Design of a PC-Based Open-Architecture Machine Tool Controller

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Commercial CNC Today

- Proprietary hardware-based controllers
  - Expensive
  - Inflexible
  - Require Extensive Training
PC-Based Control

- Common hardware
  - Inexpensive
  - Easily Upgraded

- Software-based control
  - Flexible
  - Inexpensive
  - Common Interface Elements
Project Goals

- Determine requirements for a modular machine tool controller
- Design a controller to meet these specifications
- Demonstrate the controller on various platforms (cylindrical grinder, SLA)
Elements of a Modular Controller

- **Hardware**
  - PC
  - Motion Control Board

- **Software**
  - Core Program
  - User Interface
  - “Middle layer” Control / Processing Elements
  - Hardware Interface
User Interface

User Interface Tasks

- Monitor Machine Status
- Configure Controller
- Load/Edit/Run Programs
- Direct Machine Control (Jog, Stop, etc)
- Auxiliary Function Control

User Interface Options:

- VB-Designed Interface
- Mock of Traditional Controller
- Standard Windows Interface
- Web-Based Control
Middle Layer Elements

- Control Functions Executed on the PC
  - Interpolation Methods
  - Process Control
- Interface for DSP-Based Control Programs
  - Indicate Type of Controller
  - List Compatible Boards
  - Provide User Interface Information
Hardware Interface

- Similar to a Driver
- Allows Common Function Calls by the Core Program
- Handles Board-Specific Tasks
- Provides Core With Information on Board Capabilities
- Allows for Expansion to Future Hardware