

Altair CONCEPT C123简要概述

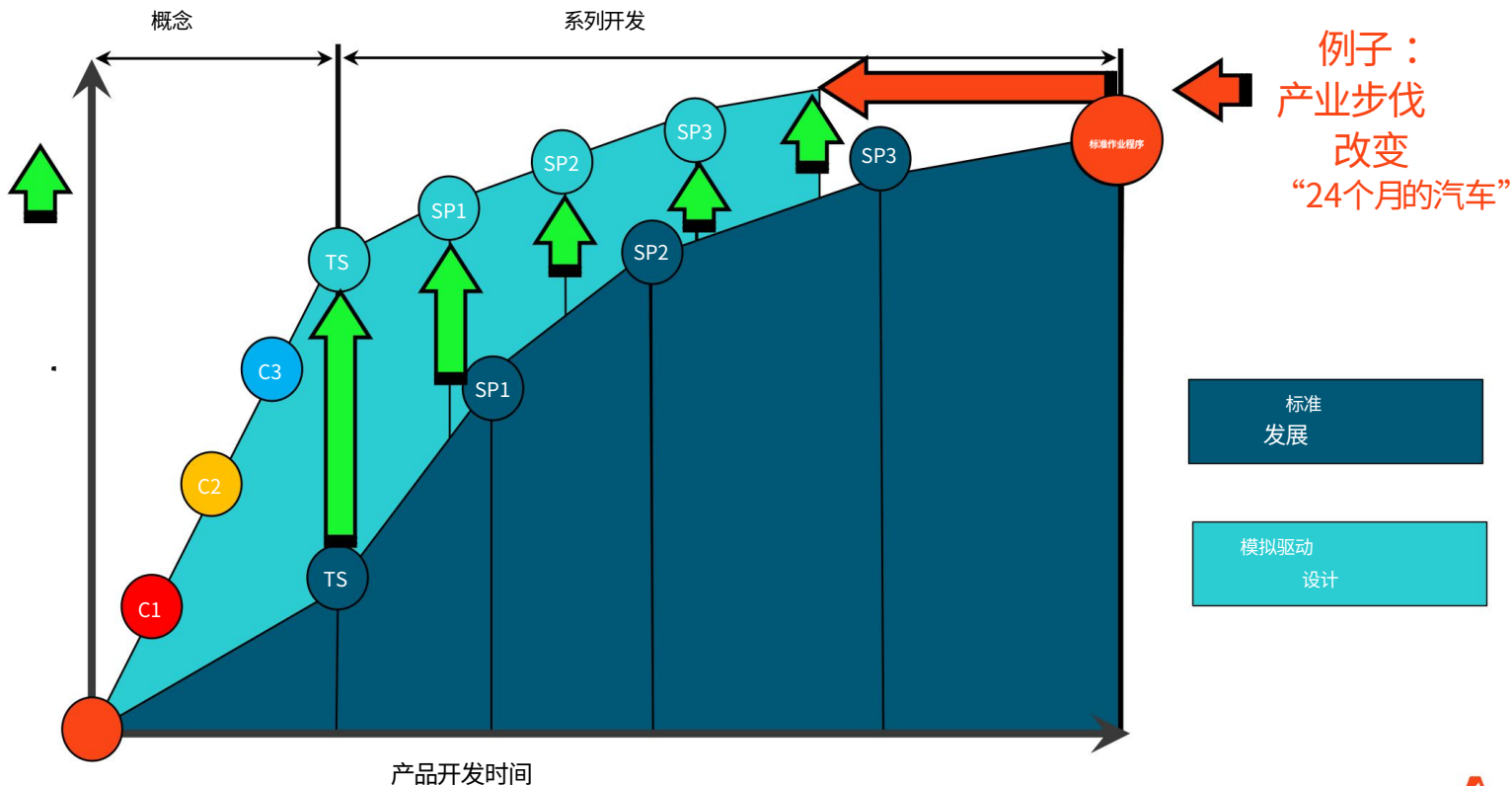
2024年1月

发展观念

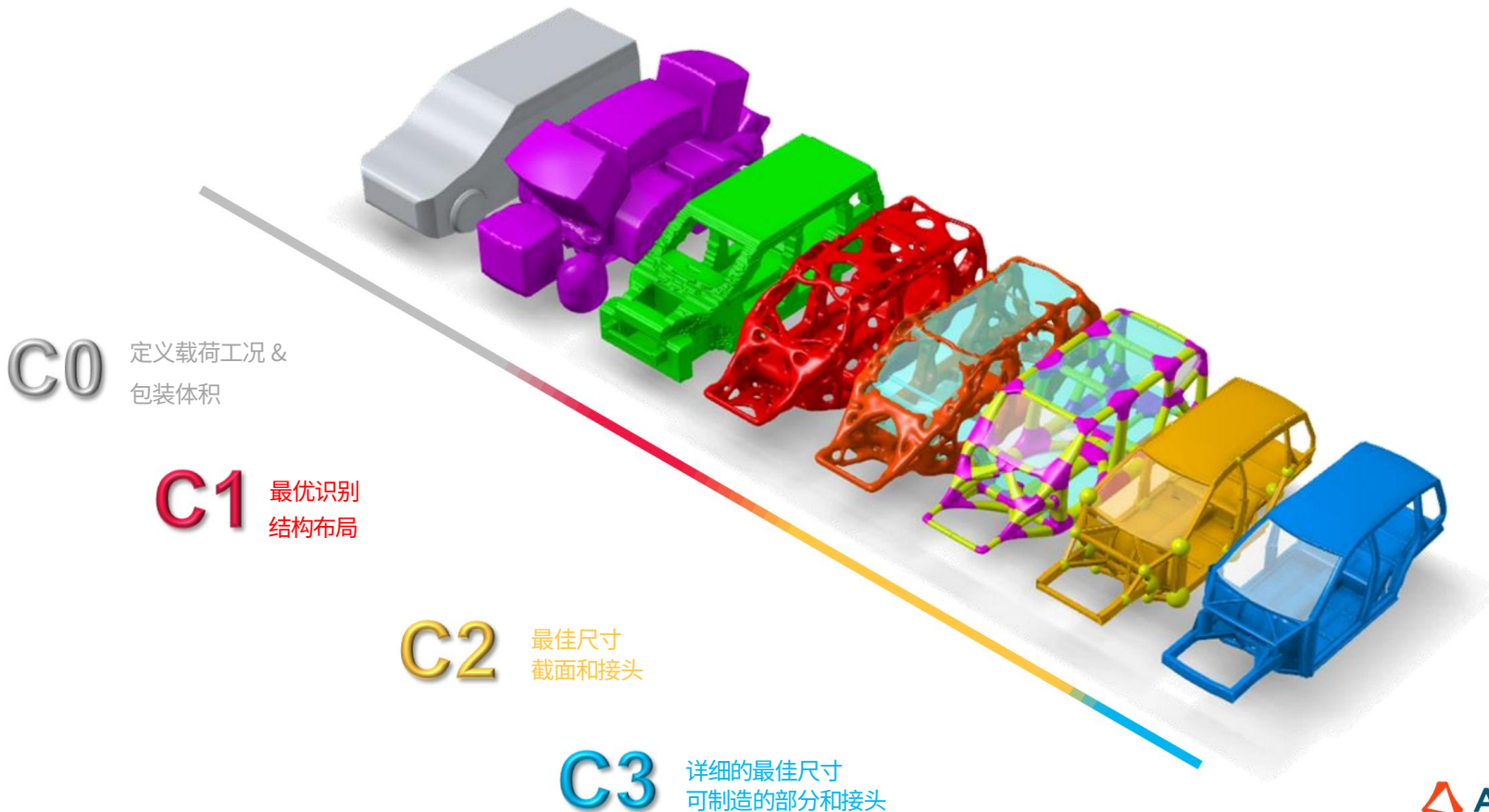
Altair Concept123概念流程历经十年
(约 2010 年)开发 - 实时流程
MODVIZ、求解器、AI 集成的绝佳示例
快速设计探索 - 套装游戏 - 创新发电机 - 颠覆性
