Summer research program

Machine Tool Monitoring

By Dongwei Bai
Introduction about myself

- Name: Dongwei Bai
- School: Purdue University
- Major: Mechanical Engineering
- Nationality: Chinese
- Current research: Institut für Fertigungstechnik und Werkzeugmaschinen (IFW)
My Advisor

❖ Name: Tobias Stiehl
❖ School: Leibniz Universitiat
❖ Major: Mechanical Engineering
❖ Research topics: Tool condition monitoring
Core program  |  MATLAB
Process showing in plot.
Processes

Filter → Arithmetic → Decision Making → Output
Processes

- Filter the data
- Calculate the limits, average, etc
- Algorithm to get output data
- Understand the output
Filter Design

Use of different filters to pass signals required and block signals that don’t need

- Low-pass
- High-pass
- Band-pass

Filter the data
Fourier transform

- Low-pass filter
- High-pass filter
- Band-pass filter
- Torque main spindle
%% CALCULATION
Maxval = movmax(data_filtered,windowsize,'endpoint','fill'); %Max value of data
Minval = movmin(data_filtered,windowsize,'endpoint','fill'); %Min value of data
Meanval = movmean(data_filtered,windowsize,'endpoint','fill'); %Mean value of data
Medianval = movmedian(data_filtered,windowsize,'endpoint','fill'); %Median value of data
stdval = movstd(data_filtered,windowsize,'endpoint','fill'); %Standard deviation

%% PLOT
***********EXTREME VALUE***********
plot(tvec,data_filtered,'--',tvec,Maxval,'-');
hold on
plot(tvec,data_filtered,'--',tvec,Minval,'.');
legend('Original data','Moving max value','Moving min value');
grid on;
xlabel('Time (s)');
ylabel('Amplitude');
***********MEAN VALUE***********
plot(tvec,data_filtered,'--',tvec,Meanval,'-');
legend('Original data','Moving mean value');
grid on;
xlabel('Time (s)');
Decision Making

- $S_k$: Standard deviation of values at the respective time
- $B_k$: Rating of single feature $K$
- $B_{ges}$: Total valuation by combing each individual valuation
Output Data
Travel
Hannover
Hamburg
Munich
Paris
Cologne, Frankfurt and Düsseldorf
Berlin
Amsterdam
“It is better to travel ten thousand miles than to read ten thousand books”
Reference


- [https://www.google.com/maps](https://www.google.com/maps)
Dank!