IMPLEMENTATION OF A FAST TOOL SERVO FOR A DTM

October 14, 1998

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Diamond Turning Machine
Carbide vs. Flat Nose Finish (Before FTS)

Carbide Surface Profile
380 nm RMS

Flat Nose Diamond Profile
44 nm RMS
**BENEFITS OF A FAST TOOL SERVO**

- Active Control of Tool Position
- Low Inertia in Comparison to Ways
- Flexibility of Interchangeable Controllers
  - Noise Rejection
  - Rejection of Periodic Disturbances
- Higher Precision Control of Surface Generation
  - Improved Surface Finish (Roughness, Waviness, Flatness)
  - Generation of ‘micro-structures’
  - Generation of non-axially symmetric profiles
Statement of Goals

- Develop a GUI for the DTM Interface
- Implement a FTS
  - Piezoelectric Actuation
  - Position Feedback
- Design Effective Control Schemes
  - Polynomial Control Design (noise rejection)
  - Learning Control (Periodic disturbance rejection)
- Evaluate Performance of FTS
  - Surface Roughness
  - Surface Waviness
Matching of Frequency with Sample Time

Tracking a 45 Hz Signal with Fs=1.125 kHz

Signal value

Time (sec)

Signal to Track
Sampling
Fast Tool Servo