优化驱动和固有的稳健性、系统评估
目标设定/质量/权衡/级联速度促进并发工作消除属性孤
岛

白车身设计流程示意图

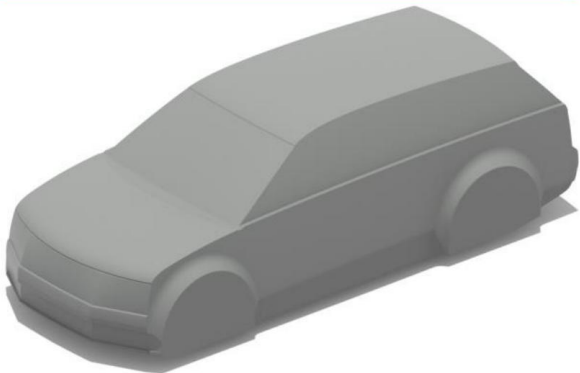
提供关键业务优势 – 显着缩短开发时间并提高成熟度



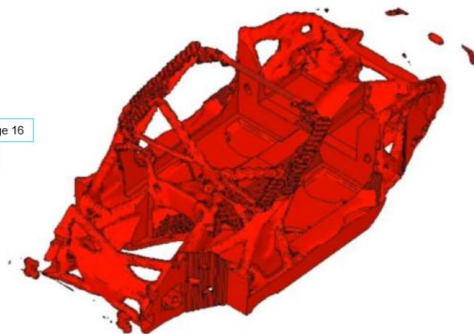
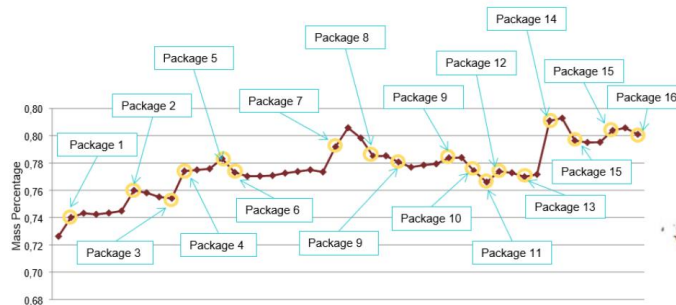
C123车辆概念开发流程



