

- Pre-defined adaptive control in **\*CONTROL\_ADAPTIVE**

- ADPFREQ: constant time intervals
- LCADP: curve data defining time intervals
- **NOT suitable to maintain mesh quality for complex material deformation**  
**NOT able to avoid unnecessary adaptive steps (introducing error, more expensive and less robust)**

- **\*CONTROL\_REMESHING\_EFG**

- Card 2

Variable	IVT	IAT	IAAT	IER	MM
Type	I	I	I	I	I
Default	1	0	0	0	0

- Card 3

Variable	IAT1	IAT2	IAT3
Type	F	F	F
Default	1.0E20	1.0E20	1.0E20



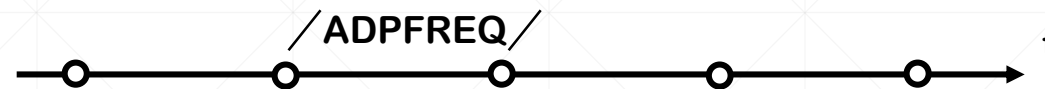
▪ **\*CONTROL\_REMESHING\_EFG**

▪ Card 2

Variable	IVT	IAT	IAAT	IER	MM
Type	I	I	I	I	I
Default	1	0	0	0	0

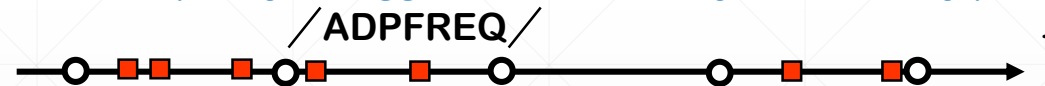
**IAT** EQ.0: No interactive adaptivity

A constant period of adaptivity is defined by **ADPFREQ**



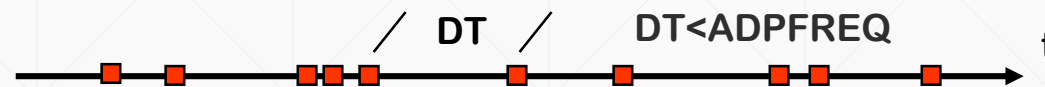
EQ.1: Interactive adaptivity combined with predefined adaptivity

Extra adaptivity is triggered interactively within every period defined by **ADPFREQ**



EQ.2: Purely interactive adaptivity

The time interval between two successive adaptive steps is bounded by **ADPFREQ**



EQ.3: Purely interactive adaptivity



▪ **\*CONTROL\_REMESHING\_EFG**

▪ Card 2

Variable	IVT	IAT	<b>IAAT</b>	IER	MM
Type	I	I	I	I	I
Default	1	0	0	0	0

- **IAAT=1**: automatically adjusts the tolerance of interactive control parameters based on ADPFREQ and the history of adaptive time intervals to **avoid over-activation of interactive adaptivity**

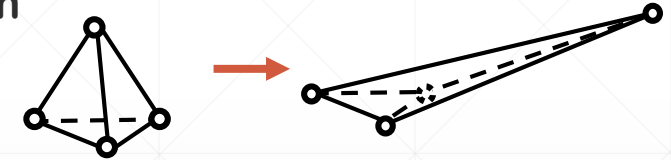
▪ Card 3

Variable	<b>IAT1</b>	<b>IAT2</b>	<b>IAT3</b>
Type	F	F	F
Default	1.0E20	1.0E20	1.0E20

- **IAT1, IAT2, IAT3**: user-define tolerance of three interactive control parameters (**distortion indicators**)
- The rate of indicator change over ONE time step **Interactive adaptivity when the rate is over 50%**

