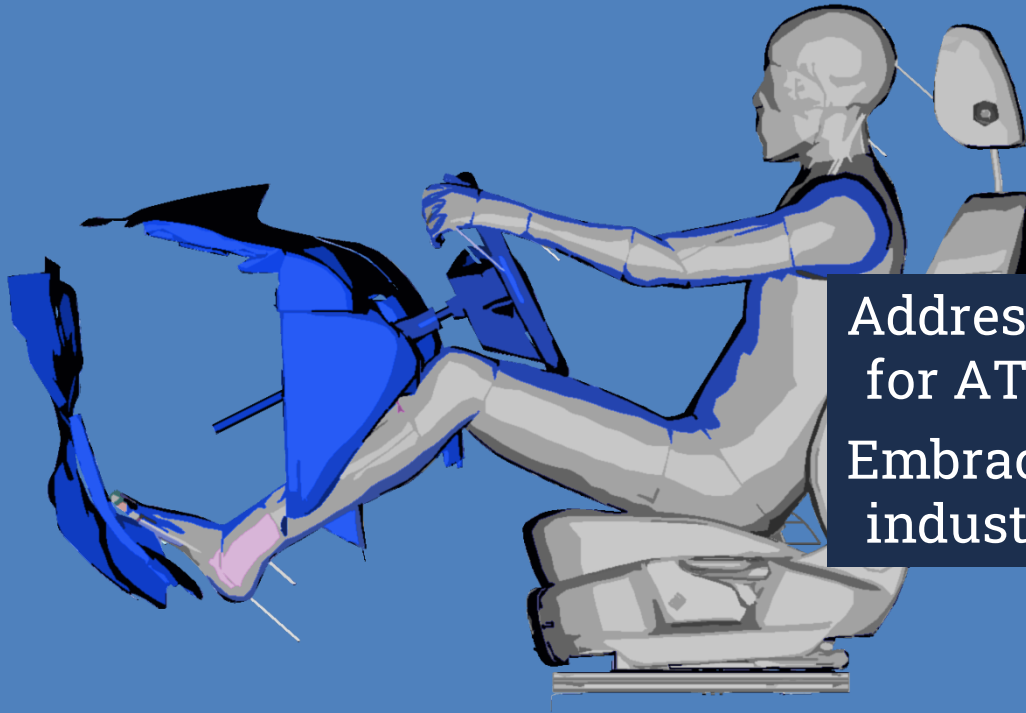


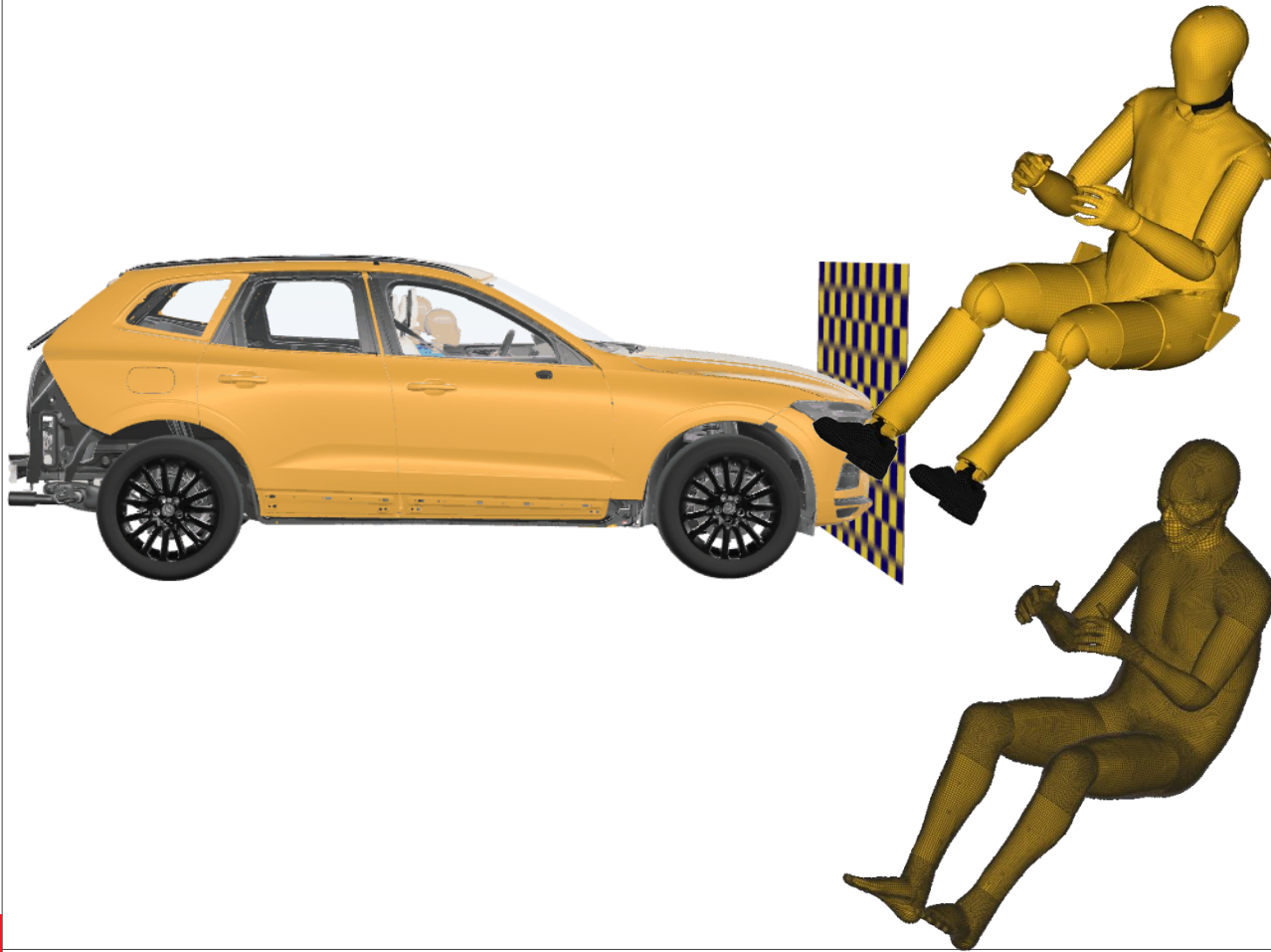


Groundbreaking