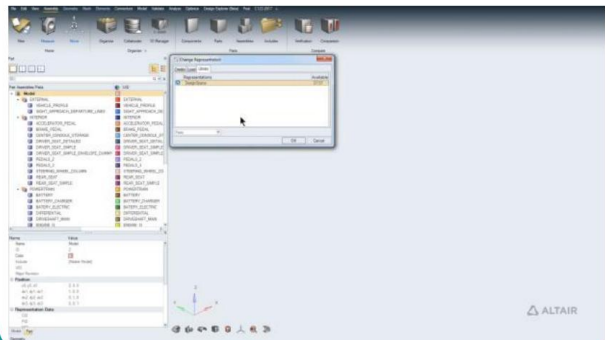
C1 最优识别 结构布局



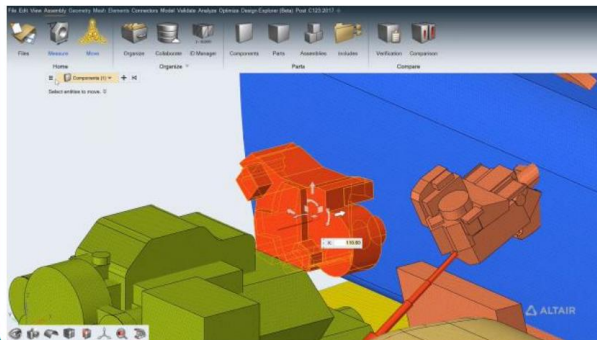
封装空间探索



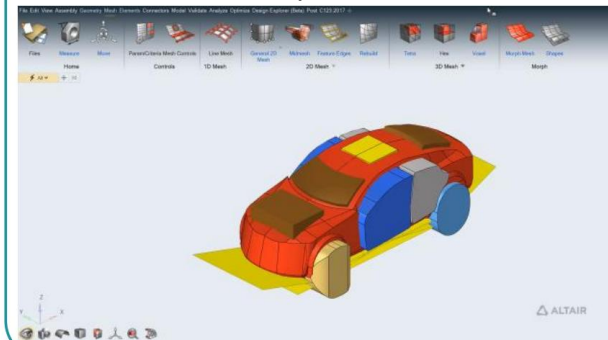
设计空间库



包空间操作

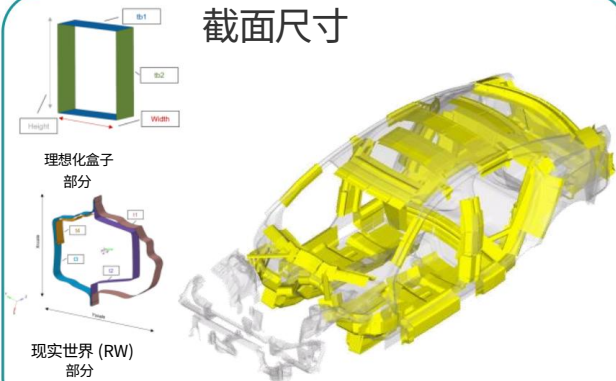


快速设计空间生成/编辑

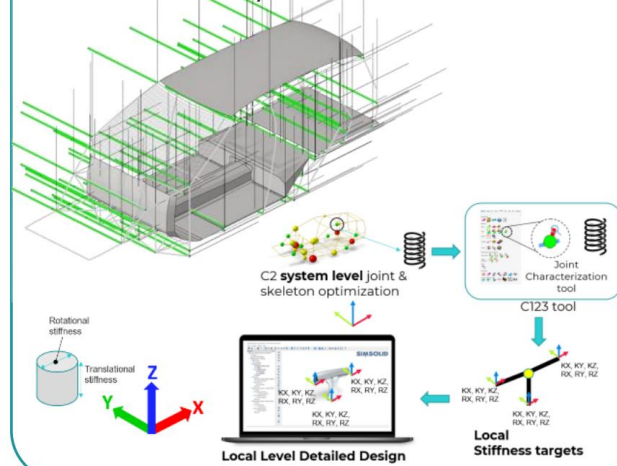


C2 截面的最佳尺寸 & 关节

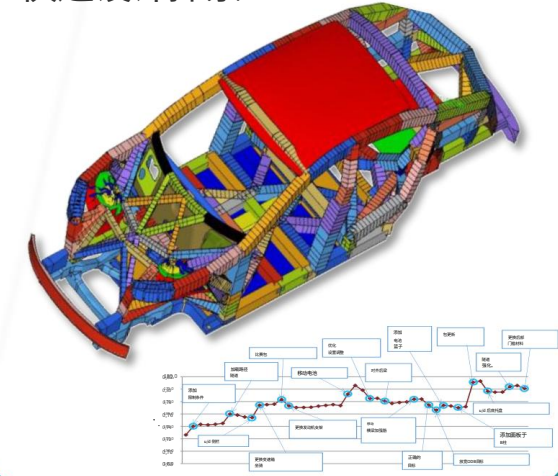
截面尺寸



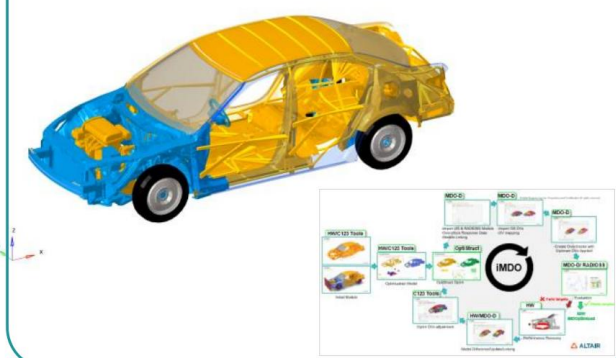
加入尺寸/设计



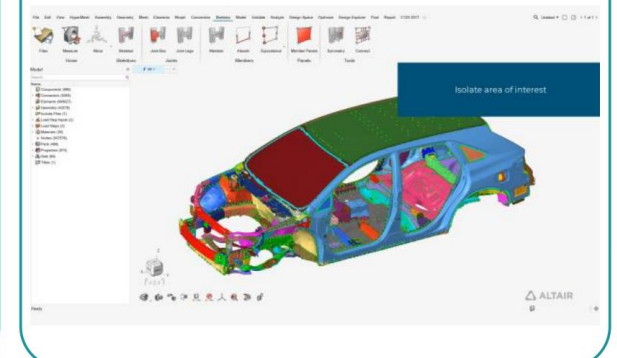
快速设计探索



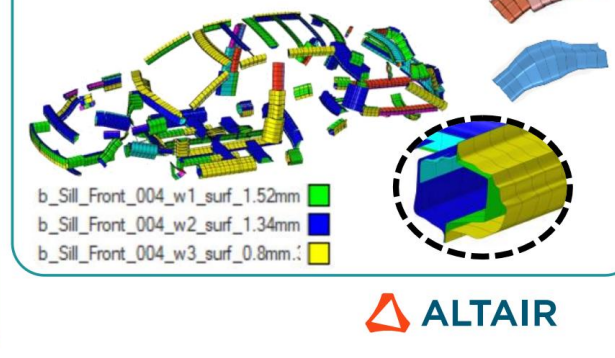
快速崩溃检查



快速简单的模型构建



设计师握手



C3 详细的最佳尺寸 可制造的部分和接头

产业化精细化

连接技术、连接位置优化、枪
可访问性检查...

