ESF 26240220076 *Industrial research into the methods and procedures in generative design and knowledge engineering in car development,* OP VaV

Utilization and advantages of skeleton modelling in Catia Environment

SLOVAK UNIVERSITY OF TECHNOLOGY IN BRATISLAVA

FACULTY OF MECHANICAL ENGINEERING

STU SjF

SLOVENSKÁ TECHNICKÁ UNIVERZITA V BRATISLAVE
STROJNÍCKA FAKULTA

Ing. Jozef Bucha, PhD.

Outline of presentation

- Skeleton modeling,
- Cava module for Catia
- Using Cava in skeleton model,
- MSC Adams/Car,
- Using skeleton model with MSC Adams/Car,
- Conclusion.

Skeleton method in CAD

Definition: The CAD skeleton is collection of specifications, which keeps functional characteristic of entire model.

The specification can be:

- Surface geometry,
- Wireframe geometry (Points, lines, planes),
- Parameters and formulas,
- Axis systems.

Skeleton method in CAD

Main advantages of using skeleton modelling are:

- All information in assembly is stored in one placed and transferred trough product structure.
- Every part or subassembly is constrained only to skeleton part. Assembly does not contain unnecessary constrains. Easy replacing of assemblies.
- Mechanical designers involved in design can work individually, all necessary information are stored in shared skeleton part.

Skeleton method in CAD

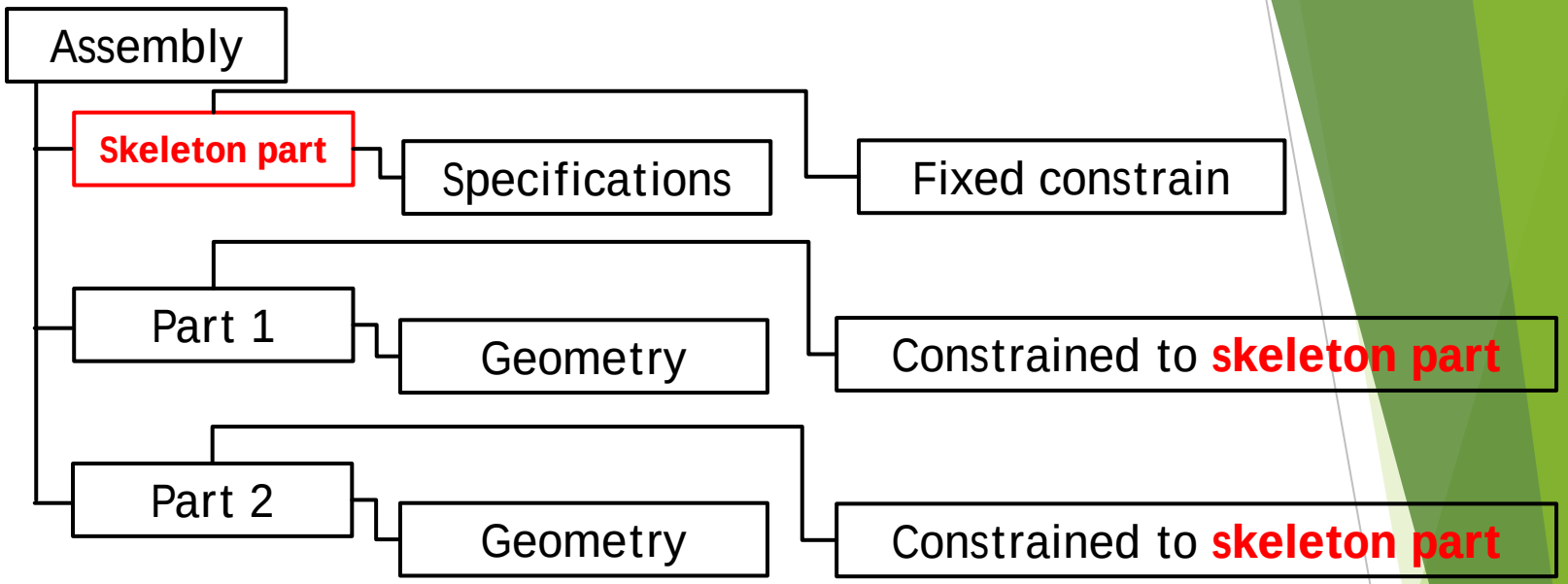
Where to use skeleton method:

- Mechanical models with different variations of dimensions but same kinematics function (suspensions, engines, boom arms, etc..)
- Mechanical models with shape variations.

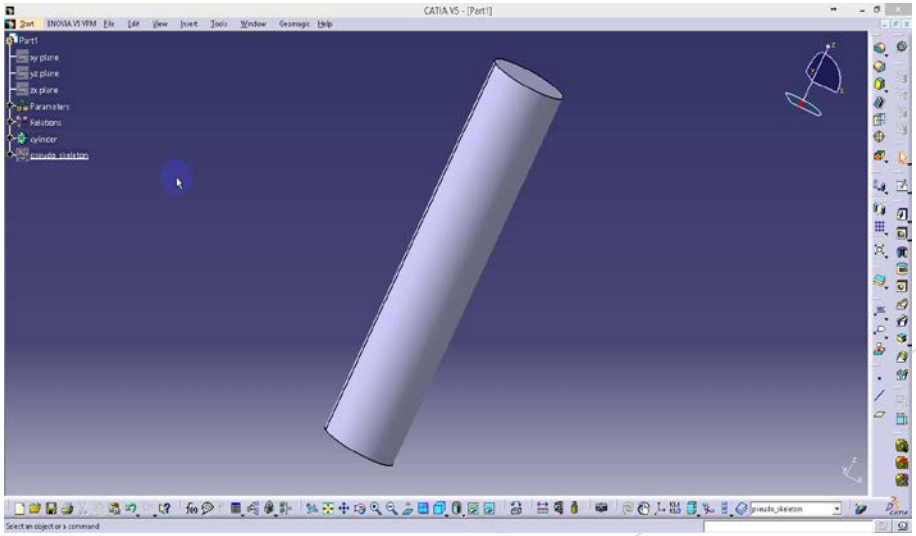
Disadvantage of skeleton modeling:

- Skeleton modeling should be used from beginning of design process.
- Making skeleton for one time project is time consuming.

Skeleton method in Catia



Pseudo skeleton



CAVA

TRANSCAT

CATIA V5 AUTOMOTIVE EXTENSIONS
VEHICLE ARCHITECTURE

- Overall Vehicle Architecture,
- Manikin,
- Safety,
- Vision,
- Wiper,
- Tools.

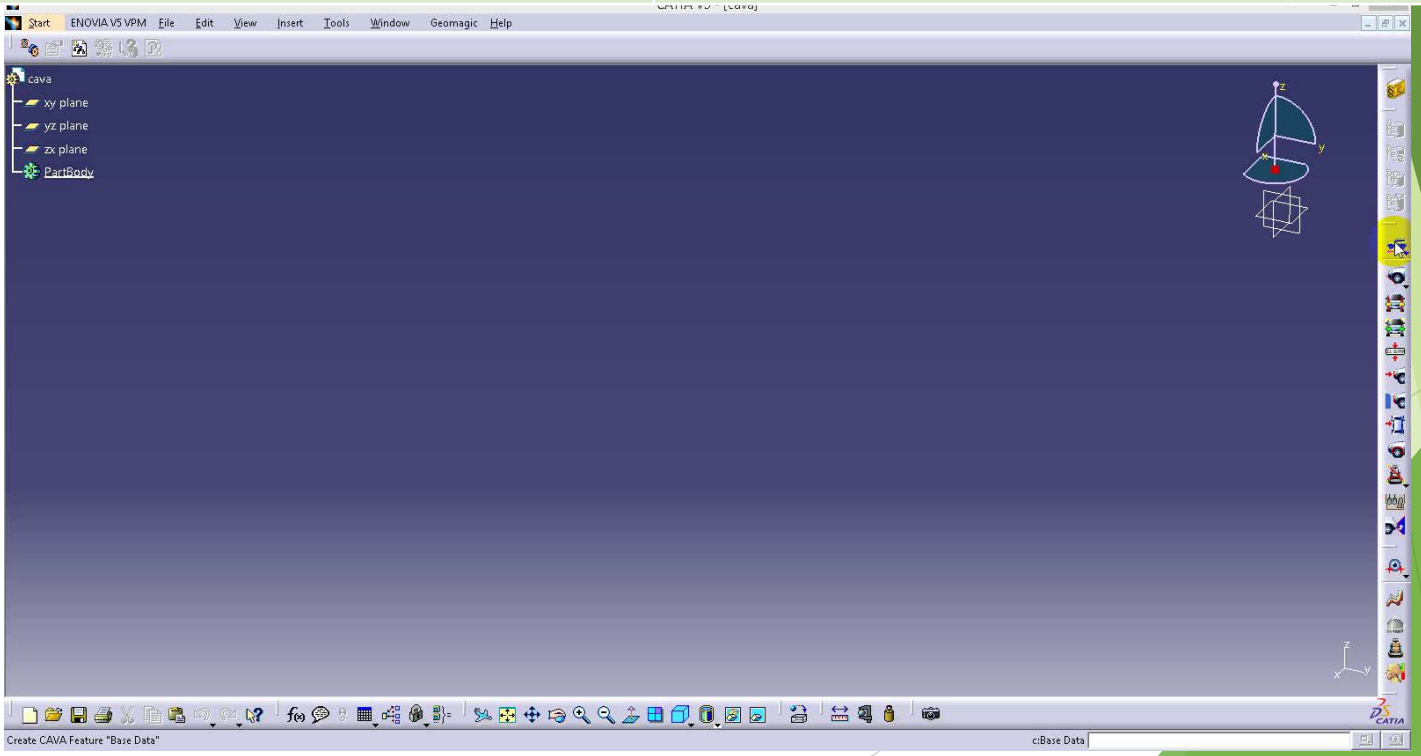
CAVA advantages

- Can be used through every step of vehicle design,
- Can be helpfull in process of homologization,
- Contains various standards (SAE, ECE,…),
- Fully parametrical,
- Detailed manual.

