

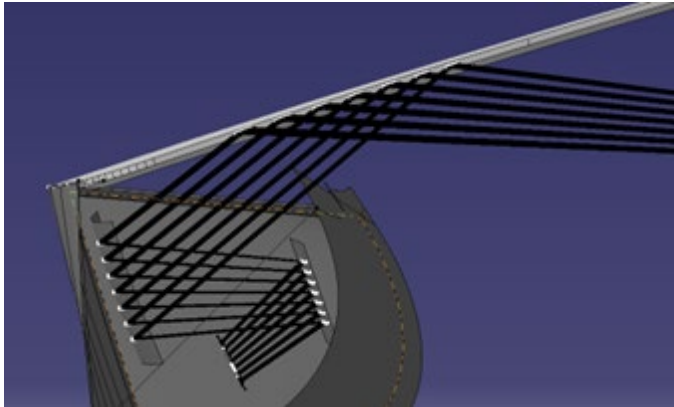
Head-Up Display Simulation

Using CODE V and LucidShape CAA V5 Based

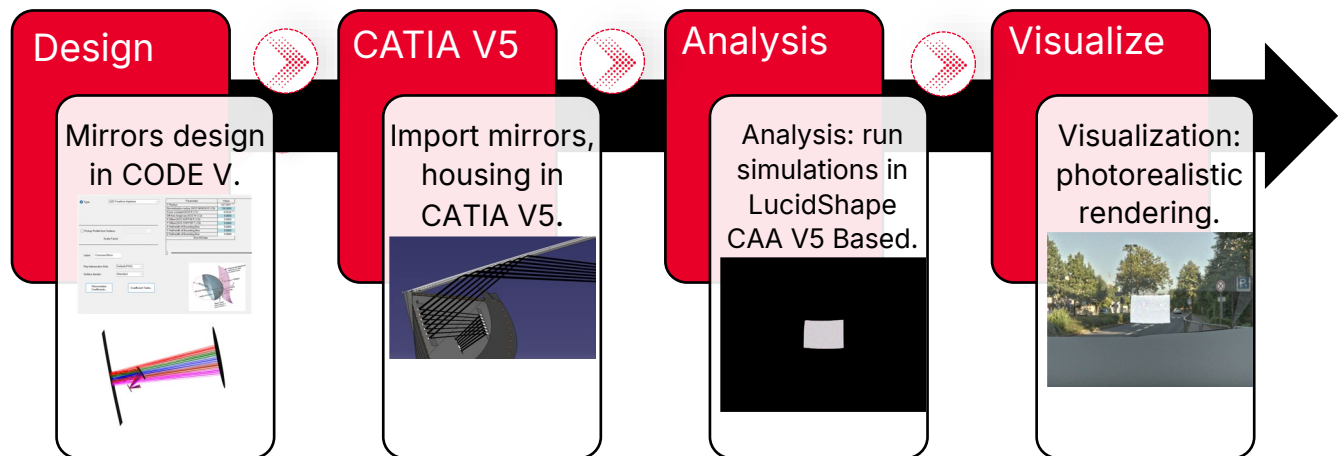
Introduction

In this application example, you will set up a photorealistic simulation for a Head-Up Display (HUD).

Mirrors are designed and optimized in CODE V, then imported into LucidShape CAA V5 Based as step format. HUD housing has been designed in CATIA V5, and is included in the simulation with optical materials from the SmartStart Material Library.



Flow Description

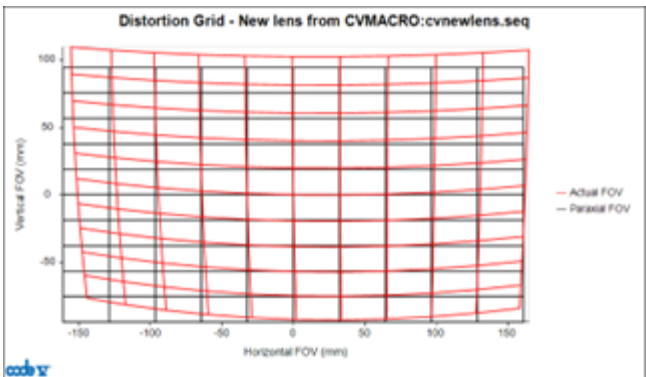
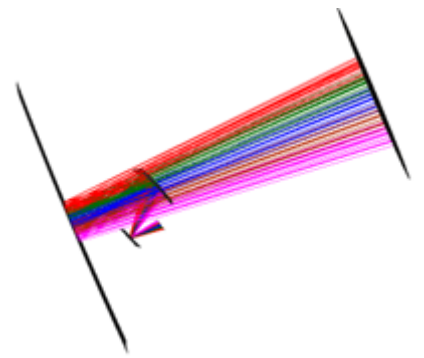


We combine CODE V for sequential simulations and imaging design, and LucidShape CAA V5 Based for mechanical design, non-sequential simulation and analysis, and photorealistic rendering (visualization).