**IAT1**: shear deformation

$$|F_{ij} + F_{ji}|, \quad i \neq j$$



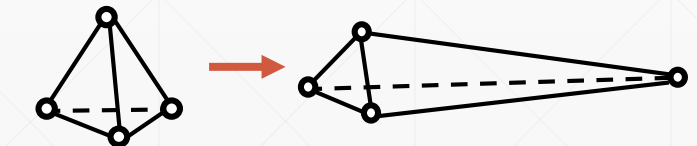
**IAT2**: volumetric change

$$|1 - \det(\mathbf{F})|$$

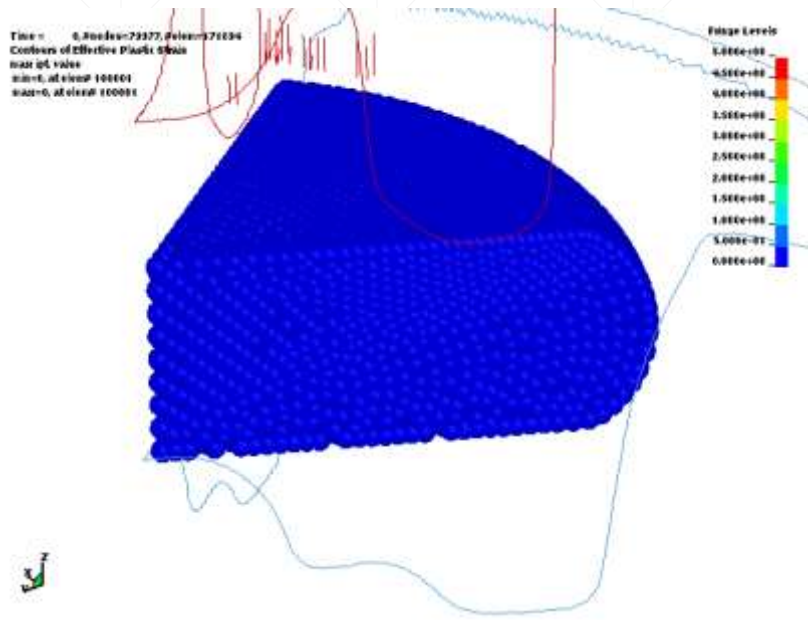


**IAT3**: unbalanced nodal distribution

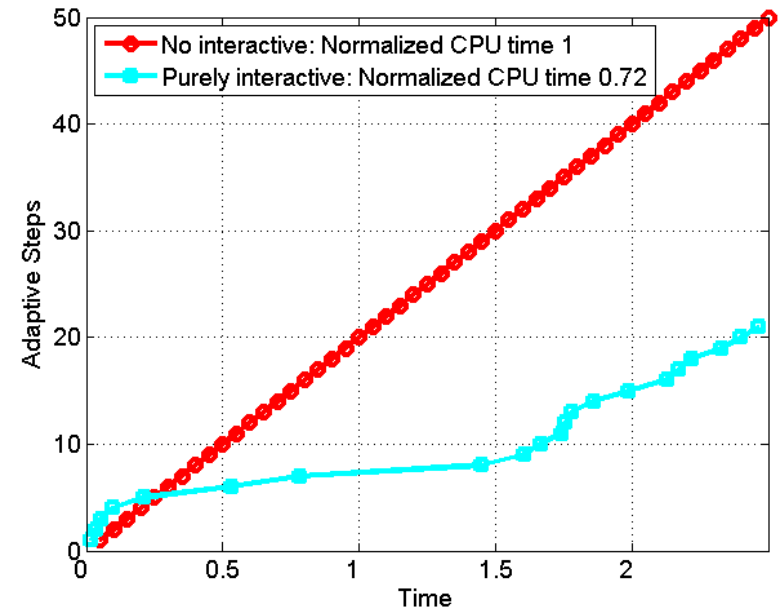
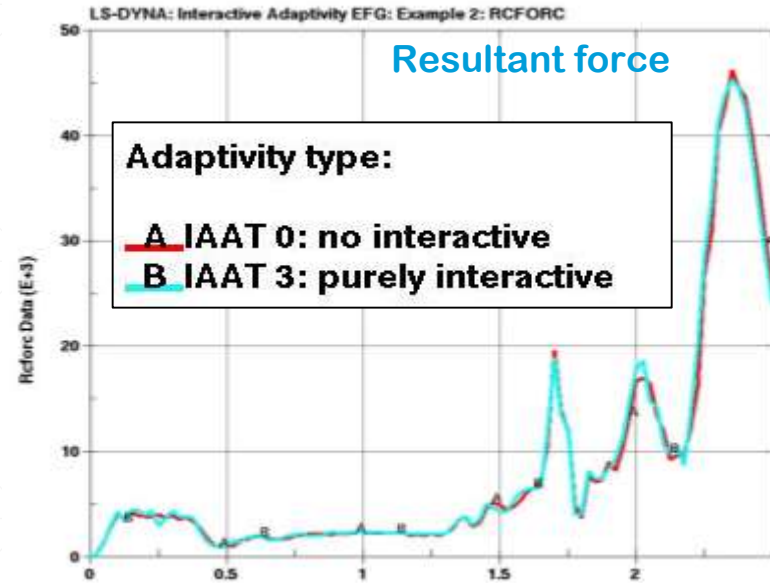
$$\frac{\text{Max}(\text{edge length})}{\text{Min}(\text{edge length})}$$