Simulation Solutions

physics on screen

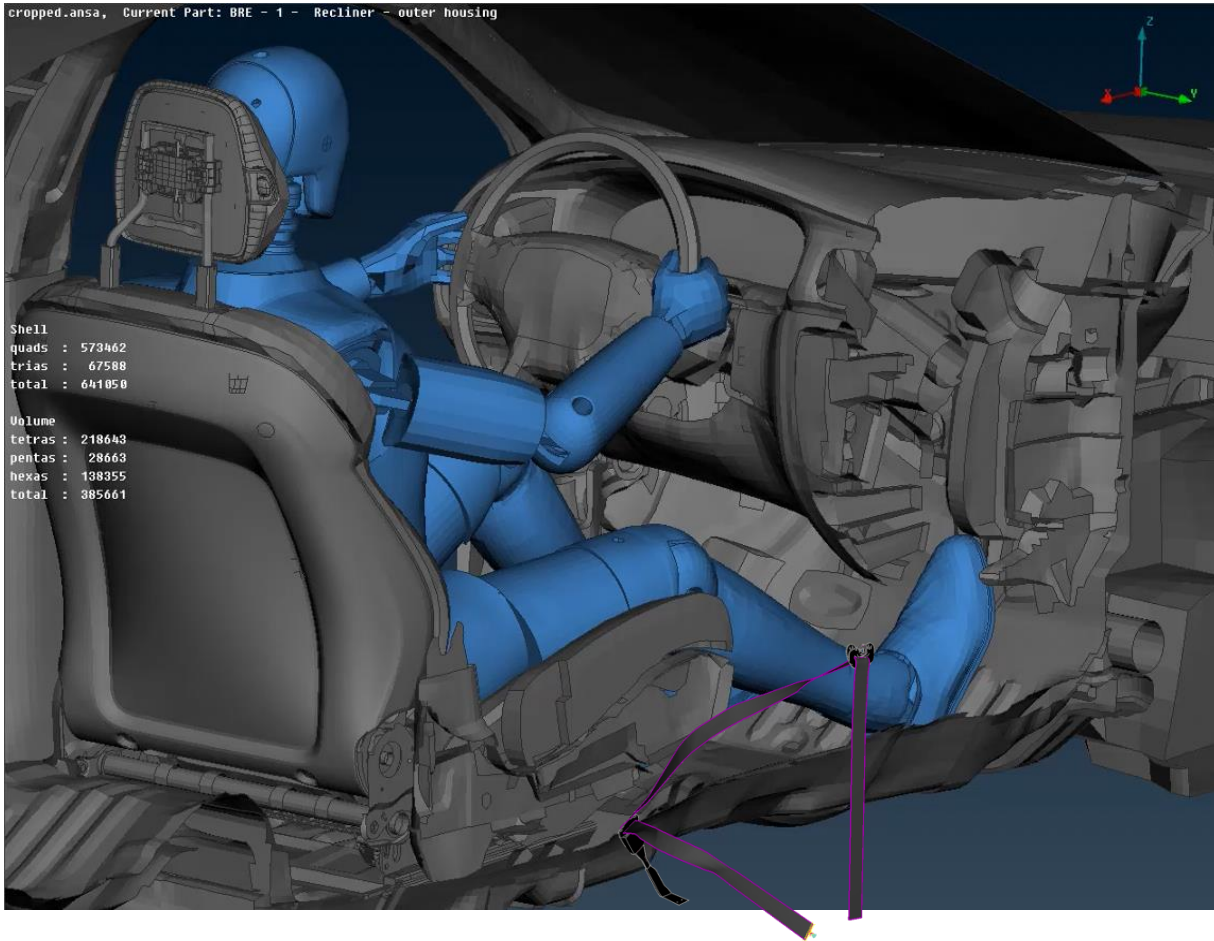


Addressing positioning challenges
for ATDs and HBMs:
Embracing the ANSA approach in
industrial safety applications



