# Automation (21-541)

*Advanced Manufacturing Laboratory*

*Department of Industrial Engineering*

*Sharif University of Technology*

*Session # 16*

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# 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*

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# 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.*
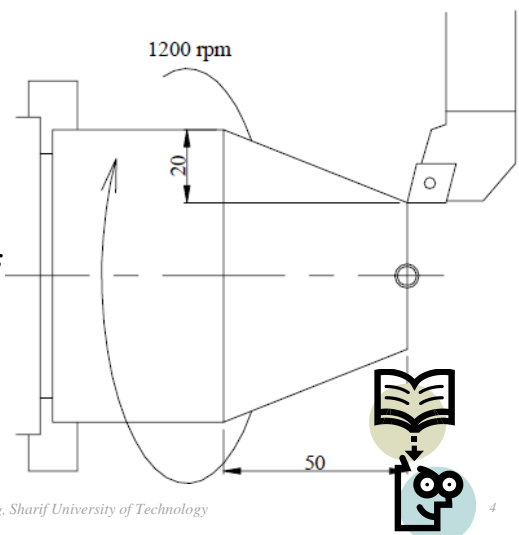
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# Computer-Aided Manufacturing (CAM)

- *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;*

1200 rpm

20

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# Computer-Aided Manufacturing (CAM)

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

## 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
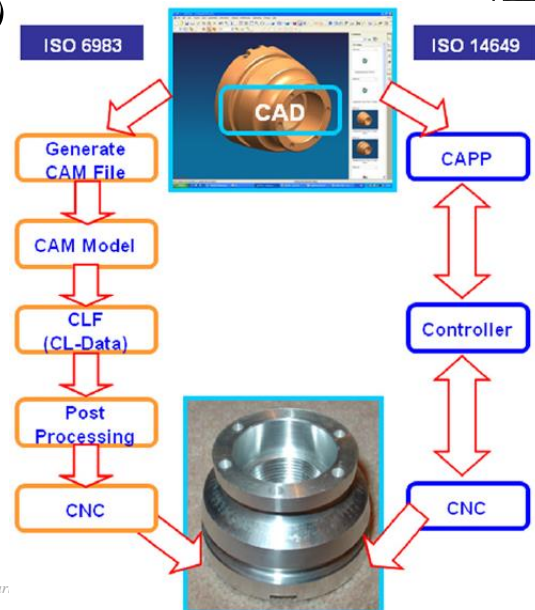[b] School of Mechanical Engineering, Loughborough University, Loughborough LE11 3TU, United Kingdom

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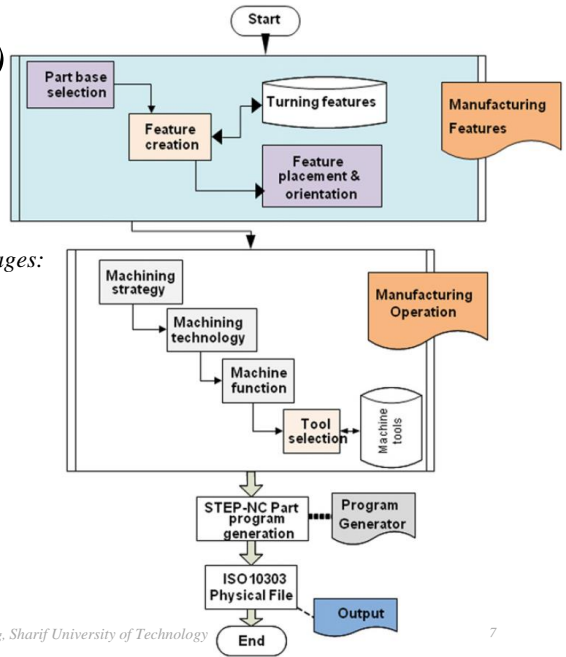# Computer-Aided Manufacturing (CAM)