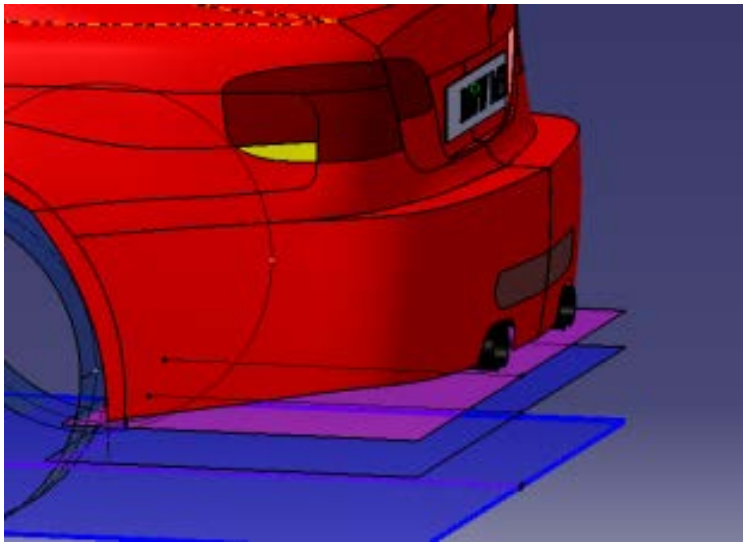
CAVA

Wheelbase	Front overhang	Rear overhang	Overal lenght	Front track	Rear track
2575 mm	1000 mm	775 mm	4350 mm	1564 mm	1557 mm

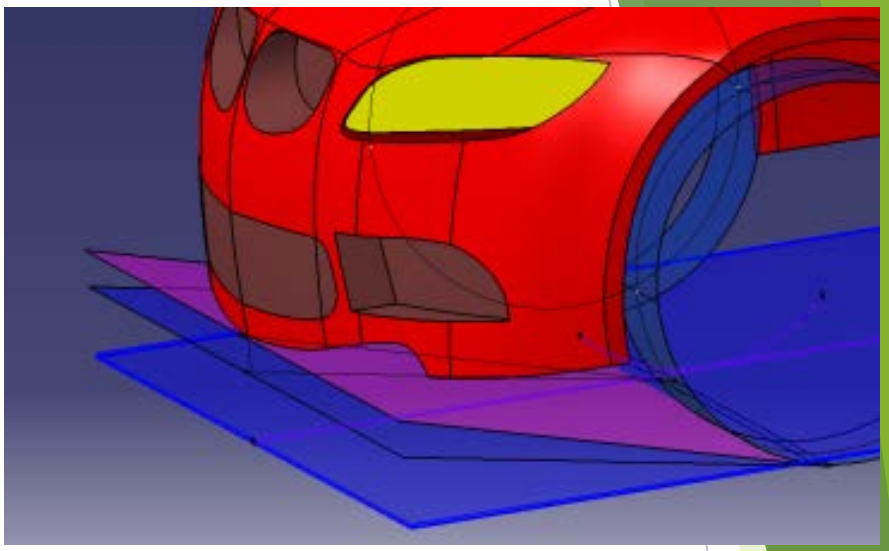
Front pneumatics	Rear pneumatics
POTENZA RE050A 225/40 R 18	POTENZA RE050A 255/35 R 19



