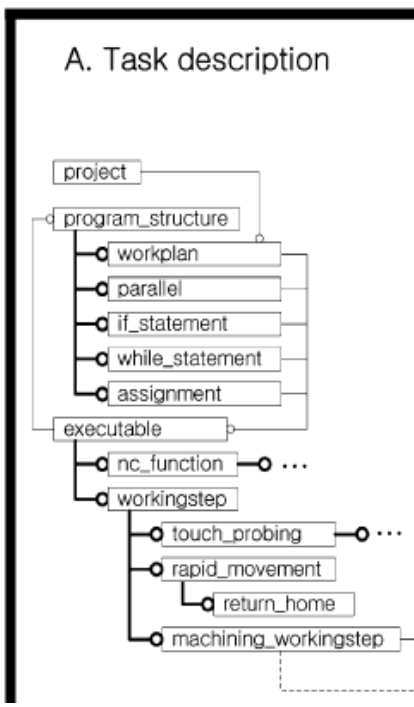

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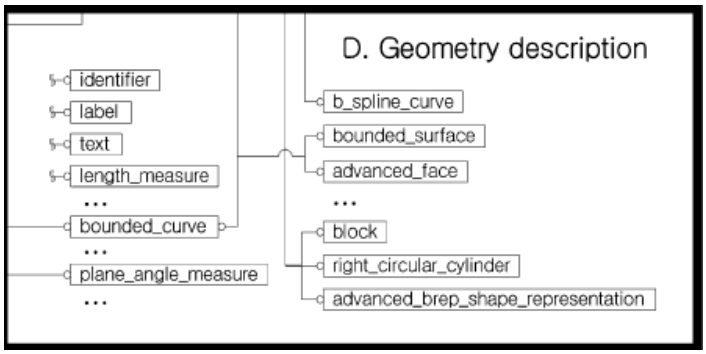

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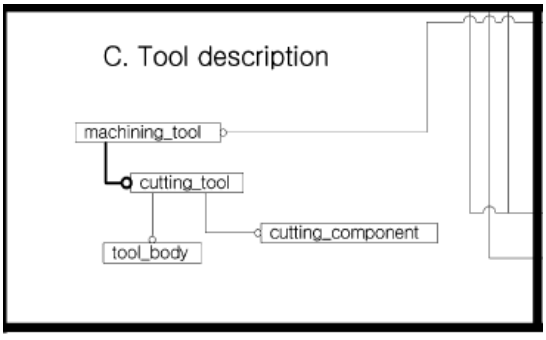

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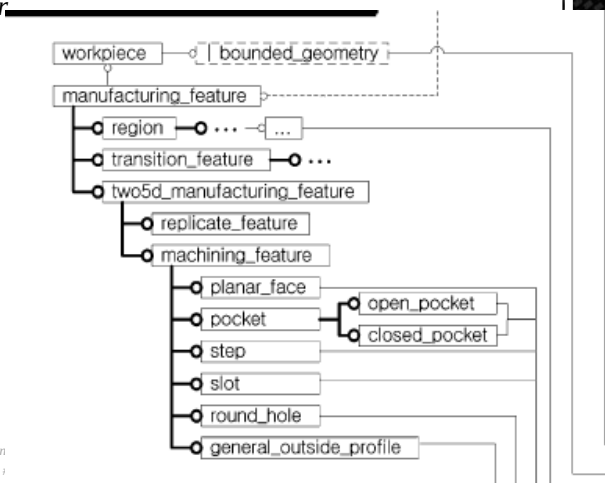

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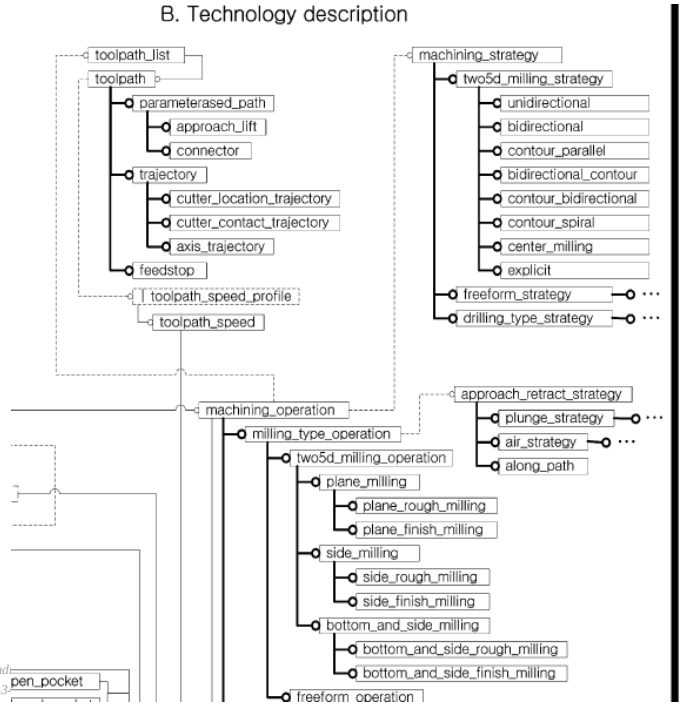

Computer-Aided Manufacturing (CAM)