CATIA Reverse Engineering

3DEXP-R2020x
3DEXPERIENCE Design
What’s New | R2020x

Creative Designers

CREATIVE DESIGN from art to part

IMMERSIVE DESIGN
CATIA NATURAL SKETCH VR

xGENERATIVE DESIGN

HUMAN DESIGN - VR INCARNATION

Surface Designers

SURFACE REFINEMENT
Perfection in Surface Quality

ICEM DESIGN eXPERIENCE

CATIA Ichem

REVERSE ENGINEERING

Decision makers

PRODUCT EXPERIENCE
To make the right decision

PRODUCT EXPERIENCE PRESENTER
VR & COLLABORATION ENABLED

VISUAL EXPERIENCE DESIGNER
AI DEEP LEARNING RENDERING

VISUAL EXPERIENCE CONTENT COLLECTION
INDUSTRY FOCUS

Highlights
**CATIA Design**
Digital Continuum

**Ideation**
Creativity

**Concept**
Concept modeling

**Refinement**
Detail modeling

**Design Validation**
Visualization & Experience

- **Better design** | More design explorations
- **Keep the design intent** | Improve team collaboration
- **Accelerate Design & Reduce cost** | Less Phys Prototypes / Avoid late mistakes / Transition time & work
Geometry continuum challenge*

IDEATION / THEME convergence

2D rendering | pics
Character lines / sections | curves (nurbs)
Shapes | surfaces (nurbs / subdivision) | scan (stl)

STYLE INDUS / A-class

Class A surfaces | surfaces (bezier / nurbs)
Character lines / Master sections | curves (bezier/nurbs)

PRODUCTION parts / B-class

BiW parts
Chassis part | solids (bodies/volumes)
...

* excluding color & trim | materials & textures
Geometry transitions needs
Technology … and User eXperience

- subdivision surfaces
- scanned data
- nurbs
- beziers

Class A modeling
Class A modeling
Prototyping / Rendering
Prototyping / rendering

Re-style
Re-style

Greyzone

Class B modeling
Class B modeling

Prototyping

Re-style
Virtual & Physical Prototyper
Hybrid Design with Physical Prototype

Hybrid Design Acceleration from Real to Virtual
Virtual & Physical Prototyper

To Increase **productivity** - Enlarge **reconstruction scope** - favor process **predictibility**

Automate as much as we can the Mesh to Surface process

[ Mesh Analysis - Curve Network - Surface Network ]

But keep it **under control** at any time
Scan to exact geometry
Existing Reverse Engineering solutions

MANUAL

Surface based workflow
Scan data
Segmentation
Basic shape/feature recognition
Trimmed surface
Fillets

Curve based Workflow
Scan data
Patchwork lines
Surface generation

AUTOMATIC

Free-form (artistic & organic)
Scan data
Surface generation
New commands for a new “accelerated” workflow

Contrast Map new command to quickly understand shapes

Fictive Edge new command for character line (theoretical edge)

Mesh Shape Analysis accuracy (brush) for Accurate Segmentation
Virtual & Physical Prototyper [Role]
Reverse Engineering Productivity & competitiveness

**Preparation**  APP: ‘Digital Shape preparation’
- **Mesh Preparation**: External envelop Repair
- **Import command**: Large Cloud Import now possible (billions of points)

**Reconstruction**  APP: ‘Digital Shape To Surface’
- **Curve Network Preparation** scope enriched
- **Curve Network** new user interface and enriched workflow

**IP Control**
- **Product Filtering** now based on point(s) of view and nurturing up to geometry faces granularity
Scan processing improvements

Mesh Preparation new options

• External envelop repair: applies to a close mesh, get rid of all internal details and pathologies (intersections, overlaps, …)
• Button Holes: stitching gaps between domains/parts

Import scalability increased

• Enabling fluid 3D navigation and import of very large cloud (billions of points)
• Activate to extract a subset to focus on.
Managing large clouds

**Import scalability increased**
- Enabling fluid 3D navigation and import of very large cloud (billions of points)
- Activate to extract a subset to focus on.

**Automatic 3DPrimitive recognition workflow**
- Accelerates the reconstruction
- Recognize and create Planes (coming next: cylinders torus, others)
- Very flexible and easy to use (thanks to Preview and Validation)
Curve Network Preparation workflow is enriched

- Integration of Fictive (theoretical) edge command
- Unified workflow to create and modify the various curves.
- All curves can now be extended UP TO curves or planes
- Fictive edge command can be extrapolated
- Consistency of Connect curves between fictive edges
Curve Network Preparation enriched
Finding fictive vertex with UP TO capability
Curve Network new workflow

Allow selection of Fictive edges and/or Border lines

Priority management when processing the curves :
• Default: Face border > User Frozen > Fictive edge > curve
• Can be user defined too

New option to merge consecutive curves (for polishing)

Productivity improvement:
• Display Sharp/Smooth status
• If creation fails, provide guidance and locate the error
Frozen by user picking
Can be frozen
### Customer case KPIs | half car exterior

#### R2019X-FD01

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<th>duration</th>
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<tr>
<td>Fictive edges</td>
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<tr>
<td>Connect fictive edges + Gaps</td>
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<td>Boundaries</td>
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*Note: With decimated mesh*

#### R2020x / R2019x-FD05

<table>
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<tr>
<td><strong>Total:</strong></td>
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*Note 1: With 4 millions triangles mesh*

*Note 2: Optimized mode recommended for better performances in graphical actions*
Major improvements for Product Filtering

New feature allow to **filter from Vizualisation** criteria:

- With various accuracy (low/medium/high/very high)
- Part, feature, or even *geometry* granularity

Very productive ignition for:
- 3D Printing data preparation
- CFD Simulation data preparation
Thank you!!