Step 1: Design

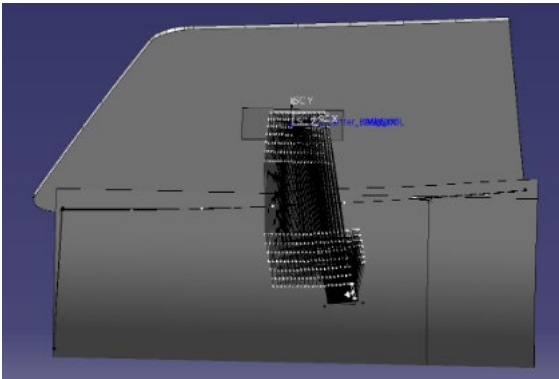
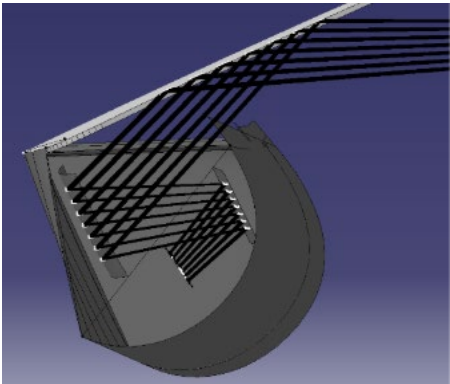
CODE V is our imaging optics simulation software. It permits us to design sequential optics, like HUD mirrors. Metrics like PSF, MTF, distortion, etc. can be studied. Optimization can be run, to optimize either the shapes of the mirrors and windshield, or the materials used (Glass Expert).

Surface #	Surface Name	Surface Type	Y Radius	Thickness	Glass	Refract Mode	Y Semi-Aperture	X Semi-Aperture	Non-Centered Data
Object	Display	Sphere	Infinity	-80.0000		Refract			Decenter & Return
Stop	Flat Mirror	Sphere	Infinity	150.0000		Reflect	30.0000	60.0000	Decenter & Bend
2	Concave Mirror	Q2D Freeform Asphere	-537.0941	-230.0000		Reflect	50.0000	120.0000	Decenter & Bend
3	Windshield	Sphere	1.0000e+04	800.0000		Reflect	300.0000	150.0000	
Image		Sphere	Infinity	0.0000		Refract	199.0587	199.0587	
End Of Data									



Step 2: CATIA V5

Import the CODE V optimized mirrors into CATIA V5, as STEP format. Additionally, the housing has been designed in CATIA V5.

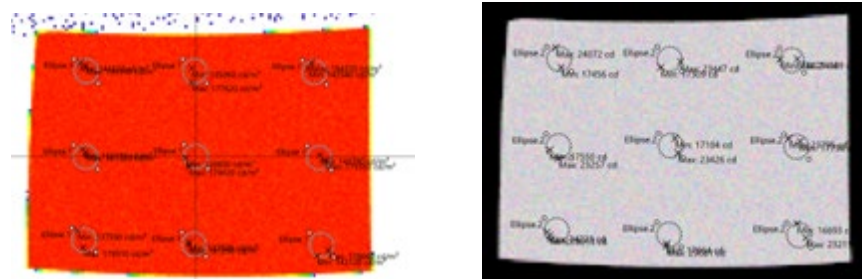


Materials applied to the housing can be loaded from the Smartstart Material Library, containing Acktar highly absorbing material. Windshield medium can also be loaded from the SmartStart library, containing hundreds of glasses and plastics.