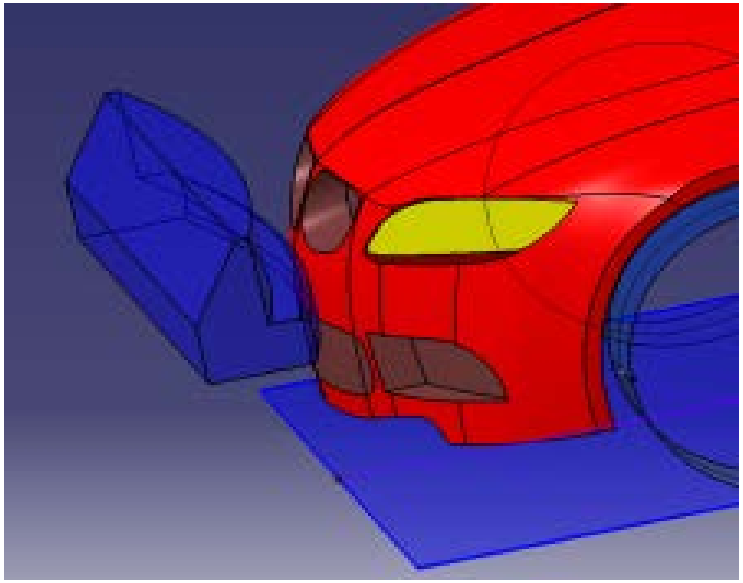
CAVA Selected analyses



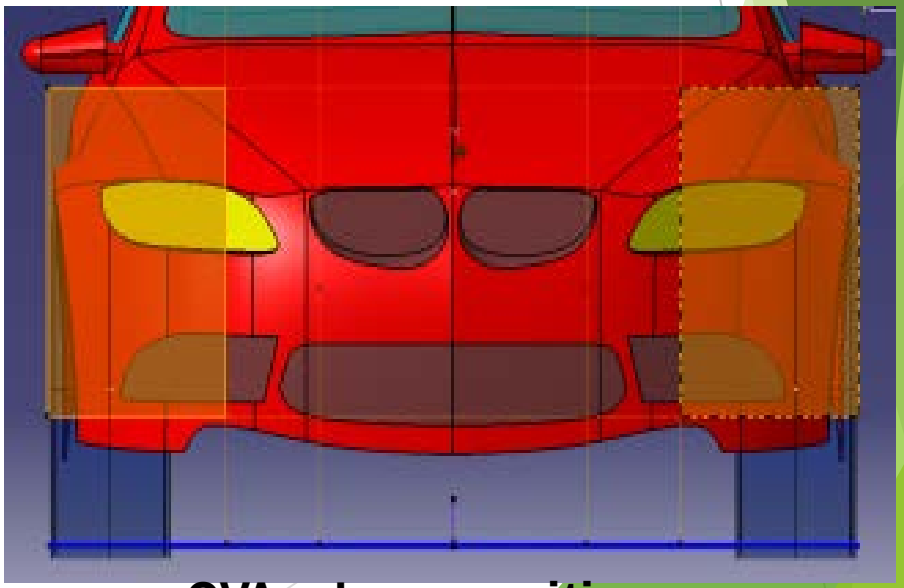
OVA - Static curb



OVA - Slope angle

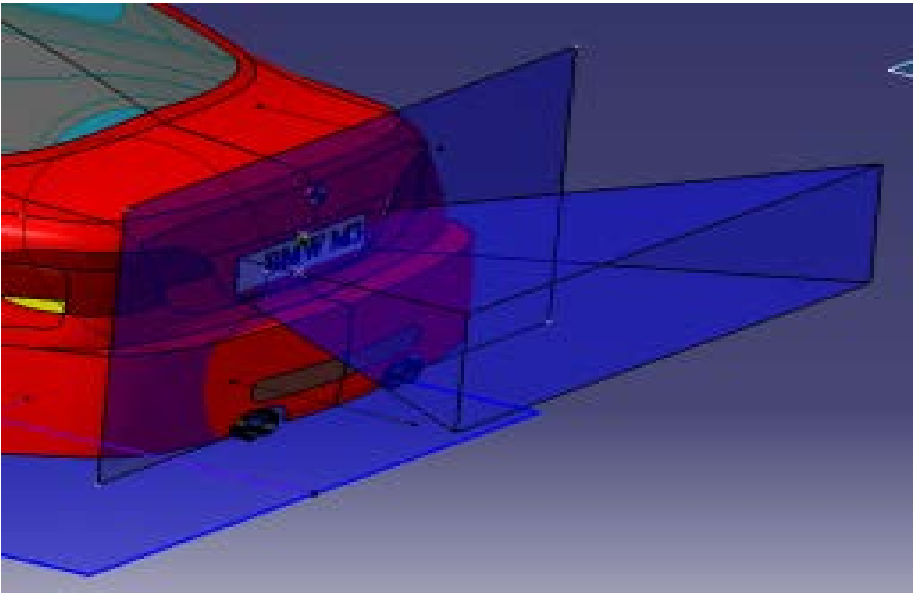


OVA - Crash barriers

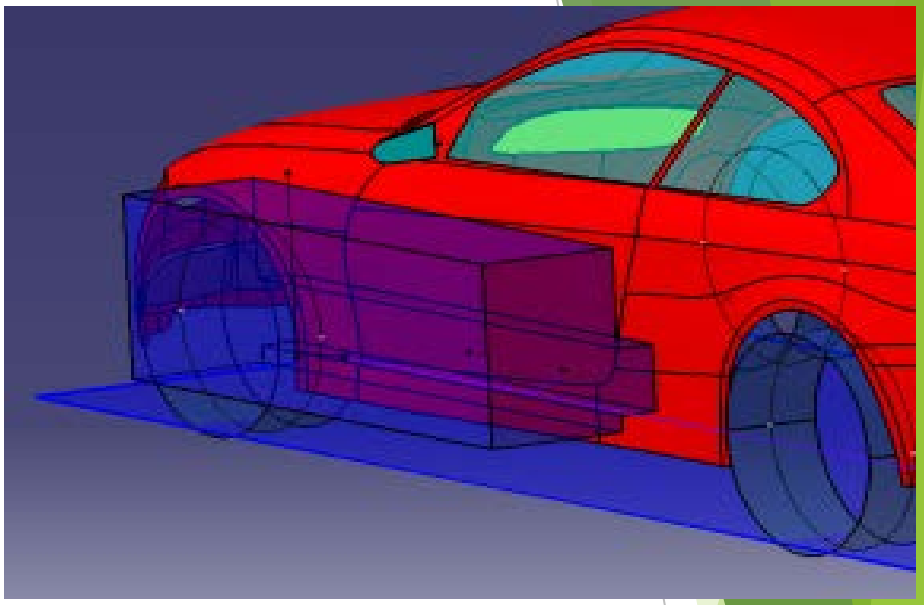


OVA - Lamp position

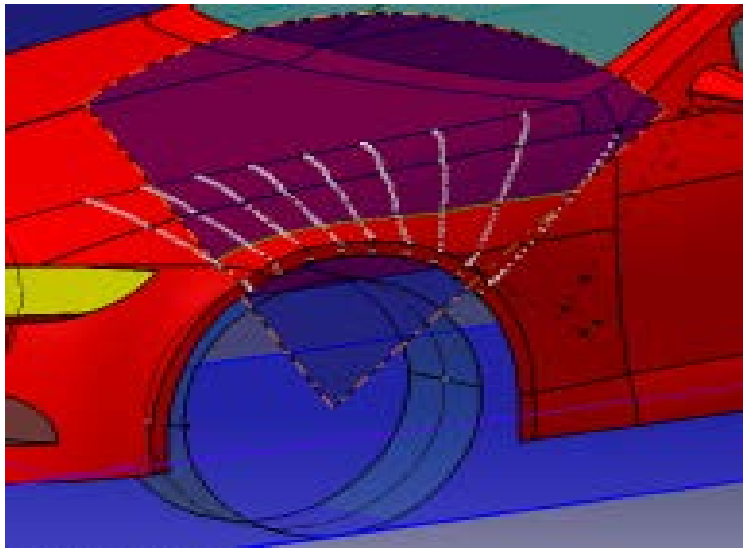
CAVA Selected analyses



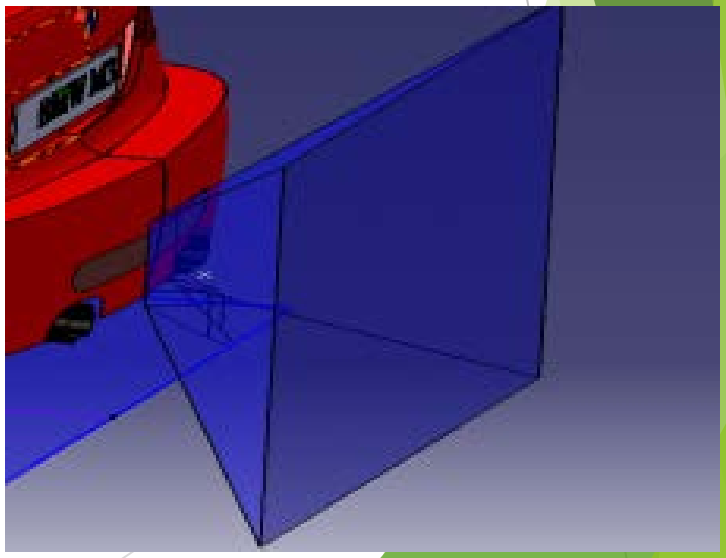
OVA - Number plates



OVA - Side impact

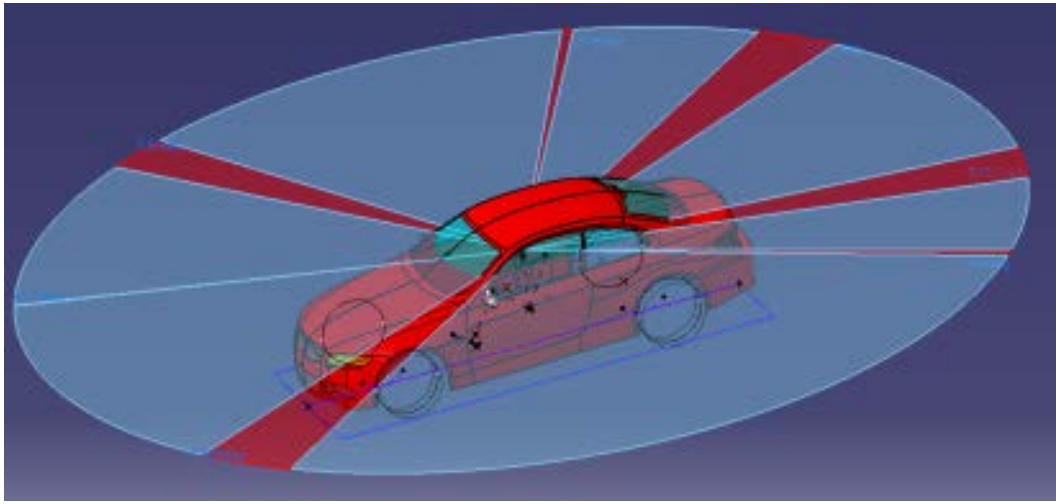


OVA - Wheel covering

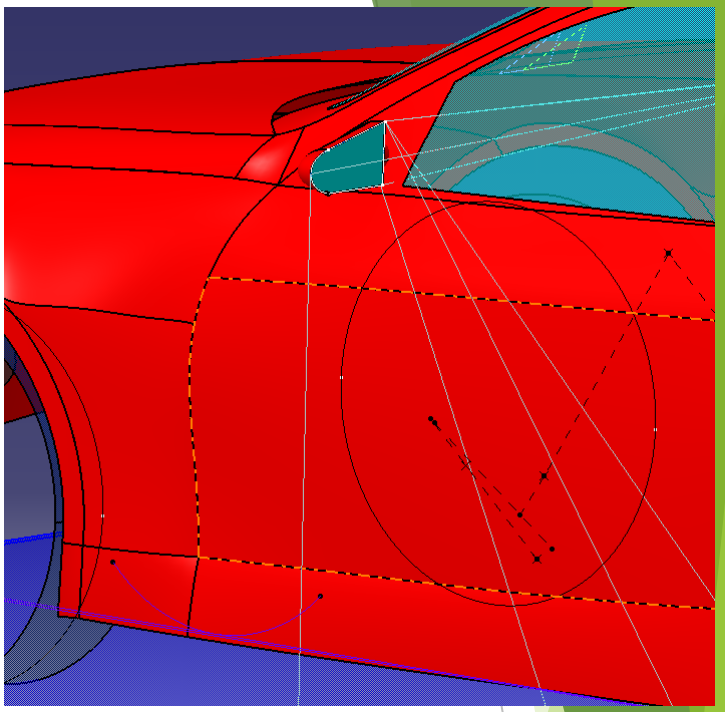


OVA - TCD device

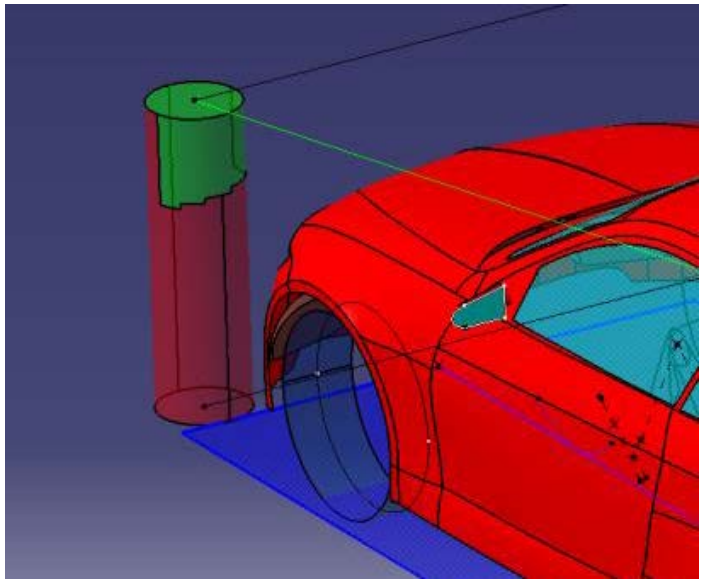
CAVA Selected analyses



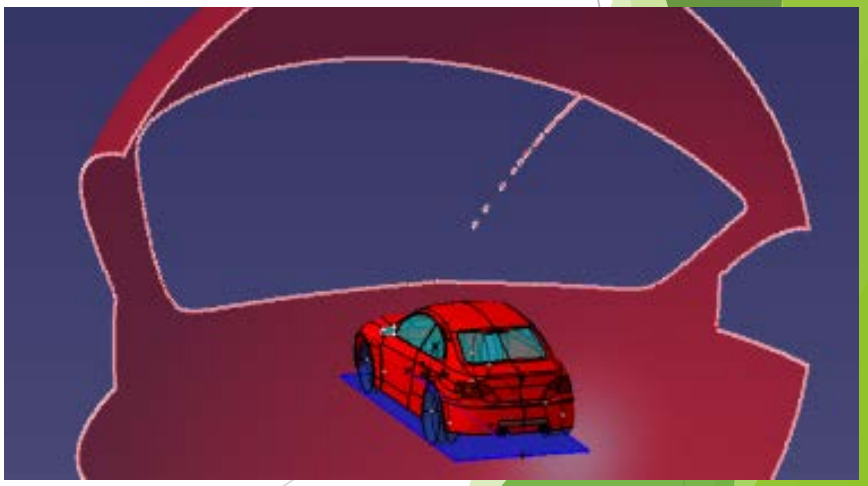
Vision - Plan view



Vision – CAVA mirror

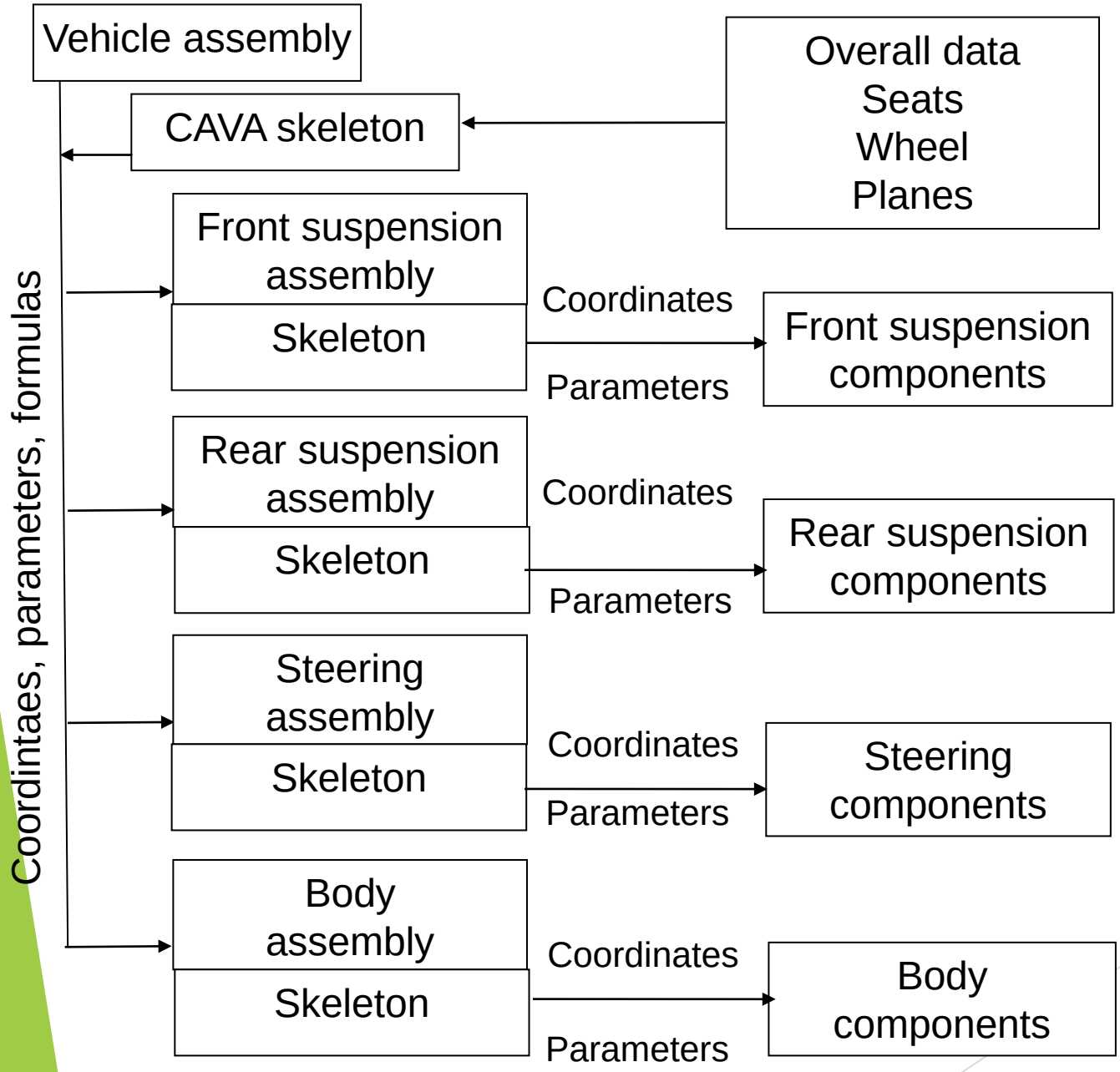


Vision – Close range visibility

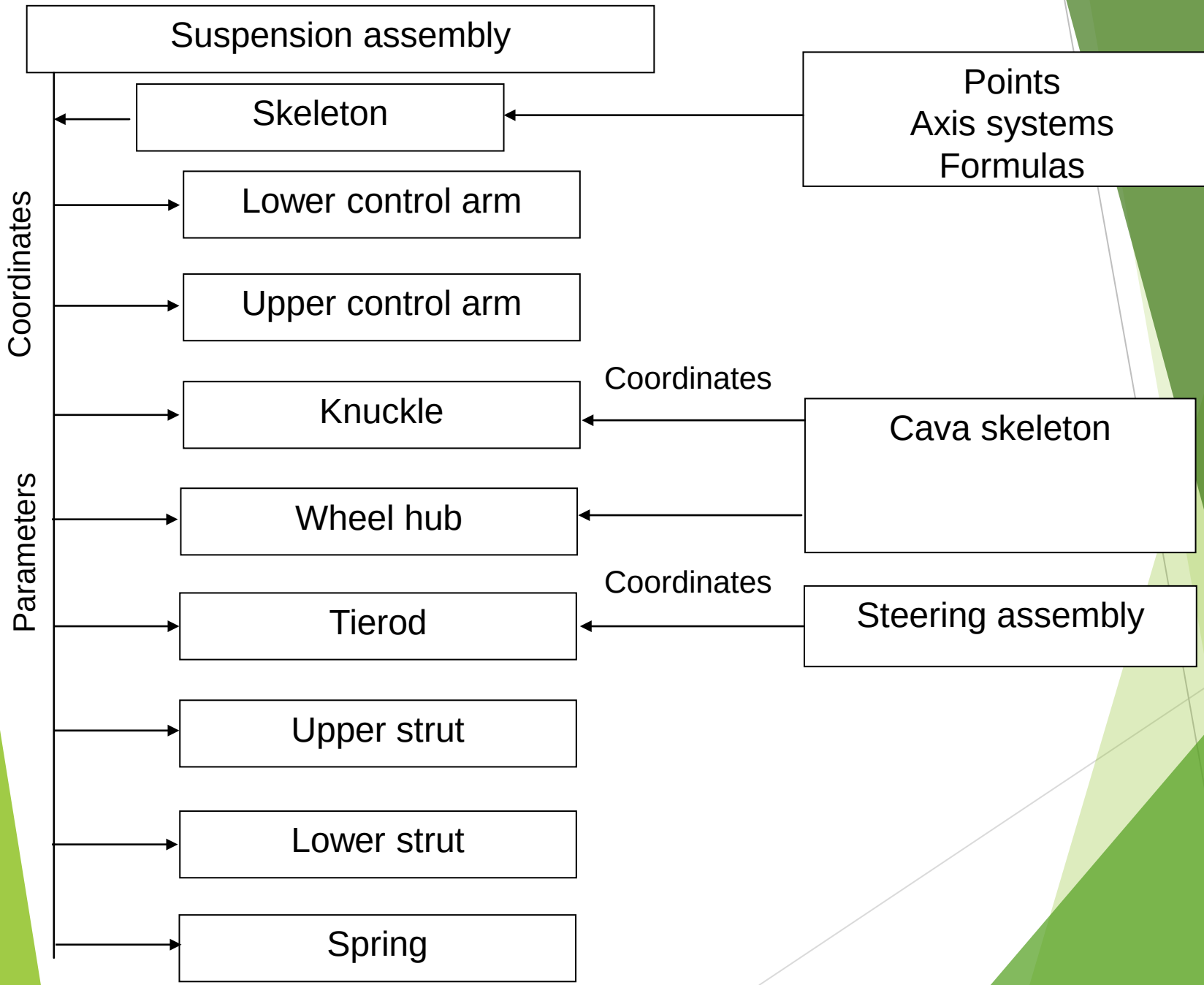


Vision - Direct view 3D

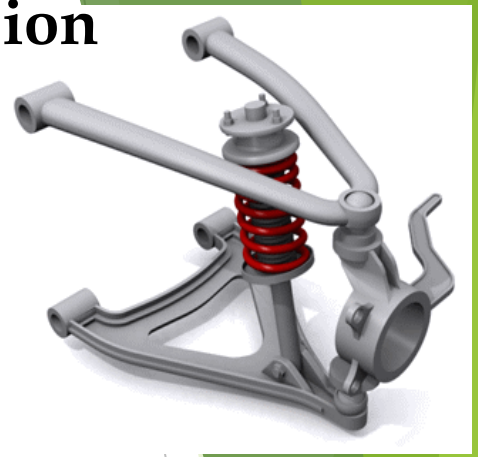
Using CAVA in skeleton model

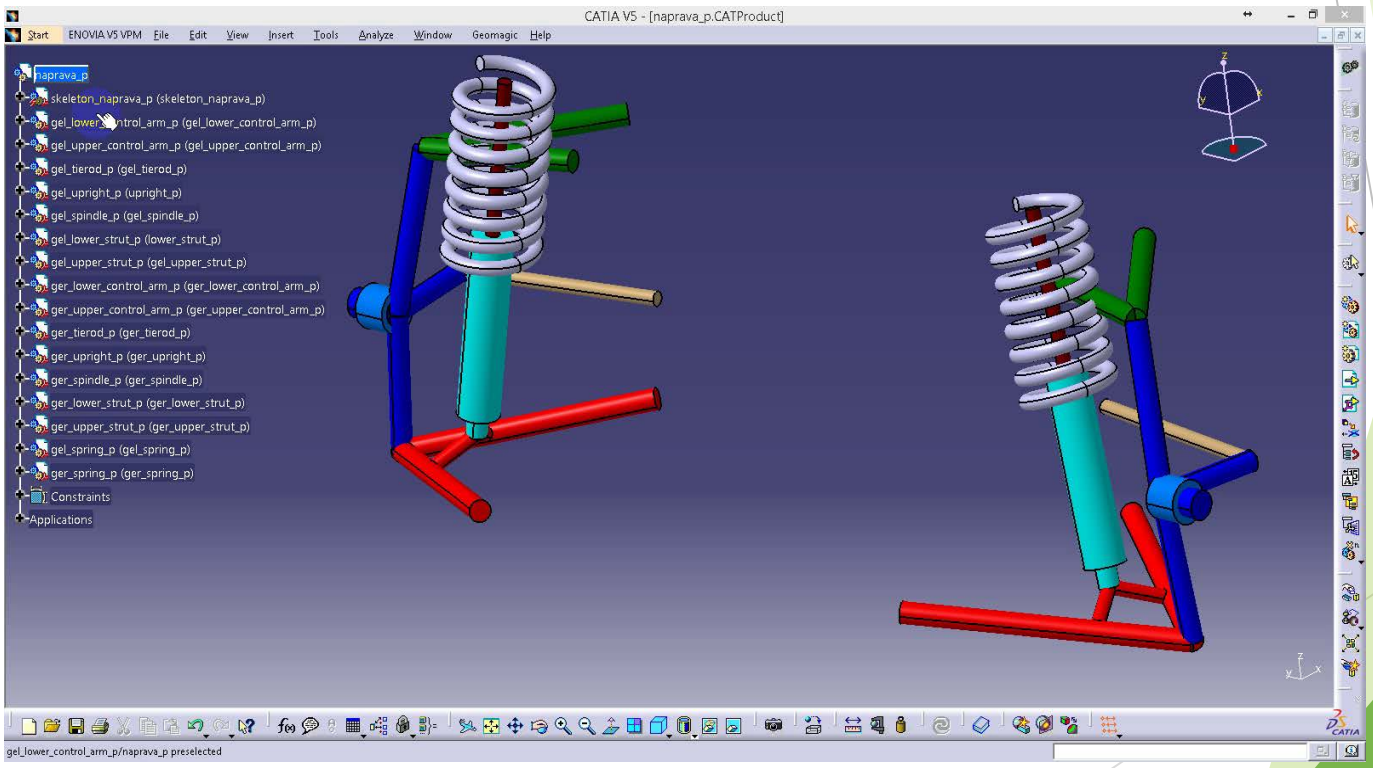


Using CAVA in skeleton model



Skeleton model of double wishbone suspension