Bill of Process

Tool makes joining decisions in line with manufacturing process chronology

Bill of Materials

BoM used to aid joining selection & pitch decisions

Geometric Checks

Detailed assessment of proposed joint location suitability conducted

Manufacturing Rules

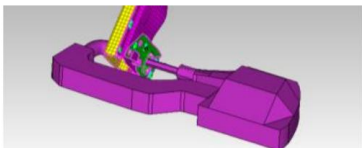
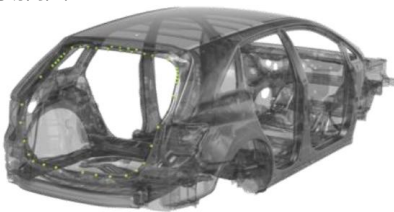
Key manufacturing constraints regarding joinability of certain materials considered

Gun Clash Detection

Tool checks that a twistRISW gun can reach the proposed site

Meshed Model

Geometry extracted from meshed model



层层叠放



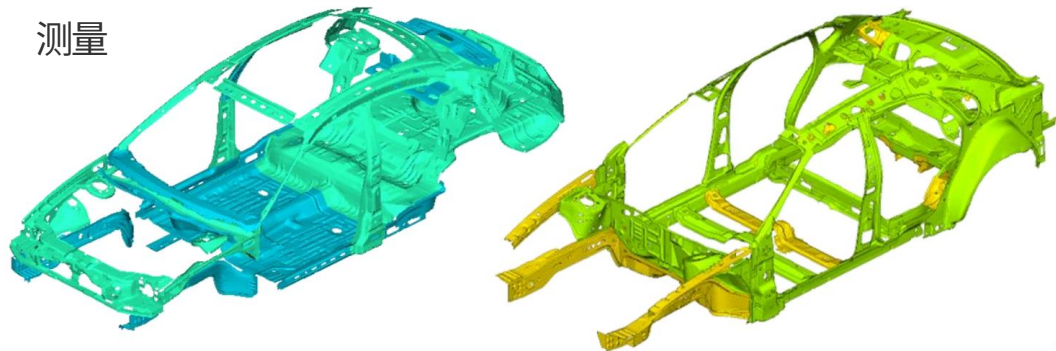
1. If the outer layers have different thicknesses, check that:

$$\frac{\text{maximum outer layer thickness}}{\text{minimum outer layer thickness}} < \text{maximum allowed ratio}$$

2. If the outer layers have the same thickness, check that:

$$\frac{\max(\text{inner layer thickness, outer layer thickness})}{\min(\text{inner layer thickness, outer layer thickness})} < \text{maximum allowed ratio}$$

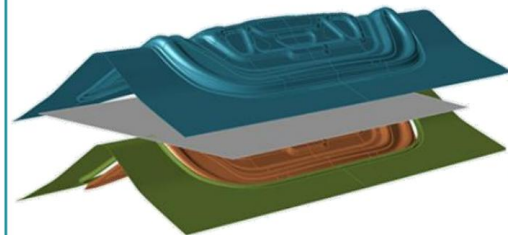
测量



价值工程

欧元

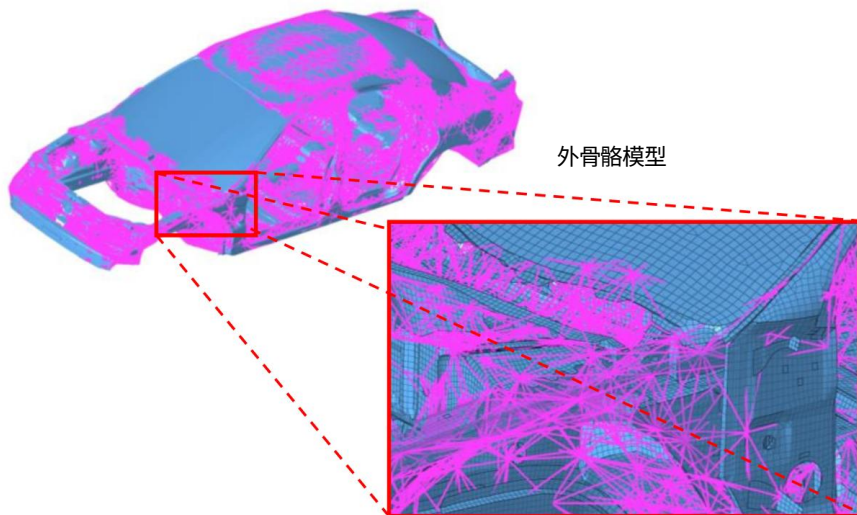
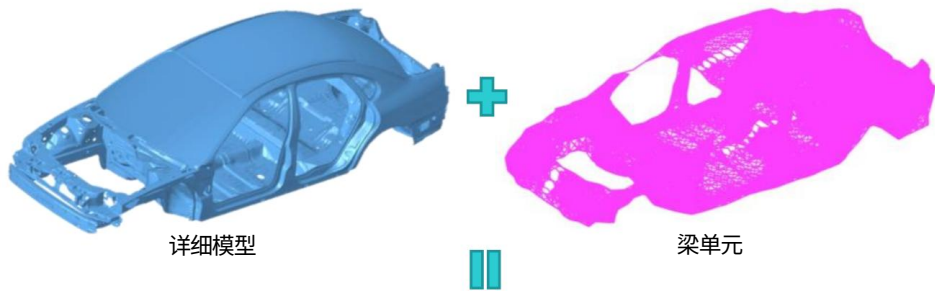
制造性