- *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*
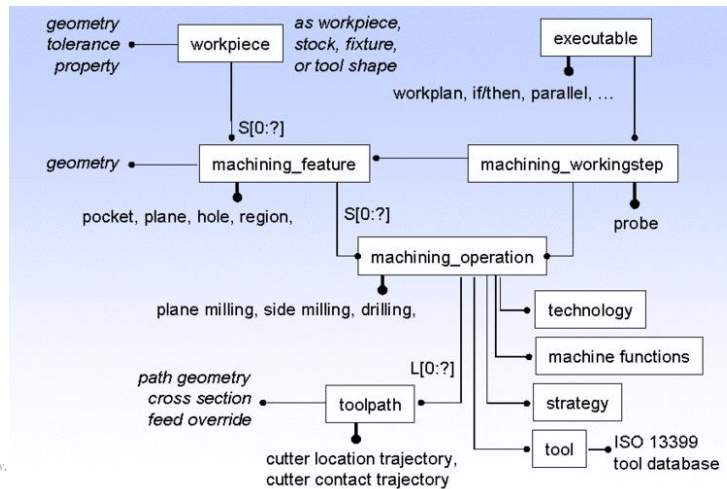      - *The construction of the system application*



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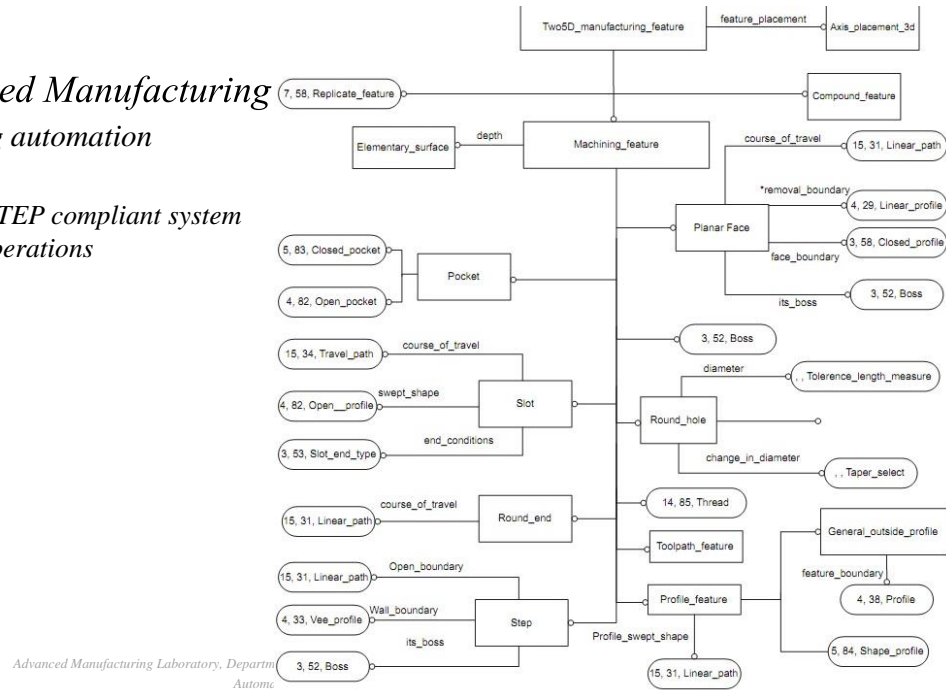
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# Computer-Aided Manufacturing (CAM)

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



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## Computer-Aided Manufacturing

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



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## Computer-Aided Manufacturing (CAM)