Skeleton model of double wishbone suspension

Schránka | Písmo | Zarovnanie | Číslo | formatovanie

E3

	A	B	C	D
1	Points\Left_points\hpl_lca_front\X (mm)	-200	-200	-304,4
2	Points\Left_points\hpl_lca_front\Y (mm)	-400	-400	-281
3	Points\Left_points\hpl_lca_front\Z (mm)	-150	-150	-37
4	Points\Left_points\hpl_lca_outer\X (mm)	0	0	-4,67
5	Points\Left_points\hpl_lca_outer\Y (mm)	-750	-750	-820,24
6	Points\Left_points\hpl_lca_outer\Z (mm)	-200	-200	-106,94
7	Points\Left_points\hpl_lca_rear\X (mm)	200	200	295,6
8	Points\Left_points\hpl_lca_rear\Y (mm)	-450	-450	-281
9	Points\Left_points\hpl_lca_rear\Z (mm)	-145	-145	-37
10	Points\Left_points\hpl_uca_outer\X (mm)	40	40	8,7
11	Points\Left_points\hpl_uca_outer\Y (mm)	-675	-675	-789,5
12	Points\Left_points\hpl_uca_outer\Z (mm)	225	225	199,3
13	Points\Left_points\hpl_uca_rear\X (mm)	250	250	284,5
14	Points\Left_points\hpl_uca_rear\Y (mm)	-490	-490	-406
15	Points\Left_points\hpl_uca_rear\Z (mm)	230	230	210,8
16	Points\Left_points\hpl_uca_front\X (mm)	100	100	-365