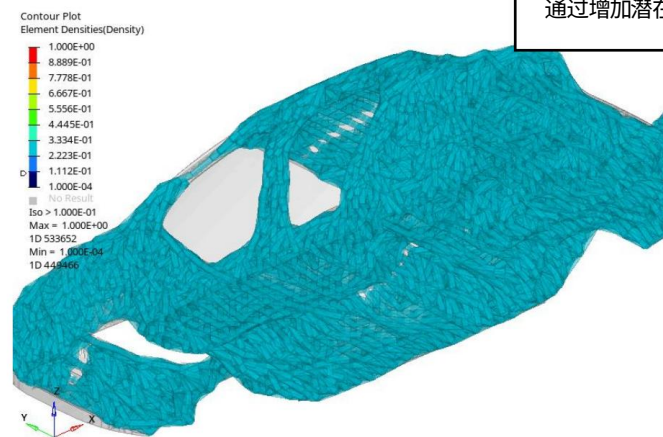
仪表工况灵敏度

INDEX	描述	BOF10 内部	BOF10 外部	BOF10 顶部	BOF10 底部	ENER20 顶部	ENER20 底部	ENER20 外部	ENER20 内部
1	PSHELL_317 顶	顶							
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100	PSHELL_317 底				顶				

外骨骼 概念生成和改进



- 能够创建一些额外的潜在负载路径
- 可用于现有网格（连接接触）
- 帮助解决非直观问题,例如全局模式
- 快速确定用户在解决问题时应集中注意力的地方



通过增加潜在面积提高性能

外骨骼结果



C0:设计空间

Rapid & systematic loadcase generation and post-processing



Real-time Design Spaces as **variable** changes

ALTAIR

C1:布局



Identification of Optimum Structural **Layout**

ALTAIR

C1:协作



Collaborative Design:
Organic, Clean topology
Interpretations using
Inspire PolyNurbs

