

Speed and Feed Adjustment in STEP-NC

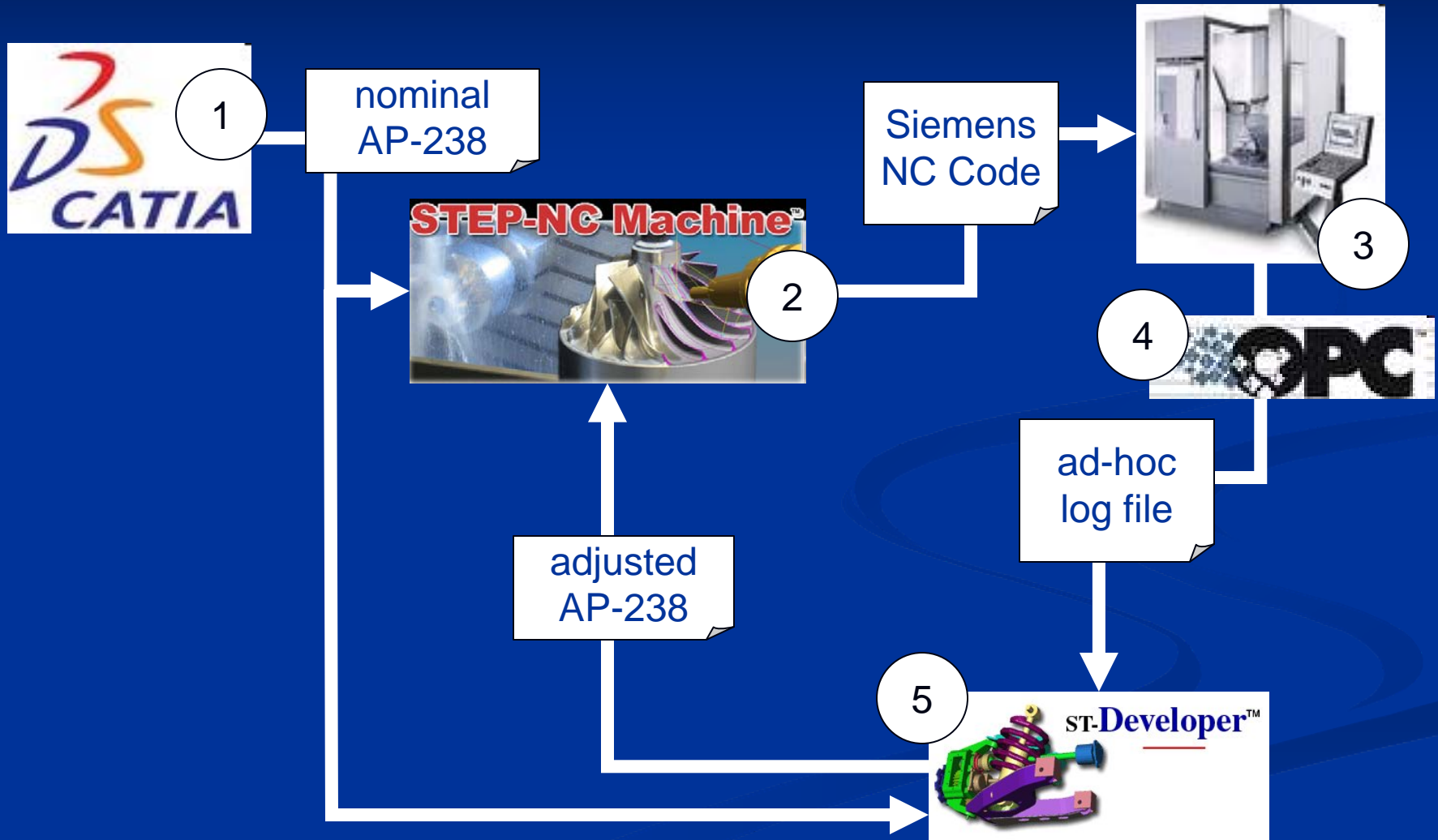
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NIST

Objective

- To record real-time operator adjustments to STEP-NC programmed spindle and feed rate overrides, and adjust the original STEP-NC file accordingly
- Scenarios where this might be useful:
 - manual optimization – the nominal speeds and feeds may be too conservative
 - to account for worn tools, or different tools
 - to compensate for chatter
 - to see the effect of speed and feed on surface finish

Overall Technique



Technique Details ...



- 1 Catia is used to generate an AP-238 process plan with nominal spindle speeds and axis feed rates
- 2 STEP-NC Machine is used to generate Siemens 840D NC code, with comments that indicate to which working step the following NC code lines are associated

Sample NC Code

```
X5.58Y0.658Z0.875
```

```
X5.572Y0.654Z0.875
```

```
X5.562Y0.652Z0.875
```

```
G0Z2
```

```
; Workingstep: Island 3 #121939
```

```
G1X4.621Y4.635F80
```

```
Z0.9
```

```
X4.614Y4.614Z0.899
```

```
X4.646Y4.624Z0.898
```

```
X4.648Y4.625Z0.898
```

Comment text

“Island 3 #121939”

is the name of the AP-238
workingstep from which
this NC code was
generated

... Technique Details ...