17	Points\Left_points\hpl_uca_front\Y (mm)	-450	-450	-406
18	Points\Left_points\hpl_uca_front\Z (mm)	225		
19	Points\Left_points\hpl_tierod_outer\X (mm)	150		
20	Points\Left_points\hpl_tierod_outer\Y (mm)	-750		
21	Points\Left_points\hpl_tierod_outer\Z (mm)	0		
22	Points\Left_points\hpl_tierod_inner\X (mm)	200		
23	Points\Left_points\hpl_tierod_inner\Y (mm)	-400		
24	Points\Left_points\hpl_tierod_inner\Z (mm)	0		
25	Points\Left_points\hpl_wheel_centre\X (mm)	0		
26	Points\Left_points\hpl_wheel_centre\Y (mm)	-800		
27	Points\Left_points\hpl_wheel_centre\Z (mm)	0		
28	Points\Left_points\hpl_top_mount\X (mm)	40		
29	Points\Left_points\hpl_top_mount\Y (mm)	-500		
30	Points\Left_points\hpl_top_mount\Z (mm)	350		
31	Points\Left_points\hpl_lwr_strut_mount\X (mm)	0		
32	Points\Left_points\hpl_lwr_strut_mount\Y (mm)	-600		

Hárok1

Topology variations

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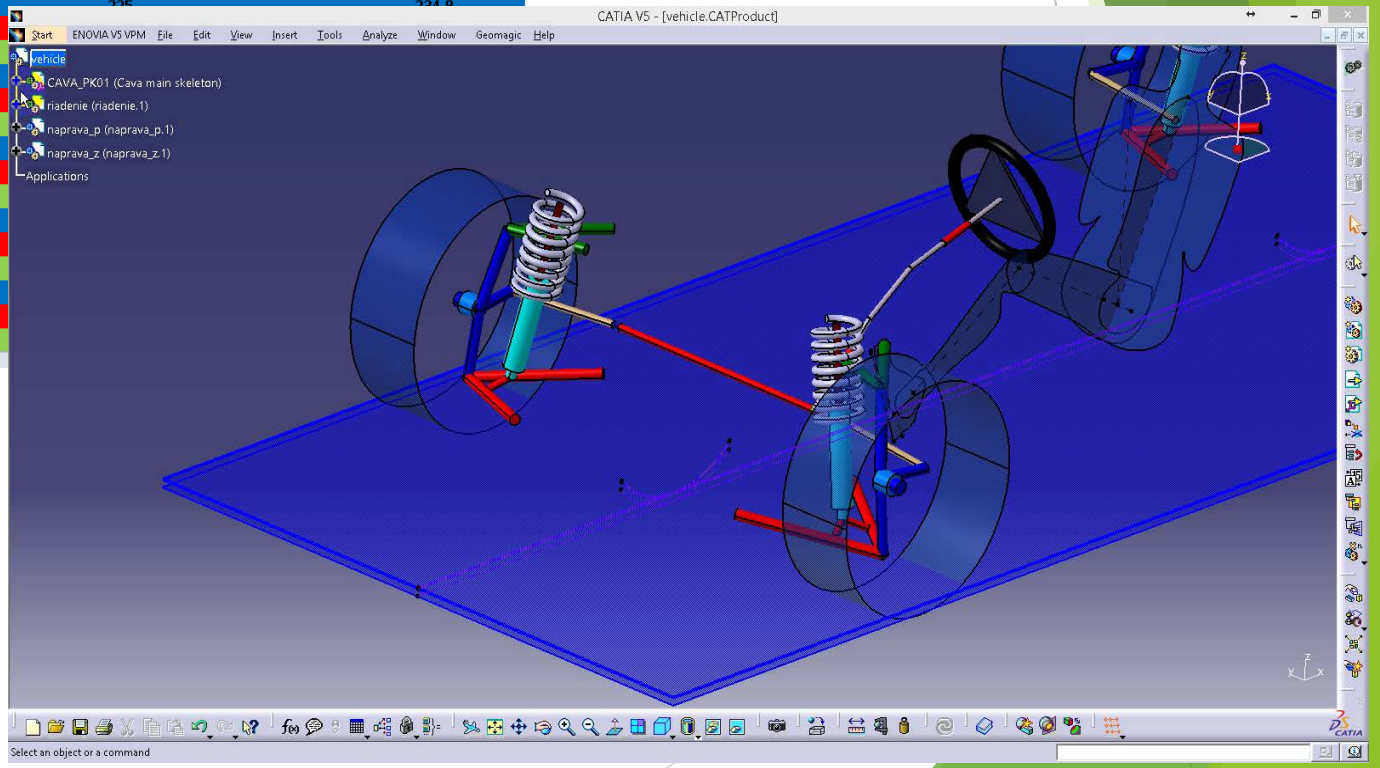
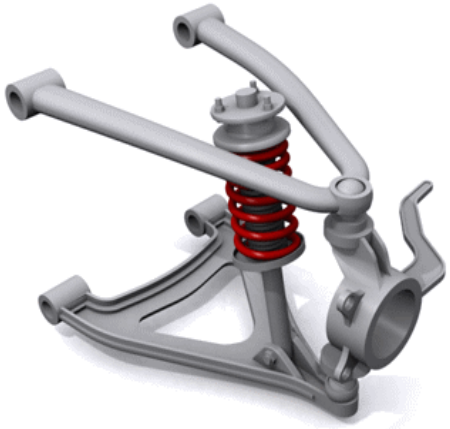
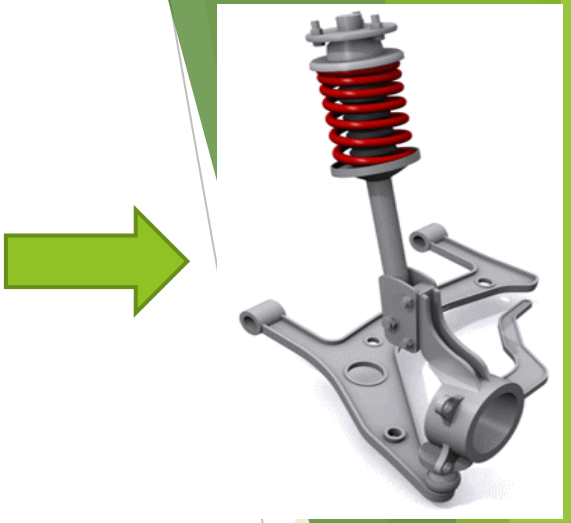
Design table in Excel file