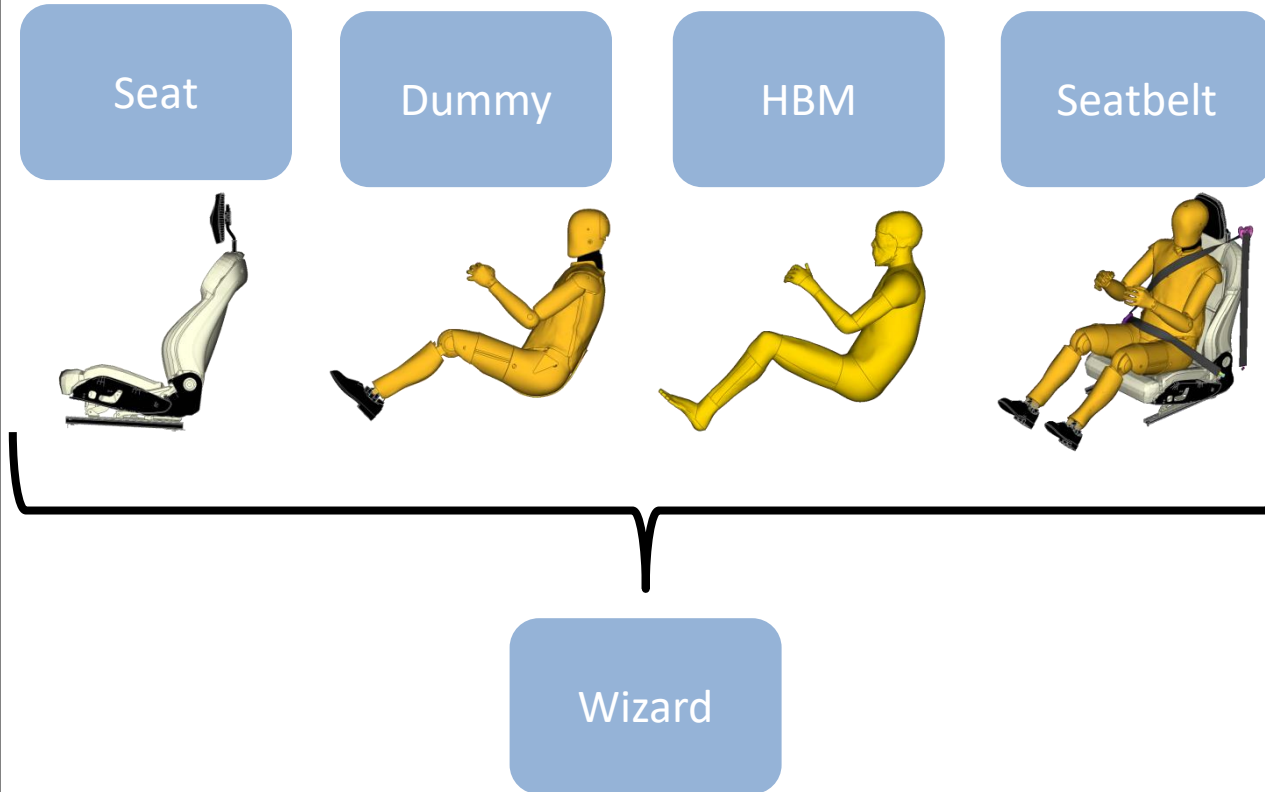
Introduction

- Crash-Safety analysis
- ATDs – Standard in Crash/Safety simulations
- HBMs gain popularity
- Challenges – Problems
- BETA solutions



Challenges

- Several steps
- Accuracy robustness
- Customization
- Solver alignment
- Automation
- Different loadcases



Process explanation

- Seat positioning
- Dummy positioning
- HBM positioning
- Restraining
- Automated process

Seat Positioning



	KINETICS	
<input type="checkbox"/>	KIN_BODY	53
<input type="checkbox"/>	KIN_CONFIG	10
<input type="checkbox"/>	KIN_JOINT	3
<input type="checkbox"/>	KIN_JOINT	10

IC	Id	Name	Number
No	1	Fixed_rail	
No	2	Ball_bearings	
No	3	Moving_Track	
No	4	Front_links	
No	5	Rear_Links	
No	6	Cushion	
No	7	Backrest	
No	8	Headrest_rod	
No	9	Headrest	
No	10	Ground	

KIN_BODY total 10 selected 0

LIM	IC	Id	Name
		1	Fixed_Conf1
Yes	No	2	Line from Fixed_rail to Mov...
No	No	3	Hinge from Moving_Track t...
No	No	4	Hinge from Moving_Track t...
No	No	5	Hinge from Front_links to C...
No	No	6	Hinge from Rear_Links to C...
No	No	7	Hinge from Cushion to Back...
		8	Fixed_Conf3
		9	Fixed_Conf4
Yes	No	10	Line from Headrest_rod to ...

KIN_JOINT total 10 selected 0



Id	Name
1	Mechanism_1
3	Mechanism_3(Backrest_Cushion)
4	Mechanism_4(headrest)

KIN_CONFIG total 3 selected 0

Seat kinetics

- Seat build in ANSA
- Seat in another pre-processor
- KIN_BODY, KIN_JOINT and KIN_CONFIG