3 The NC code is run on the machine tool, and the operator adjusts speeds and feeds to improve machining conditions

4 A bespoke* OPC-based application reads out active NC code lines, speed and feed override settings and logs the data to a text file



ad-hoc
log file



* “custom,” for non-British English speakers

Sample Log File

moldy1.mpf, 1033, 150, 100

moldy1.mpf, 8145, 175, 100

moldy1.mpf, 12973, 75, 100

moldy1.mpf, 15928, 125, 100

moldy1.mpf, 20877, 200, 100

moldy1.mpf, 25172, 50, 100

moldy1.mpf, 28177, 50, 60

moldy1.mpf, 36023, 150, 60

moldy1.mpf, 47882, 20, 60

← NC program file name

← line number

← feedrate override, %

← spindle speed override, %

... Technique Details

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A bespoke ST-Developer application (STEP-NC DLL) associates override values in the log file by NC code line with comments indicating the source workingstep ...

nominal
AP-238



adjusted
AP-238

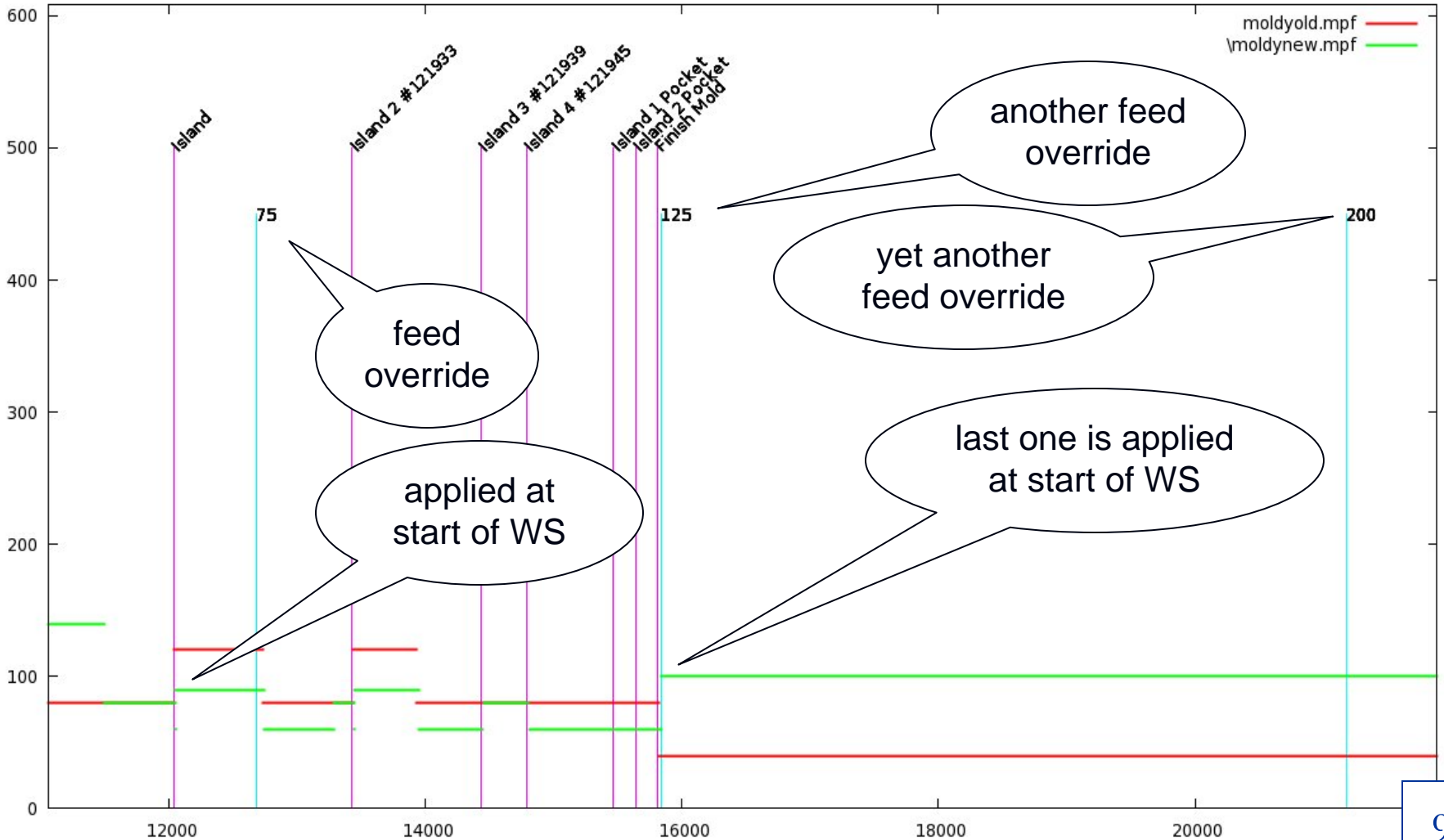
ad-hoc
log file

5



... and the workingstep's technology parameters are scaled accordingly

Sample Feed Results



Issues

- Fragile, comment-based association between AP-238 and NC code – better if AP-238 could be run natively on CNC, and OPC could log workingstep name directly
- Overrides may vary continually during a single workingstep – we apply last override to entire workingstep
 - could apply on a per-toolpath basis (still could vary continually during a toolpath) – better, not much work
 - could fit an override profile, and apply that – best, but more work