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

**ELSEVIER**

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

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## 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,*
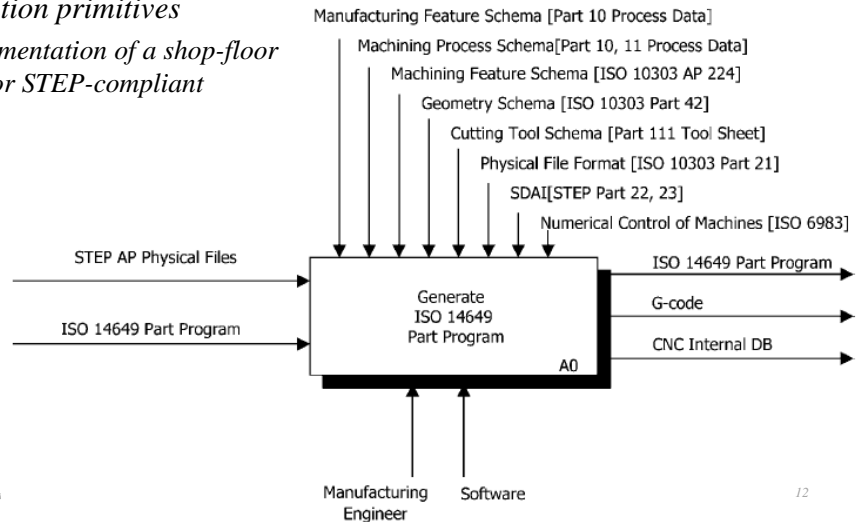          - *Automatic cutting condition selection*
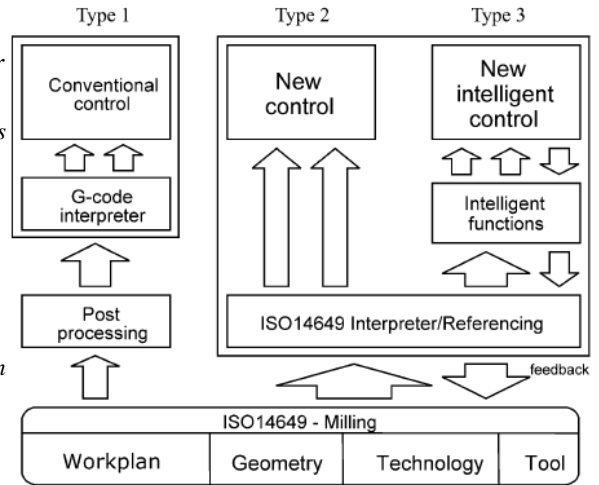


Fig. 2. Three types of STEP-CNC.

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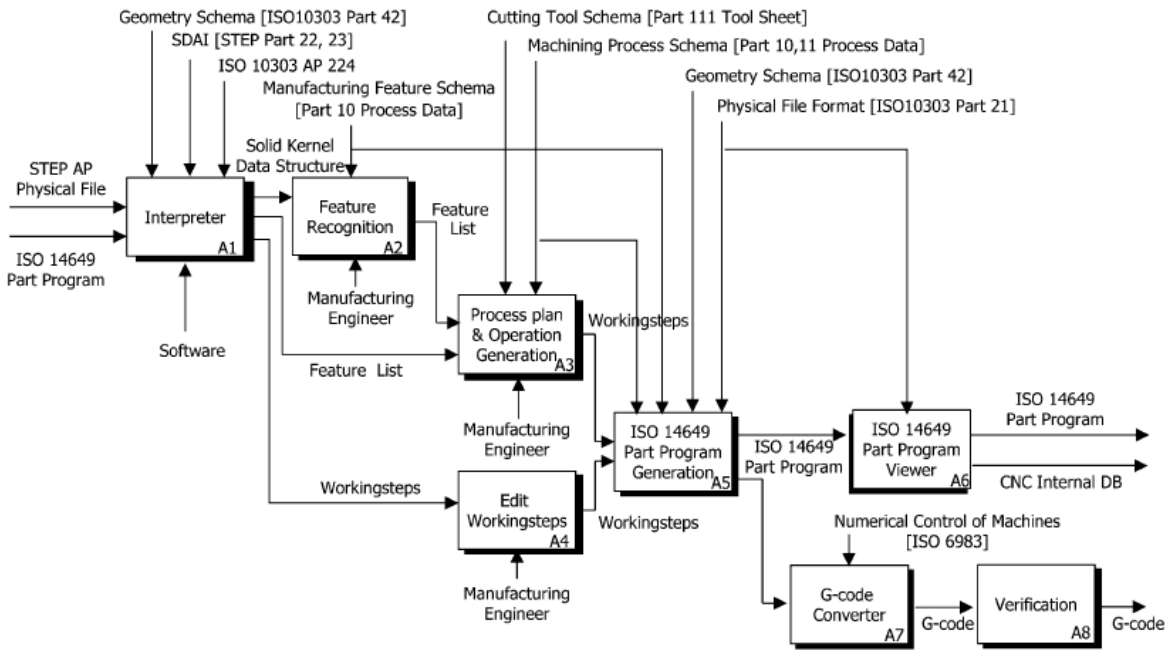*Automation (21541), Session # 16*