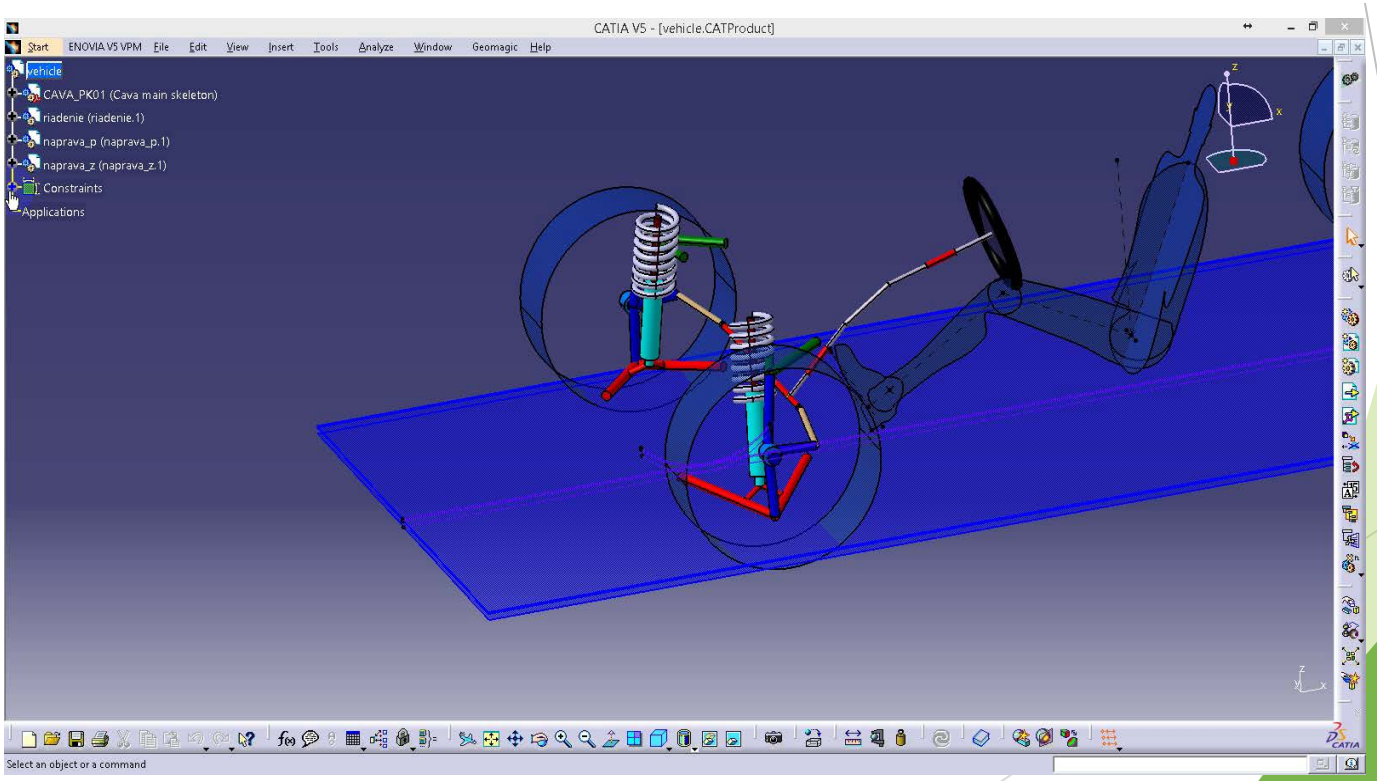


Skeleton model of vehicle

Changing suspension type







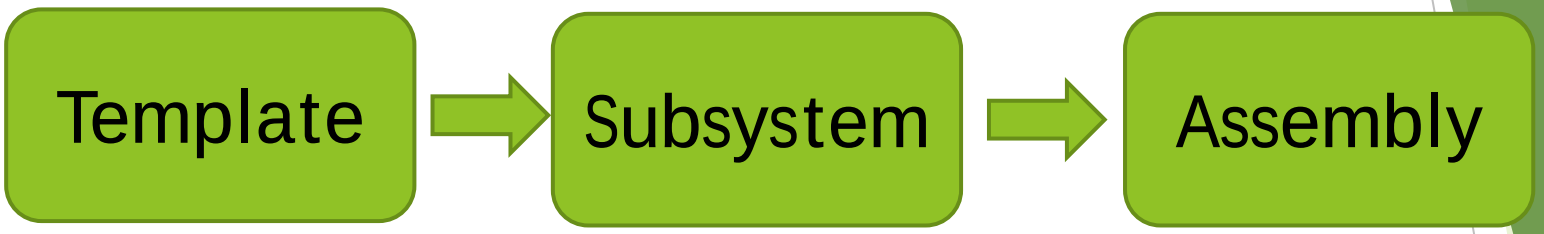
MSC Adams/Car

Part of software package:

- Adams/View,
- Adams/Car,
- Adams/Chassis,
- Adams/Driveline,
- Adams/Solver,
- Adams/Postprocessor,
- Adams/Flex,
- Adams/Insight.

MSC Adams/Car

Procedure of vehicle creation



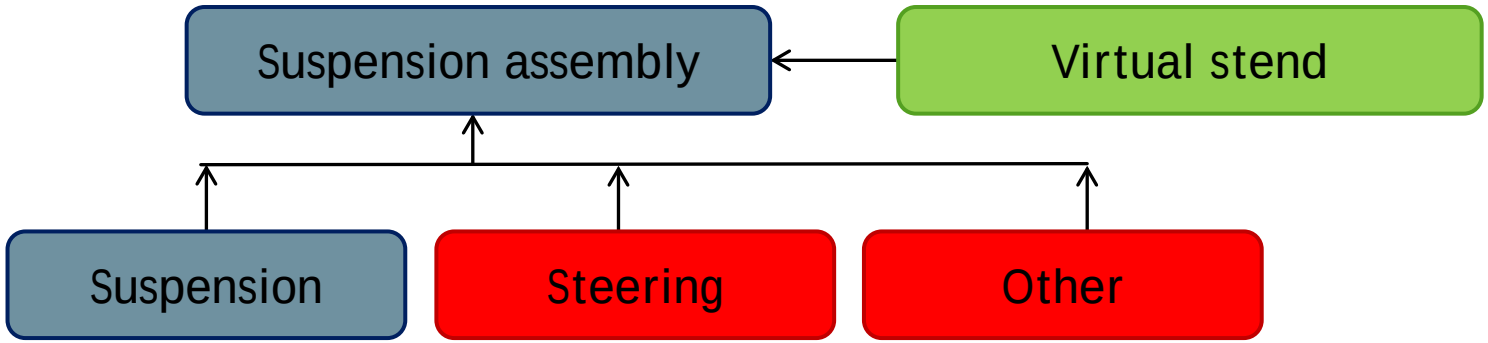
Template: basic block of vehicle; it defines basic topology of vehicle component, properties of parts, geometry of parts, used types of joint. It cannot be used directly in simulations.

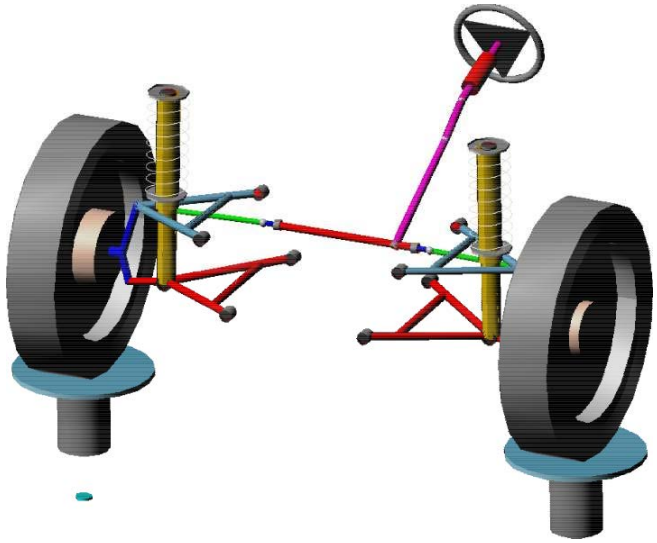
Subsystem: based on template. One template can be used by multiple subsystems. In subsystems it is possible to alter some parametrical values, change properties of spring, dampers, modification of behaviour of vehicle component is not possible.