Seat Positioning



```
Seat Positioning
Protocol
Select Protocol

95 *SET_NODE_LIST_GENERATE_TITLE
96 Transform_Set_of_Spring_SCU_rear
97 15670052
98 15055146 15055261 15055263 15055266 15055268 15055282 15055284 15055286
99 15055288 15055288 15055292 15055292 15055295 15055295 15055298 15055306
100 15055308 15055340 15055343 15055343 15055345 15055345 15055347 15055353
101 15055363 15055365 15055368 15055368 15055371 15055379 15055384 15055384
102 15055386 15055387 15055391 15055391 15055393 15055396 15055406 15055410
103 15055412 15055413 15055415 15055554 15055559 15055559 15055565 15055565
104 15055568 15055568 15055574 15055588 15055590 15055603 15055614 15055622
105 15055671 15055832 15055881 15055896 15055905 15056197
106 *NODE_TRANSFORM
107 1 15670040
108 *DEFINE_TRANSFORMATION_TITLE
109 Bearing
110 1
111 TRANSL -30.65815.0018697351.60476957
112 *NODE_TRANSFORM
113 2 15670041
114 *DEFINE_TRANSFORMATION_TITLE
115 Upper_Rail
116 2
117 TRANSL -61.315271.0007031613.21332162
118 ROTATE -.073725382.22574E-8-.997278583065.57053-343.49965610.9237680.00018348
119 *NODE_TRANSFORM
120 3 15670042
```

• the design position.

Next > Cancel

- Seat Positioning tool
- Know how of the protocols
- Custom movements
- Save positions
- Transformation keywords
- Seat remains intact

IDs handling

```
95 *SET_NODE_LIST_GENERATE_TITLE
96 Transform_Set_of_Spring_SCU_rear
97   15670052
98   15055146  15055261  15055263  15055266  15055268  15055282  15055284  15055286
99   15055288  15055288  15055292  15055292  15055295  15055295  15055298  15055306
100  15055308  15055340  15055343  15055343  15055345  15055345  15055347  15055353
101  15055363  15055365  15055368  15055368  15055371  15055379  15055384  15055384
102  15055386  15055387  15055391  15055391  15055393  15055396  15055406  15055410
103  15055412  15055413  15055415  15055554  15055559  15055559  15055565  15055565
104  15055568  15055568  15055574  15055588  15055590  15055603  15055614  15055622
105  15055671  15055832  15055881  15055896  15055905  15056197
106 *NODE_TRANSFORM
107   | 1 15670040
108 *DEFINE_TRANSFORMATION_TITLE
109 Bearing
110   | 1
111 TRANSL   -30.65815.0018697351.60476957
112 *NODE_TRANSFORM
113   | 2 15670041
114 *DEFINE_TRANSFORMATION_TITLE
115 Upper_Rail
116   | 2
117 TRANSL   -61.315271.0007031613.21332162
118 ROTATE   -.073725382.22574E-8-.997278583065.57053-343.49965610.9237680.00018348
119 *NODE_TRANSFORM
120   | 3 15670042
```

- New entities created
- ID ranges should be taken care

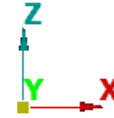
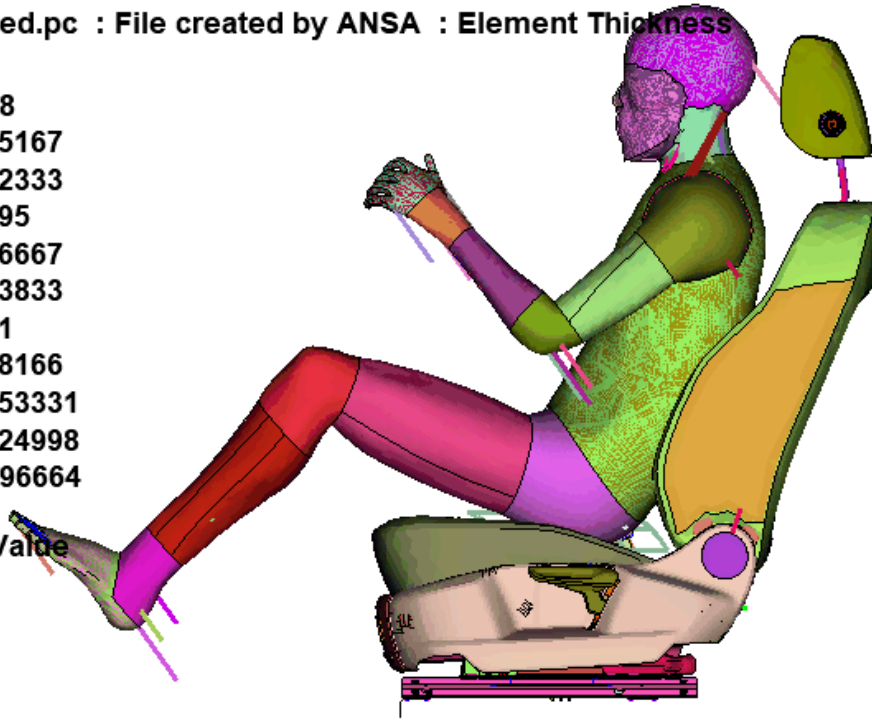
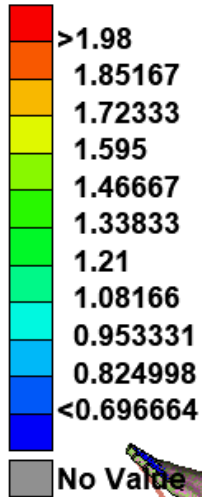
ATDs/HBMs Articulation

