Automation (21-541)

Advanced Manufacturing Laboratory

Department of Industrial Engineering

Sharif University of Technology

Session # 16



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

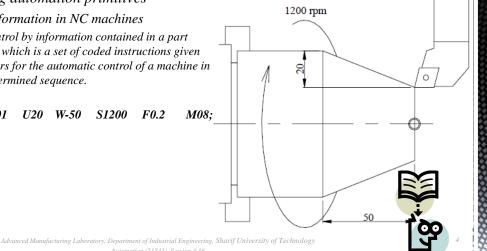
- Manufacturing automation primitives
 - CNC machining
 - Numerical control (NC) was developed in early 50's to meet the critical requirements of aerospace
 - Since the information required to actuate and control slides was coded numerically, this technology came to be known as numerical control.
 - 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.
 - S1200 N005 G01 U20 W-50 F0.2 M08;



- 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





Design of a STEP compliant system for turning operations

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Computer-Aided Manufacturing (CAM)

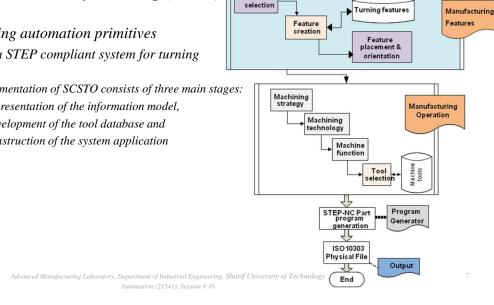
- Manufacturing automation primitives
 - Design of a STEP compliant system for turning operations
 - The use of ISO 6983 (G&M codes) for programming CNC machines requires NC part programs to be specific to a machine and CNC controller.
 - To satisfy the latest requirements and demands with respect to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



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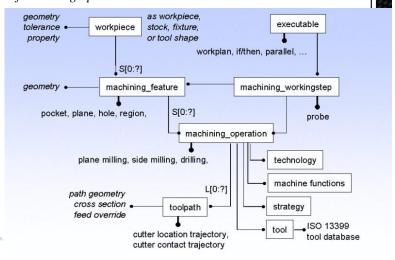
- Manufacturing automation primitives
 - Design of a STEP compliant system for turning operations
 - The implementation of SCSTO consists of three main stages:
 - The representation of the information model,
 - The development of the tool database and
 - The construction of the system application



Start

Computer-Aided Manufacturing (CAM)

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



Two5D manufacturing_feature Computer-Aided Manufacturing (7,58, Replicate_feature Manufacturing automation primitives 4, 29, Linear profi Design of a STEP compliant system for turning operations 5, 83, Closed_pocke 3, 52, Boss 4, 82. Open pocket 3, 52, Boss 15. 34. Travel pat Tolerence_length_measure 3, 53, Slot_end_typ Taper_select 14, 85, Thread 15, 31, Linear p Toolpath_feature 15, 31, Linear pa 4, 33, Vee_profile

Computer-Aided Manufacturing (CAM)

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- 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

15, 31, Linear_path

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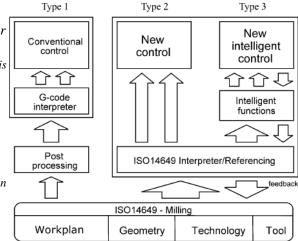
Architecture and implementation of a shop-floor programming system for STEP-compliant CNC

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- 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



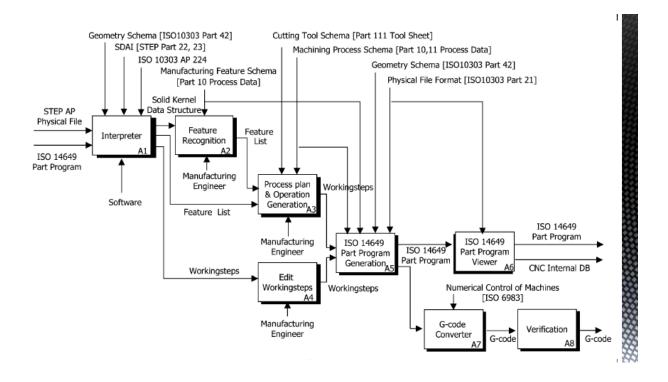
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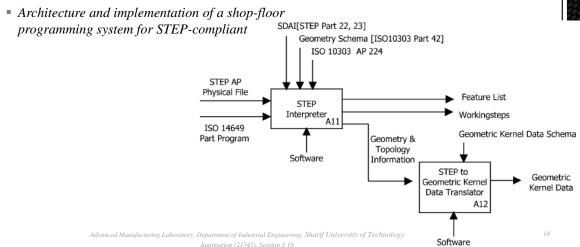
Fig. 2. Three types of STEP-CNC.

Computer-Aided Manufacturing (CAM)

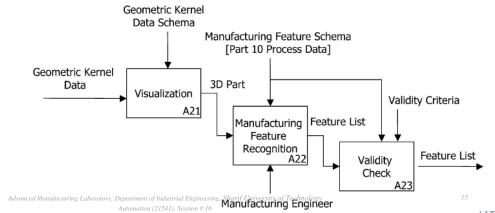
Manufacturing automation primitives Manufacturing Feature Schema [Part 10 Process Data] Machining Process Schema[Part 10, 11 Process Data] • *Architecture and implementation of a shop-floor* Machining Feature Schema [ISO 10303 AP 224] programming system for STEP-compliant Geometry Schema [ISO 10303 Part 42] Cutting Tool Schema [Part 111 Tool Sheet] Physical File Format [ISO 10303 Part 21] SDAI[STEP Part 22, 23] Numerical Control of Machines [ISO 6983] STEP AP Physical Files ISO 14649 Part Program Generate G-code ISO 14649 ISO 14649 Part Program Part Program CNC Internal DB Α0 Manufacturing Software Engineer



Manufacturing automation primitives



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



Computer-Aided Manufacturing (CAM)

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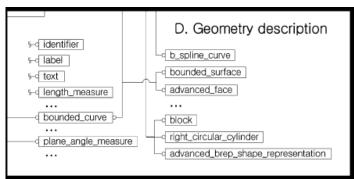
A. Task description

project
program_structure
workplan
parallel
if_statement
assignment
executable
or_ic_function
workingstep
touch_probing
orapid_movement
oreturn_home
machining_workingstep

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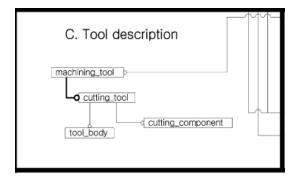
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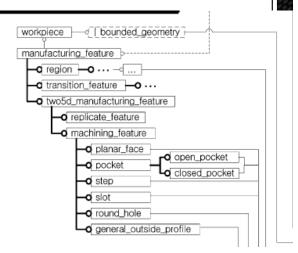
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