Assembly: collection of subsystems, which together compose valid suspension or full vehicle assembly. Both types of assemblies have prescribed minimum necessary types and number of subsystem

MSC Adams/Car

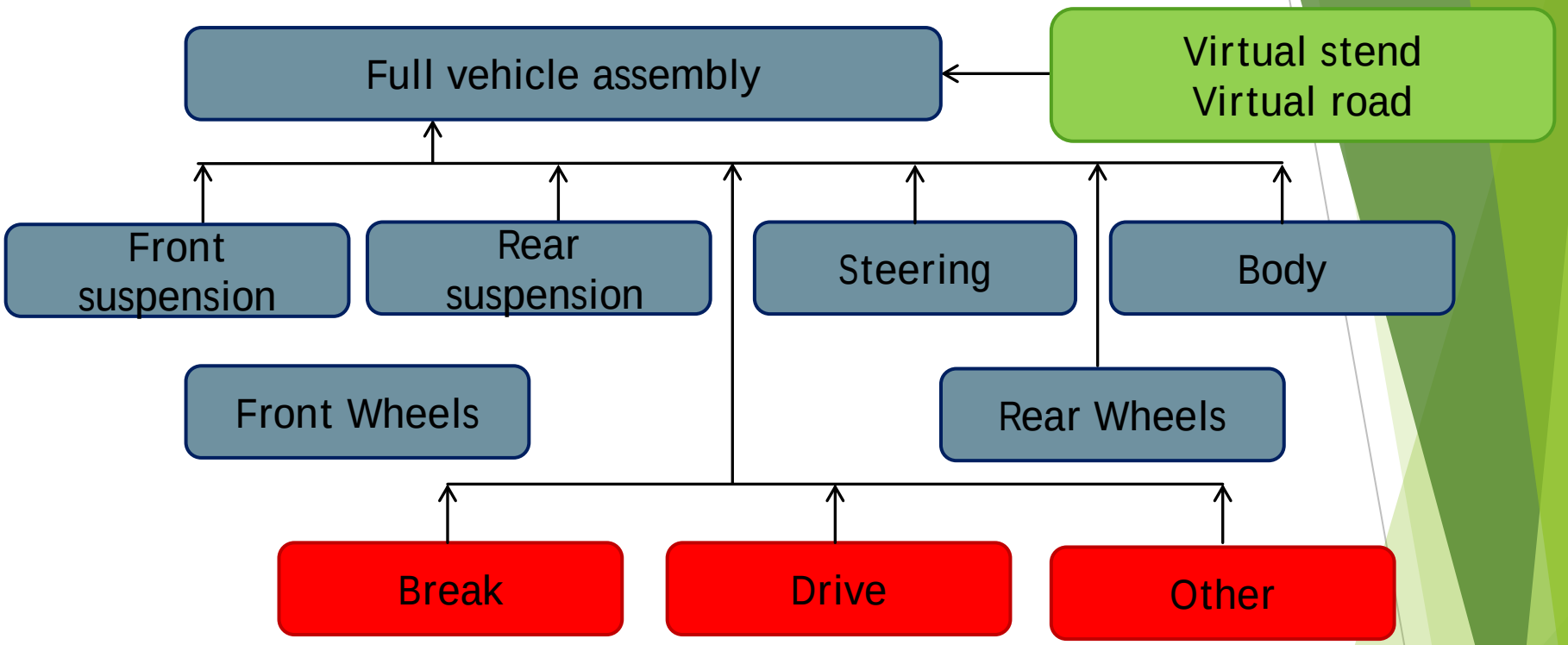
Suspension assembly

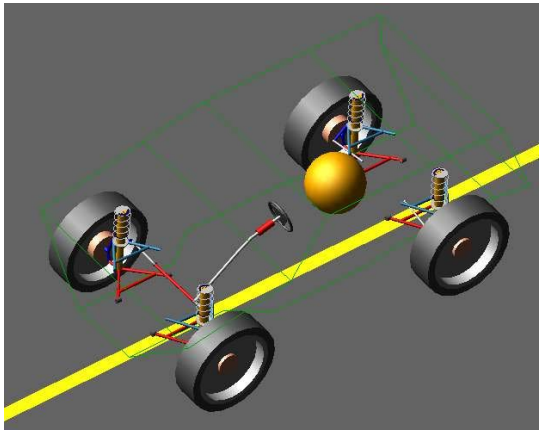


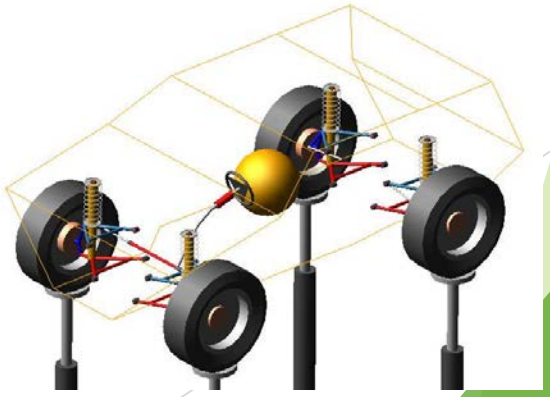


MSC Adams/Car

Full vehicle assembly







MSC Adams/Car

Template of double wishbone suspension in Adams/Car

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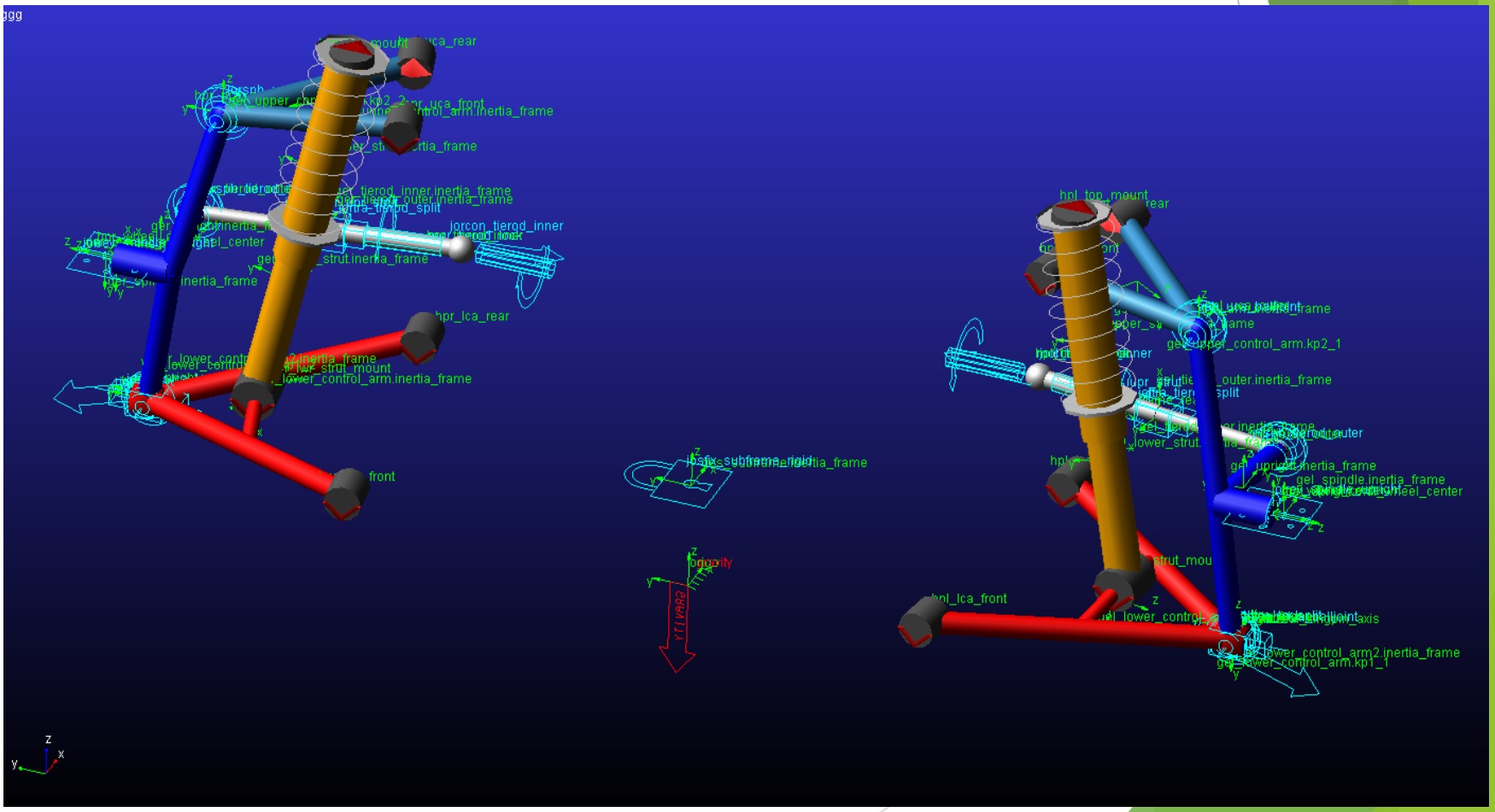
Skeleton of double wishbone suspension