ALTAIR

C1/C2:电池集成



Determine optimal attachment point locations

ALTAIR

C2:设计方向



Automated **Right-fidelity** FEM creation using **Auto-Skeleton**

10-20 times faster crash analysis

ALTAIR

C2:截面优化

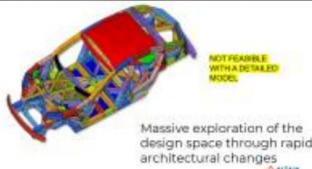
OPTIMIZE THE DESIGN USING OEM SECTION BOOK



Parameterization
Real section

ALTAIR

C2:大规模探索



NOT FEASIBLE WITH A DETAILED MODEL

Massive exploration of the design space through rapid architectural changes

ALTAIR

C2:目标

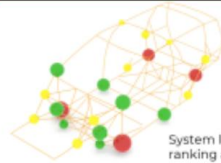
↓ Reduce risk & cost

Mature Target Setting



ALTAIR

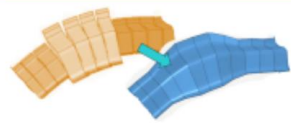
C2:关节



System level Joint ranking and designing

ALTAIR

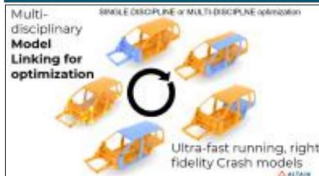
C2/C3:设计师握手



Real world section optimization, export to CAD, CAE/CAD Easy exchange

ALTAIR

C2/C3:多域作战



Multi-disciplinary **Model Linking** for optimization

SHARED DESCRIPTION OF MULTI-DISCIPLINE OPTIMIZATION

Ultra-fast running, right-fidelity Crash models

ALTAIR

C3:详细



Detailed Optimum Sizing of Manufacturable Sections & Joints

ALTAIR

C1/C2/C3:质量



Track your **mass** using Mass cubes

ALTAIR

C2/C3:诊断

Uncover **weaknesses** using **Exoskeleton Diagnostics**



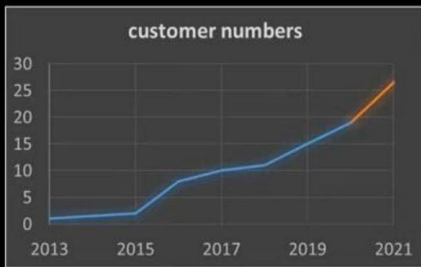
ALTAIR



最近的处决
不同的支持模式
知识转移、培训软件和方法

Customers

C1
C2
C3



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Hyundai



Zoox



NEVS



Daimler



FCA



Aston Martin



Ford



Ferrari



Dyson



JLR



CEVT



BMW



NIO



Renault



PSA



Benteler



CSR
sifang



Changan
Auto



Guangzhou
Auto

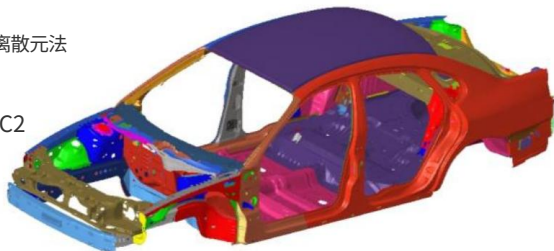


Beijing
Auto



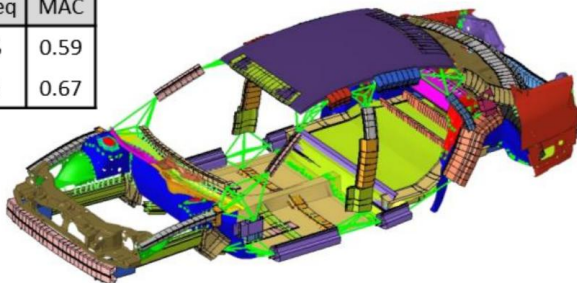
详细模型与 C2 模型 – 准确性和 CPU 时间

离散元法
C2

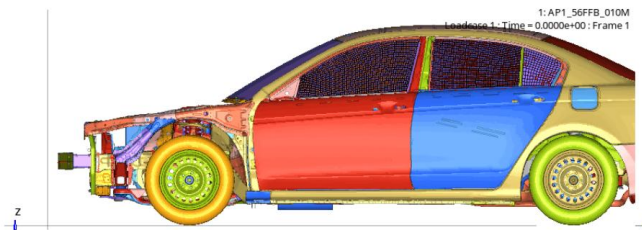


离散元法

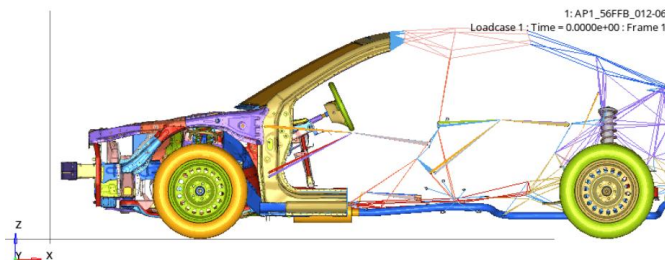
#	Delta Freq	MAC
Torsion	-2.60%	0.59
Bending	0.90%	0.67



C2



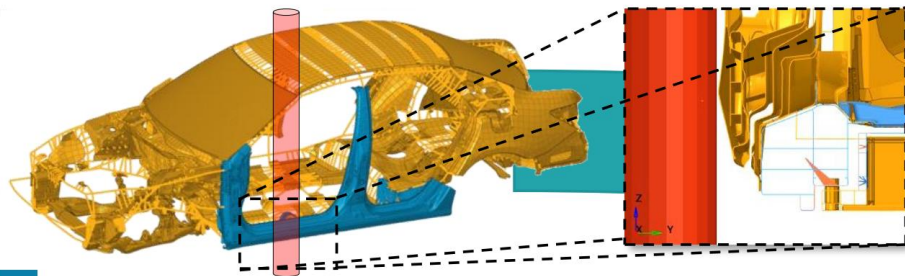
详细型号



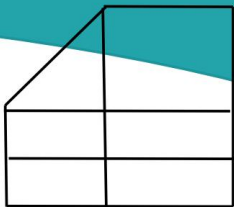
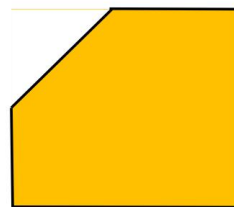
“正确保真”模型

	高保真度 (DFEM)	低保真度 (C2)
模态分析	30分钟	1分钟
56kph 力反馈碰撞	7小时 (32CPU)	30分钟 (32CPU)

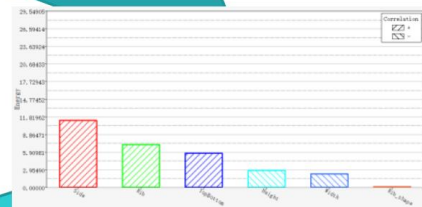
摇杆应用 - C2 + Radopt + AI



C2/C3混合模型
导出的窗台概念
侧杆碰撞



拉普特

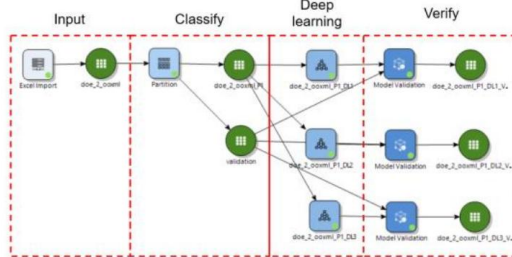


C2+溶解氧

Active	Label	Variable	Type	Resource	Subset Input File	Subset Execution Script	Subset Input Arguments
Parameterized File (1)		Parameterized File: D:_2017088_base_2000.gp	2D/3D Base_2000.tad	BA2000S			MSigmply -sp -w R
Knowledge Model (1)		Knowledge Model: C:_Cradwin_optimize_2_0000.tad	Opt. Input Script				MSigmply -resamp -w R
Knowledge Model (2)		Knowledge Model: C:_Cradwin_optimize_2_0001.tad	Opt. Input Script				MSigmply -resamp -w R
Knowledge Model (3)		Knowledge Model: C:_Cradwin_optimize_2_0002.tad	Opt. Input Script				MSigmply -resamp -w R



HST+知识工作室
摇杆减少 19% 的质量



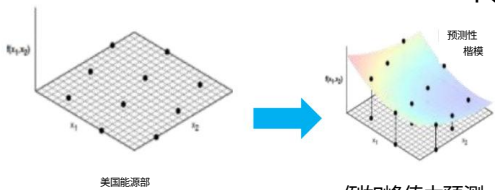
知识工作室 深度学习

机器学习

碰撞行为聚类自动识别

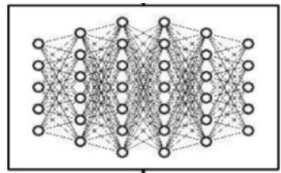
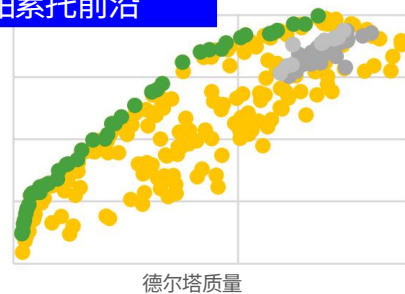


