IIT IPRO 304
Machine Tool Monitoring Control
For A. Finkl & Sons

IPRO Presentation
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Background

- A. Finkl & Sons is the world's leading supplier of forging die steels, plastic mold steels, die casting tool steels and custom open-die forgings,

- A. Finkl & Sons process over 100,000 tons of steel each year. These products are distributed domestically and to more than 18 countries worldwide.
The Problem

• Machinists must remain at machines at all time

• Broken inserts cause downtime and higher costs
Previous Work

• Visual method
  - A camera was used to take photographs of the milled piece and a Fast Fourier Transform analysis was performed to discover patterns.

• Acoustic method
  - A directional microphone was used to try to detect the sound of an insert breaking.

• Accelerometer method
  - An accelerometer was attached to the milling machine housing directly over the cutting head.
Current Work

• Accelerometer data:
  – 4 grades of steel
  – Five different machines of various size
  – Two different shapes (most milled material is rectangular)
  – Eight different size parts (from 1 to 17 tons)

• Lab View Signal Express was used to collect and analyze data
Research Time

- We went to A Finkl & Sons twice a week to collect data.

- We spent over 40 hours to get appropriate data from several machines.

- Two following signals were extracted from over 500 MB data.
Analysis (Proper signal)

Limit

Break

Detected
Analysis (Improper signal)
Hypothesis

- In order to acquire accurate data the machine’s running noise must be minimized
- Every machine is different and some may have worn bearings which could cause extra noise.
Recommendations

- Wireless accelerometers will be mounted to the milling machine shaft.
  - These computer chips are capable of wirelessly transmitting the vibration data to a central computer used for the analysis.
  - Mounting the accelerometers on the rotating shaft might minimize the noise found in the signals.
Future Work

• The accelerometers will need to be programmed to send the data to the central server.
• A program will be written to convert the streaming data into a format for LabView to analyze.
• If the noise is reduced the machine shop will be analyzed for optimal placement of the receiver.
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