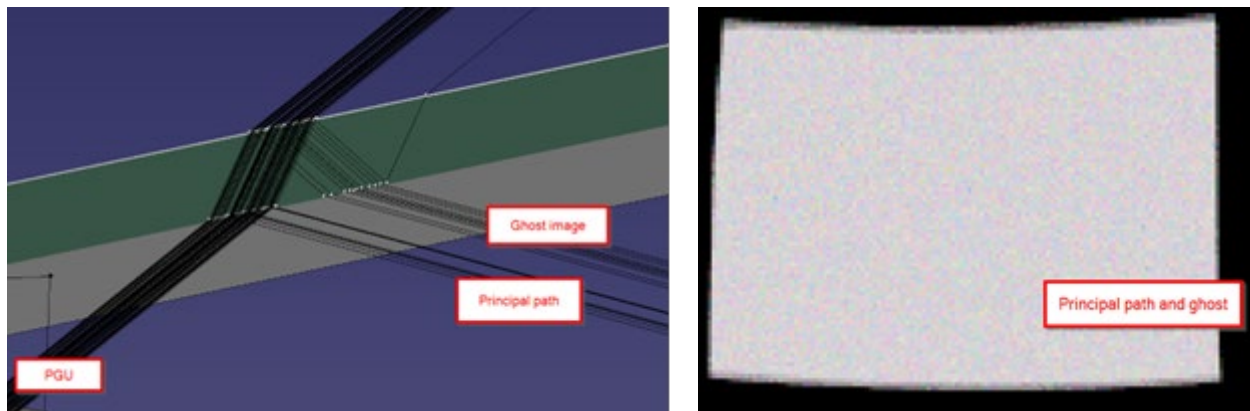
Step 3: Analysis

LucidShape CAA V5 Based permits running non sequential raytracing simulation to analyze the HUD further.

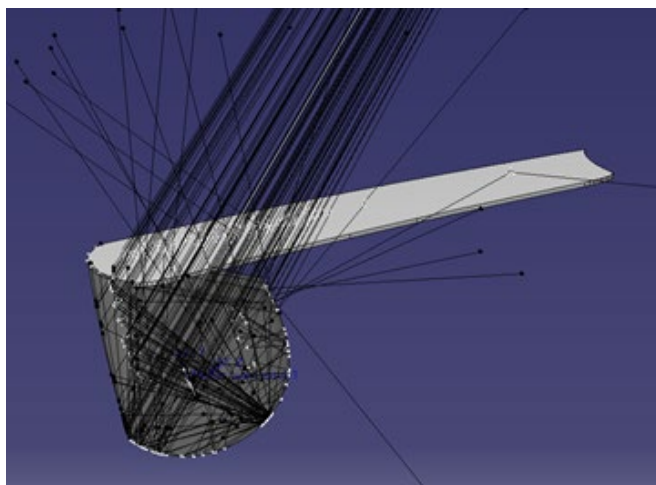
Homogeneity can be valued, running either a colorimetric, or a non-colorimetric simulation.



The second face of the windshield produces a ghost image which can also be simulated:



Sun loading analysis can be proceeded, defining a sun light source which is rotating around the HUD, in order to identify the critical sun positions which would produce a focusing hotspot on the PGU.

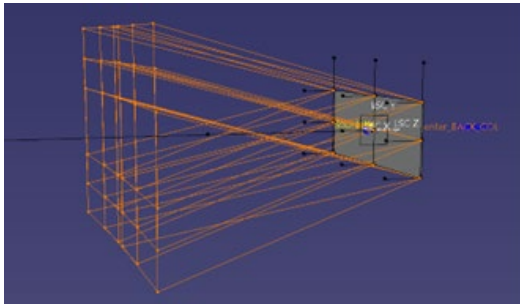


Step 4: Visualize

We have created a photorealistic rendering of the HUD: adding an environment source and running a backward simulation, we achieve the equivalent of a real photograph of the design. Human Eye Vision (HEVI) tool permits achieving a realistic rendering, as if we were driving, with eye contrast, glare induced by the eye, etc.



Panoramas create a set of luminance camera sensors rotating around a fixed point, in order to observe the design from different viewing angles. Especially, it is useful here to observe the HUD from any point in the eyebox.



Conclusion

CODE V and LucidShape CAA V5 Based permit combining imaging design with non-sequential optical simulations. Further investigations, such as ghost analysis or sun loading analysis, can be carried out. And finally, you would be able to run a photorealistic simulation, to have a 1-to-1 image as if you would look at your design for real.

Example files:

HUD_SupportingFileR32.CATPart: contains the HUD, windshield and a backward simulation.

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