传统的基于响应面的优化

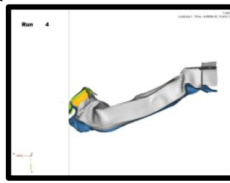
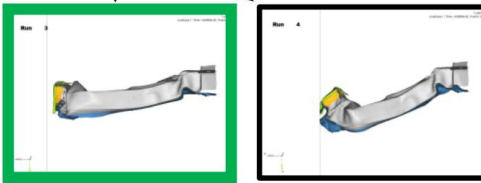
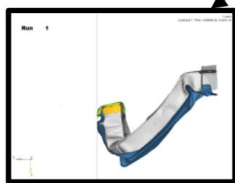
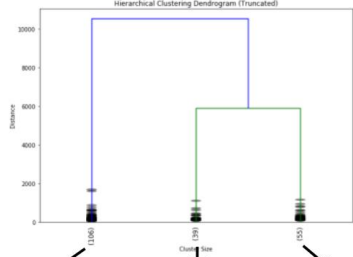


多目标优化峰值力与质量

帕累托前沿



机器学习
行为集群



具有 ML 约束的优化

多目标优化峰值力与质量

添加所需变形形状 (ML) 的约束

法拉利

2014年



Automotive News

HOME CARS & CONCEPTS NEWS BY BRAND DEALERS OEM/SUPPLIERS OPINION VIDEO DATA CENTER WEBINARS EVENTS JOBS

Ferrari, Altair Product Design team up for next-gen vehicle platform

July 27, 2014 @ 2:52 pm
Jack Walsworth

Ferrari is teaming up with longtime design, engineering and software partner Altair Product Design to create the company's next-generation vehicle platform.

The new platform will be the basis for several new flagship vehicle derivatives, Altair said today, noting that it has worked with Ferrari for more than a decade.

The next-generation platform is 15 percent lighter, while enhancing crash, noise, vibration and harshness and other performance attributes by more than 20 percent, Altair said.

Altair designers and engineers worked at Ferrari's vehicle development center in Italy alongside Ferrari's design, engineering and manufacturing teams to create the platform.

Royston Jones, Altair Product Design's global chief technology officer, said the platform's "massive deployment of structural optimization" and "optimum material layout" will result in "outstanding weight/performance characteristics."

You can reach Jack Walsworth at jwalsworth@eraim.com - Follow Jack on Twitter: <https://www.twitter.com/jackwalsworth>



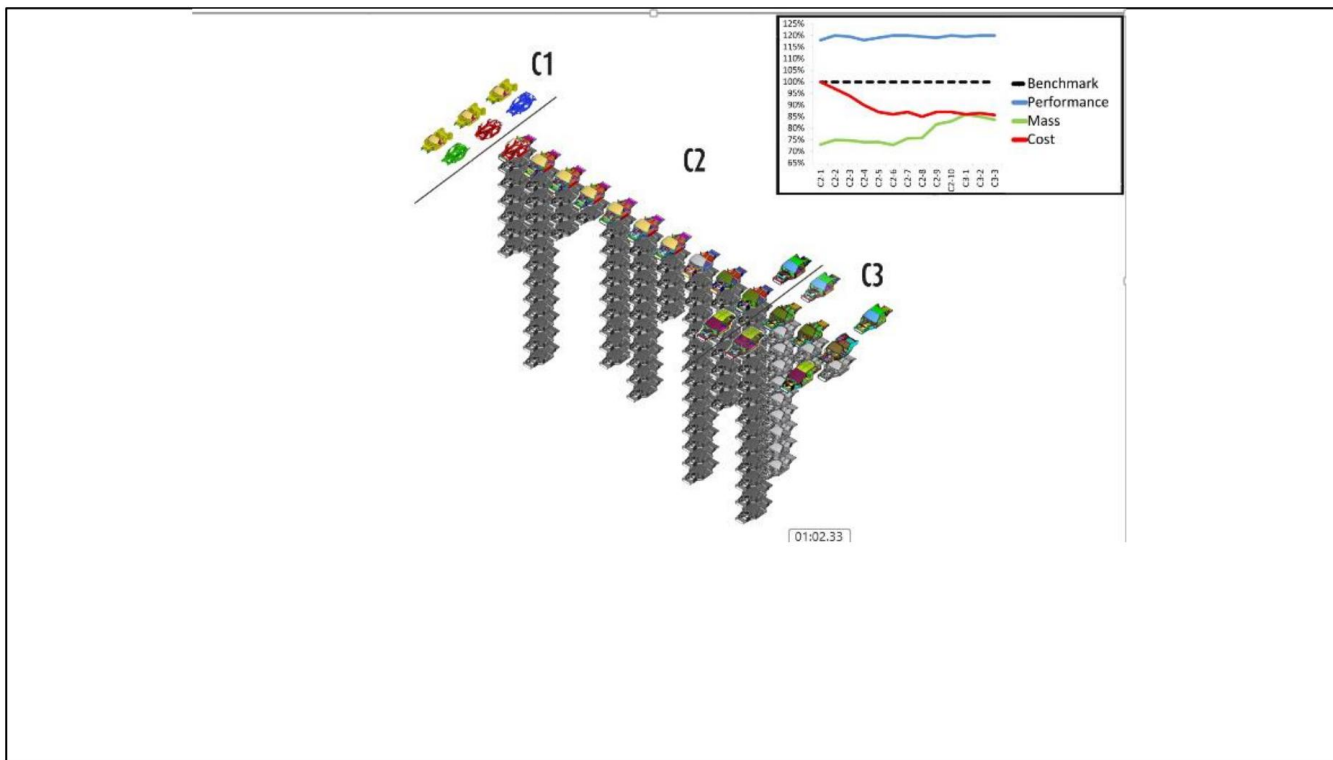
马克西米利安·斯瓦吉
法拉利创新总监

在 2014 年欧洲 ATC
上谈论 Altair 实施 C123 优化
流程。

“下一代”平台是一项重大工程成就,也是我们与 Altair 成功合作的象征。

法拉利 Portofino 的全新底盘比它所取代的 California T 显着减轻了重量。随着新包装的变化,所部署的C123优化流程的速度能够控制重量,同时实现苛刻的结构目标。