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## Computer-Aided Manufacturing (CAM)

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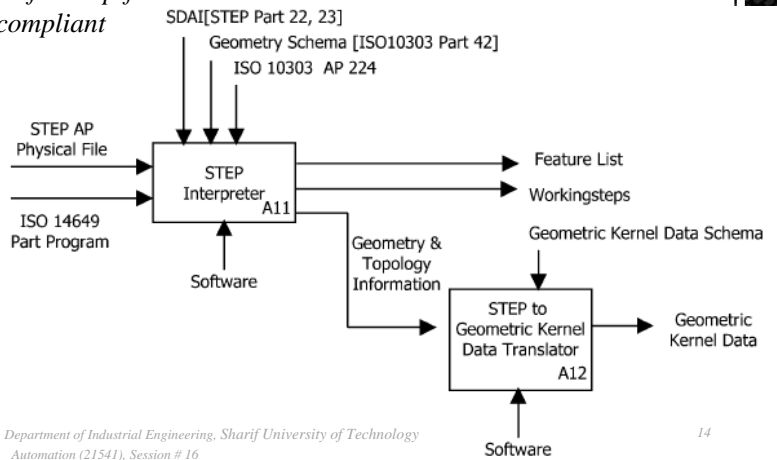  - *Architecture and implementation of a shop-floor programming system for STEP-compliant*
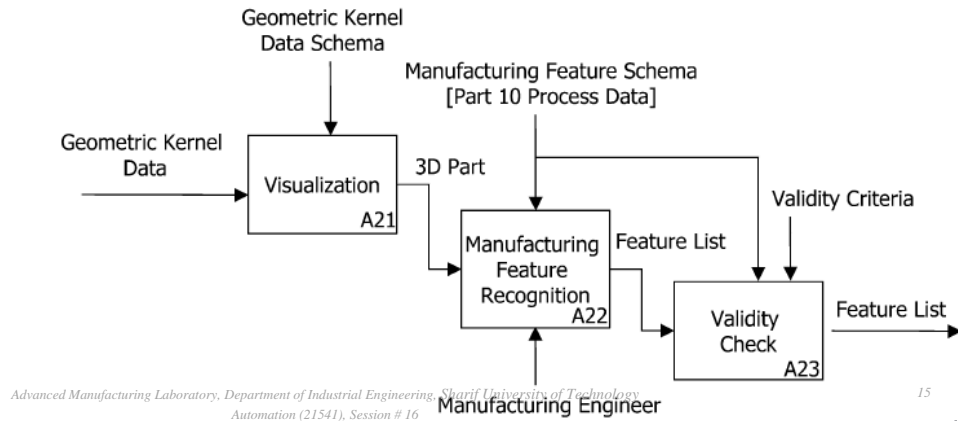


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# Computer-Aided Manufacturing (CAM)

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



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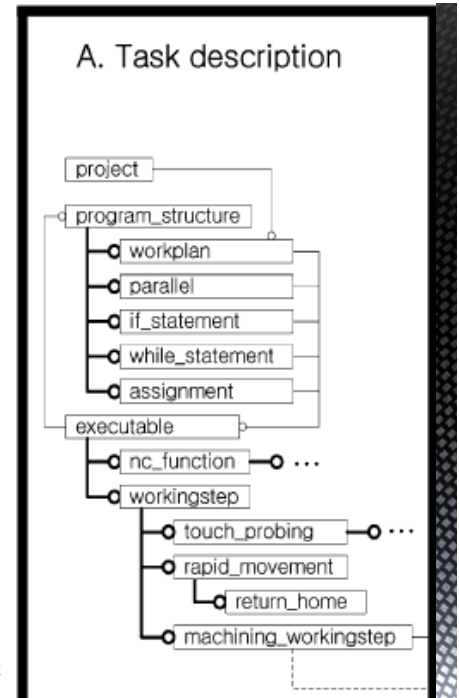Automation (21541), Session # 16

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# Computer-Aided Manufacturing (CAM)