- Wheel forging
  - Adaptive EFG with interactive control



<b>IAT</b>	0	3
Normalized CPU time	1.0	0.72
# of adaptive steps	50	22



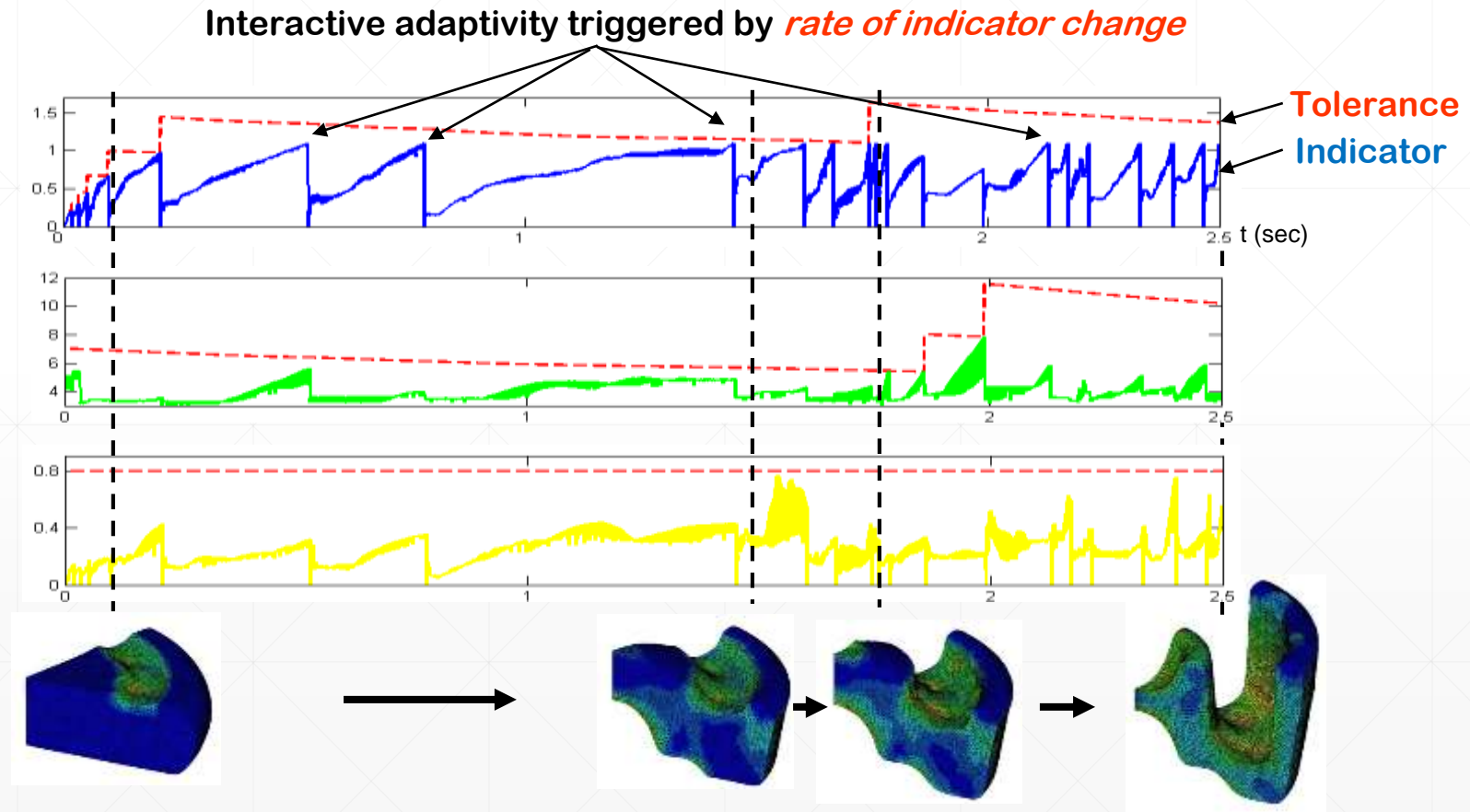
## Wheel forging

- Adaptive EFG with interactive control
- IAT=3
- IAT=1

Shear deformation  
IAT1

Unbalanced nodal  
Distribution  
IAT3

Volumetric change  
IAT2



- Gear forging
  - Adaptive EFG with interactive control
  - **IAT=3**
  - **IAAT=1**