C123 – 虚拟开发车库 – 示例（法拉利）

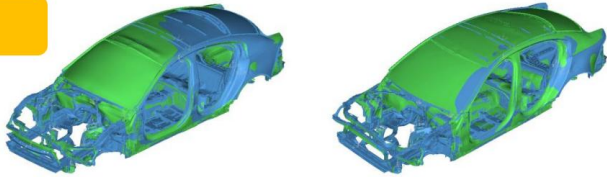




2019年

NVH

模式



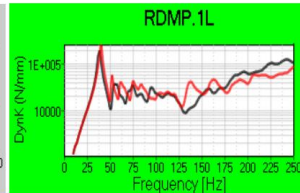
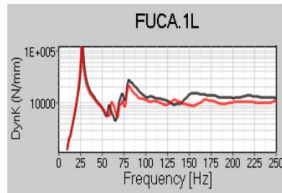
■ 离散元法

■ C2

#	Delta Freq	MAC
Torsion	-2.60%	0.59
Bending	0.90%	0.67

动态刚度

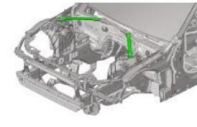
— DFEM_Baseline
— C2_Baseline



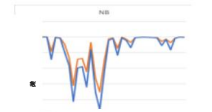
ESS

HP	Delta
FLCA.1L x	6.7%
FLCA.1L y	-8.6%
FLCA.1L z	-3.6%
FUCA.1L x	-7.8%
FUCA.1L y	-3.2%
FUCA.1L z	-10.5%
FDAMP.1L x	5.3%
FDAMP.1L y	-4.2%
FDAMP.1L z	-13.6%
FARB.1L x	-13.5%
FARB.1L y	-12.6%
FARB.1L z	-5.3%
RSUB.1L x	18.8%
RSUB.1L y	1.4%
RSUB.1L z	-8.5%
ENG.1L x	10.1%
ENG.1L y	-7.8%
ENG.1L z	-1.1%
RDAMP.1L x	3.8%
RDAMP.1L y	-7.9%
RDAMP.1L z	-10.9%

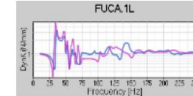
设计方向检查 - 性能损失



移除 V 形大括号



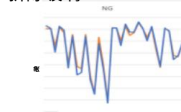
硬点



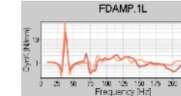
— (DFEM)/(DFEM_NB)
— (C2)/(C2_NB)



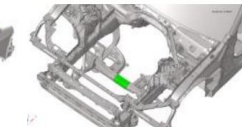
拆除玻璃



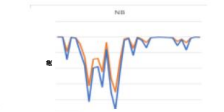
硬点



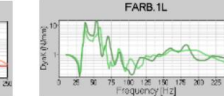
— (DFEM)/(DFEM_NG)
— (C2)/(C2_NG)



删除X成员



硬点



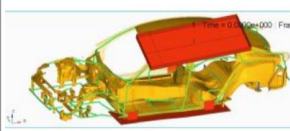
— (DFEM)/(DFEM_NXM)
— (C2)/(C2_NXM)

碰撞

屋顶挤压



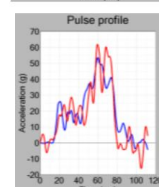
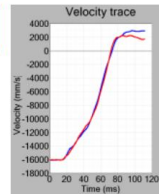
— Detailed model
— C2 model



56公里/小时力反馈

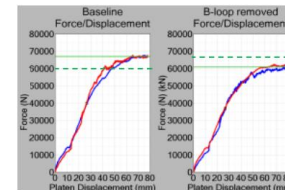


— Detailed model
— C2 model



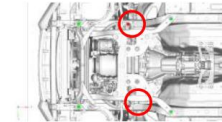
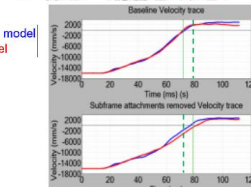
设计方向检查 - 性能损失

屋顶挤压

消除
B环

— Detailed model
— C2 model

56公里/小时力反馈

删除 6 个中的 2 个
副车架
附件

概括

- C1可以根据特定工况生成白车身载荷路径
- C2 模型可以**加速**线性 and 挤压模型的优化过程（线性、挤压模型为 30 分钟 -> 1 分钟）
7 小时 -> 0.5 小时（崩溃）
- DOE 中的 C2 模型可以**节省大量 CPU 时间**,特别是对于 AI 应用程序 – 需要大量数据!
- C2 模型更容易对**截面进行参数化**和优化
- C2 模型是用于组件优化的**全局工况**的良好边界条件,例如twistbox、shocktower 等
- C2 Linear 模型使用**Optistruct**, Crash 模型使用**Radioss**作为求解器
- 外骨骼是一种快速识别需要加固**区域**的智能方法

谢谢

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