ATDs

```
525 *BOUNDARY_SPC_SET_ID
526     1
527     2300006           1           1           1           1           1           1
528 *MAT_CABLE_DISCRETE_BEAM_TITLE
529 Marionette Cable Material
530 101504808 0.0078 0.           0.001 9.E9 50.
531 *MAT_DAMPER_VISCOUS_TITLE
532 Marionette Damping Material
533 101504810 0.001
534 *INTERFACE_SPRINGBACK_LSDYNA
535 2300004 0 0 0 0 0 0
536 *DAMPING_GLOBAL
537 0 0.001 0. 0. 0. 0. 0. 0.
538 *SET_PART_ADD_TITLE
539 Dummy_Contact
540 2300002
541 1500002 1500003 1500004 1500005 1500006 1500007 1500008 1500009
542 1500010 1500011 1500012 1500013 1500014 1500015 1500016 1500017
543 1500018 1500019 1500020 1500021 1500022 1500029 1500030 1500031
544 1500032 1500033 1500034 1500035 1500036 1500037 1500038 1500040
545 1500041 1500042 1500043 1500044 1500045 1500046 1500047 1500048
546 1500049 1500050 1500051 1500061 1500062 1500063 1500064 1500065
547 1500066
548 *SET_PART_TITLE
549 Seat_Contact
550 2300003
551 12600 12604 12605 12621 12679 12749 12778 12786
552 12812 12837
553 *SET_PART_TITLE
554 InterfaceSpringback
555 2300004
556 12600 12604 12605 12621 12679 12812 12837 92710000
557 92710001 92710002 92710003 92710004 92710005 92710006 92710007 92710008
558 92710009 92710010 92710011 92710012 92710013 92710014 92710015 92710016
559 92710018 92710025 92710026 92710027 92710028 92710029 92710030 92710031
```

- Support all ATDs
- Dummy articulation
- Marionette setup
- SPCs on bodies
- Auxiliaries - Ids handling

0:Untitled.pc : File created by ANSA : Element Thickness



HBMs

- THUMS, GHBMC, VIVA+, SAFER
- HBM articulation tool
- Achieve the final position
- Additional cases (gravity)