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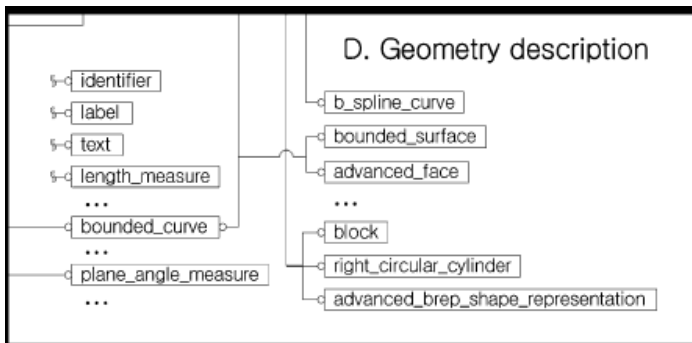# Computer-Aided Manufacturing (CAM)

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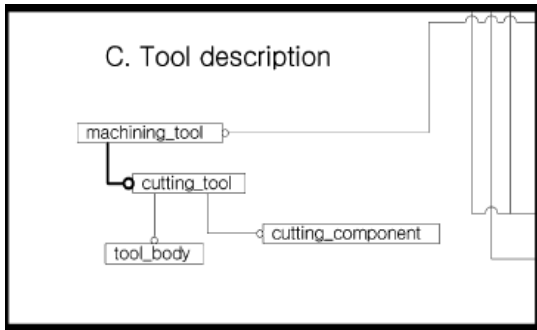  - *Architecture and implementation of a shop-floor programming system for STEP-compliant*



A. Task description

## Computer-Aided Manufacturing (CAM)

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



D. Geometry description

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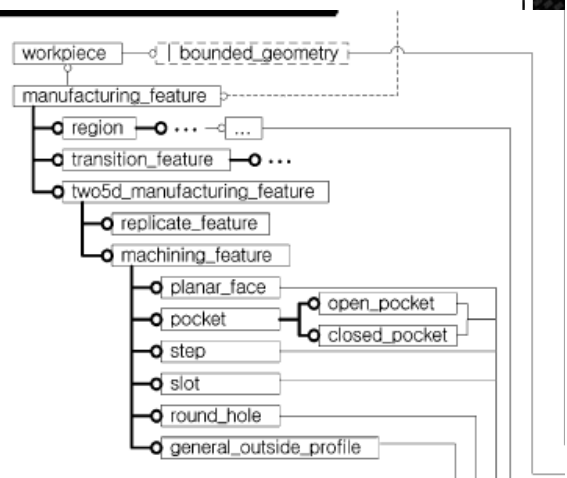


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# *Computer-Aided Manufacturing (CAM)*

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## Computer-Aided Manufacturing (CAM)

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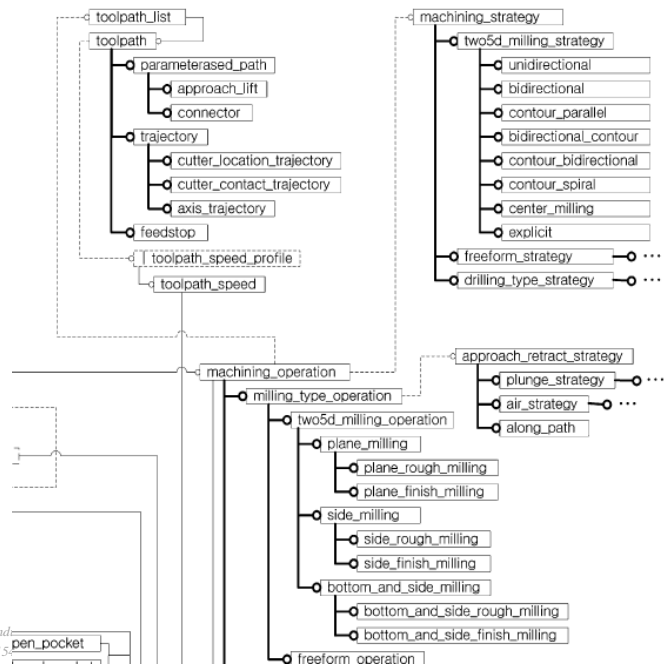  - *Architecture and implementation of a shop-floor programming system for STEP-compliant*



## Computer-Aided Manufacturing (CAM)