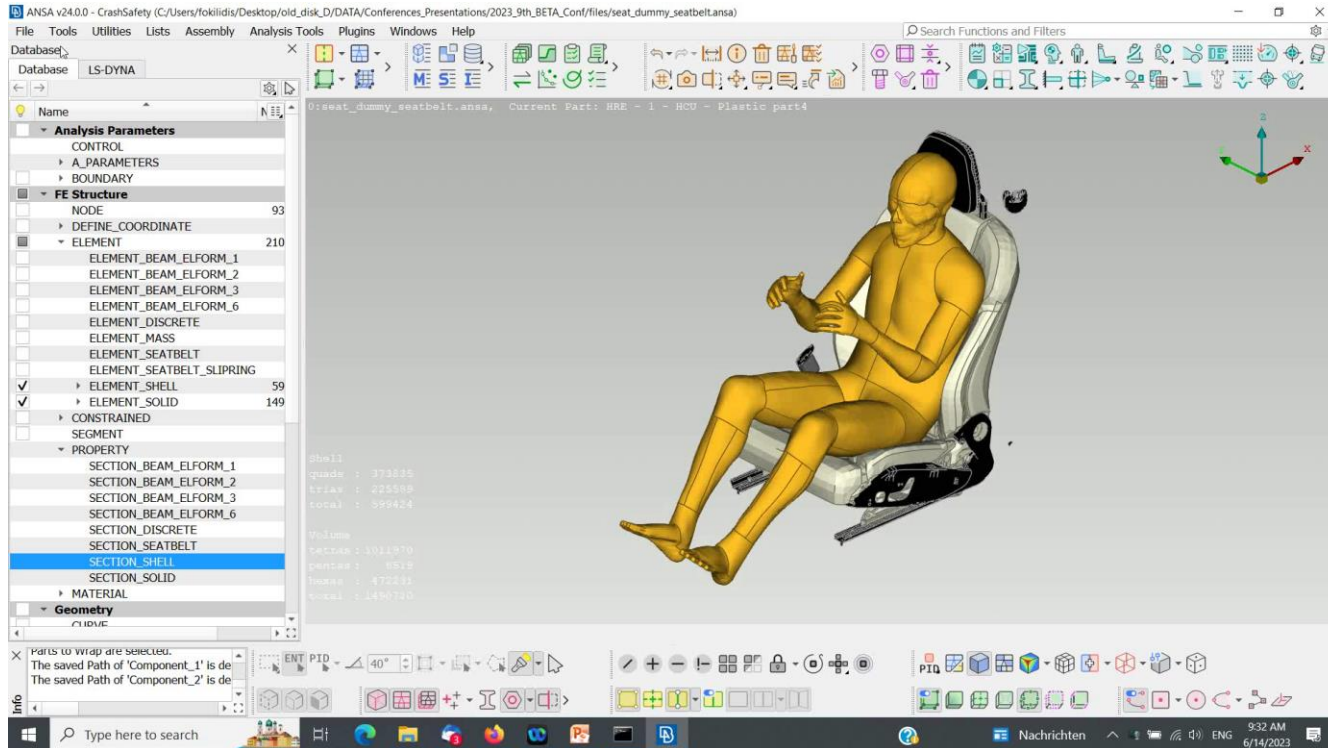
System Restraining



Seatbelt tool

- Template based creation
- All solver keywords
- 3D (geometric) sliprings
- Identical behavior in ATDs and HBMs

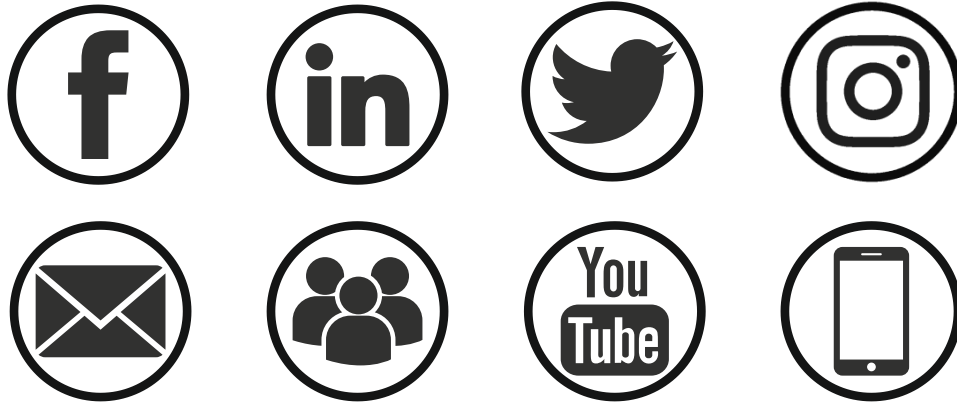
Seatbelt tool



Conclusions - Highlights

Conclusions

- All steps have been collected and streamlined under a wizard
- Ability to customize any sub process
- Identical handling of ATDs and HBMs
- Full alignment with the solver
- Automation – script based
- Minimize human interaction – avoid errors
- Next presentation (F. Cappellino) – Integration of the wizard



Stay connected