MSC Adams/Car

Template of double wishbone suspension in Adams/Car

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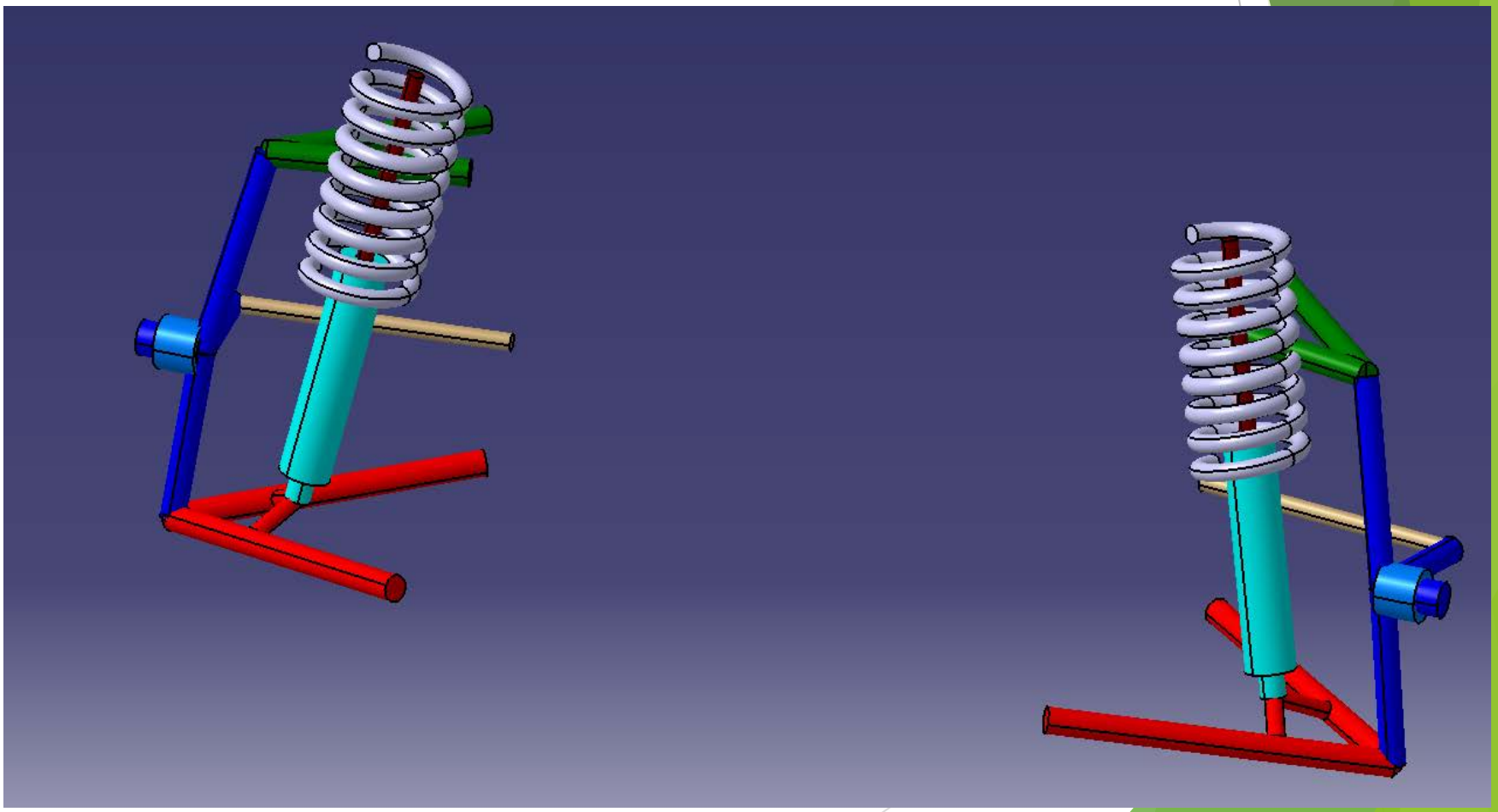
Skeleton of double wishbone suspension



Transfer of data between Catia and Adams/Car

Manual transfer: Directly in Adams/Car, by mouse and menus.

Automatic transfer: By macro in Adams/Car.

Delete simple geometry representation

↓

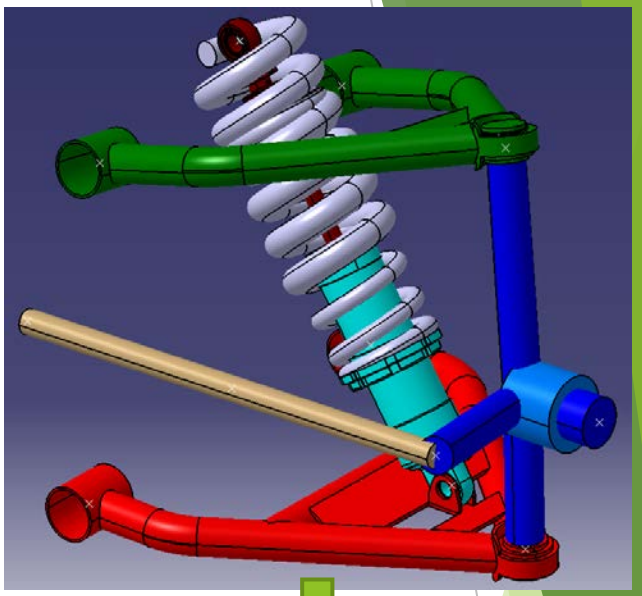
Import new geometry as .stl or .catpart file

↓

Compute new part properties from geometry (mass, inertia, position of CG)

↓

Change color of part



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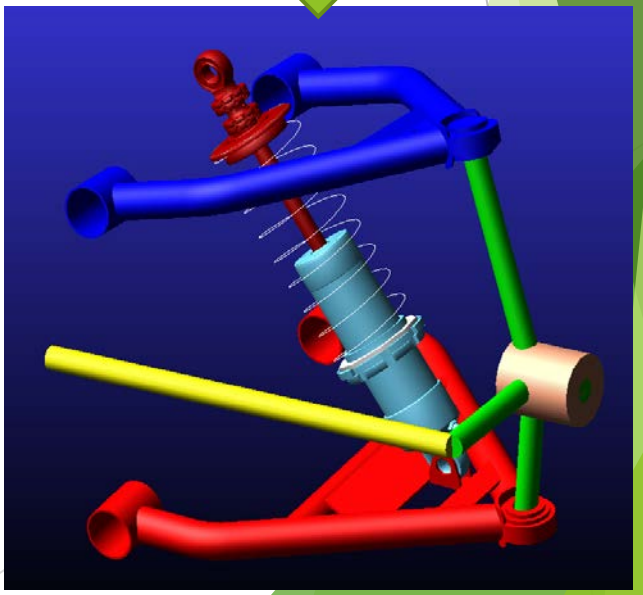
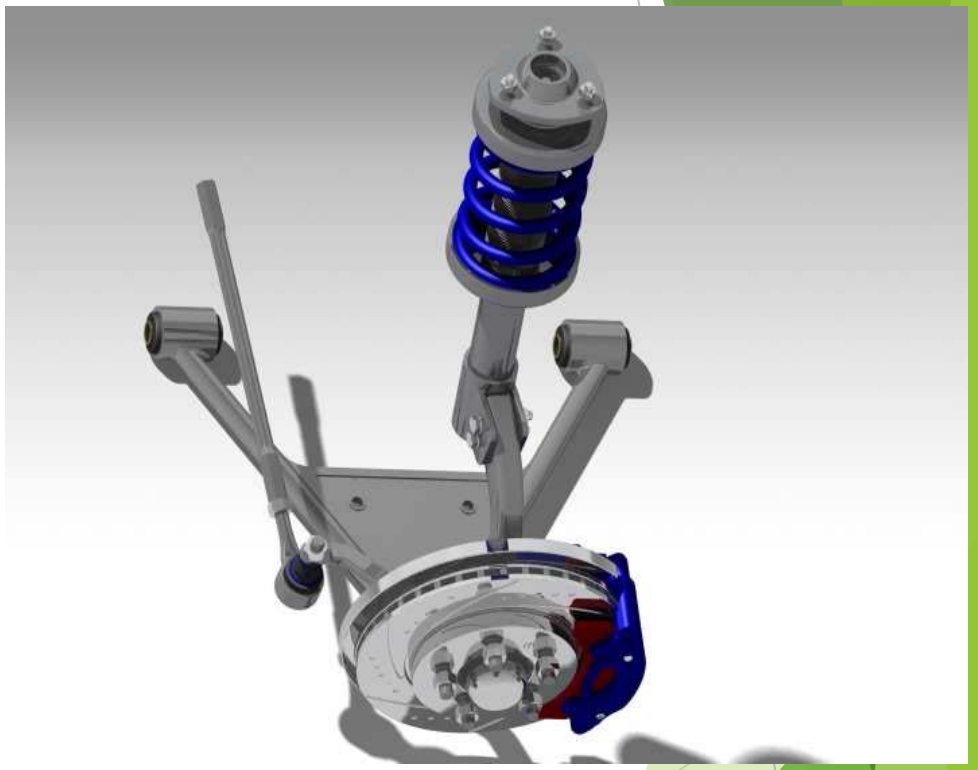
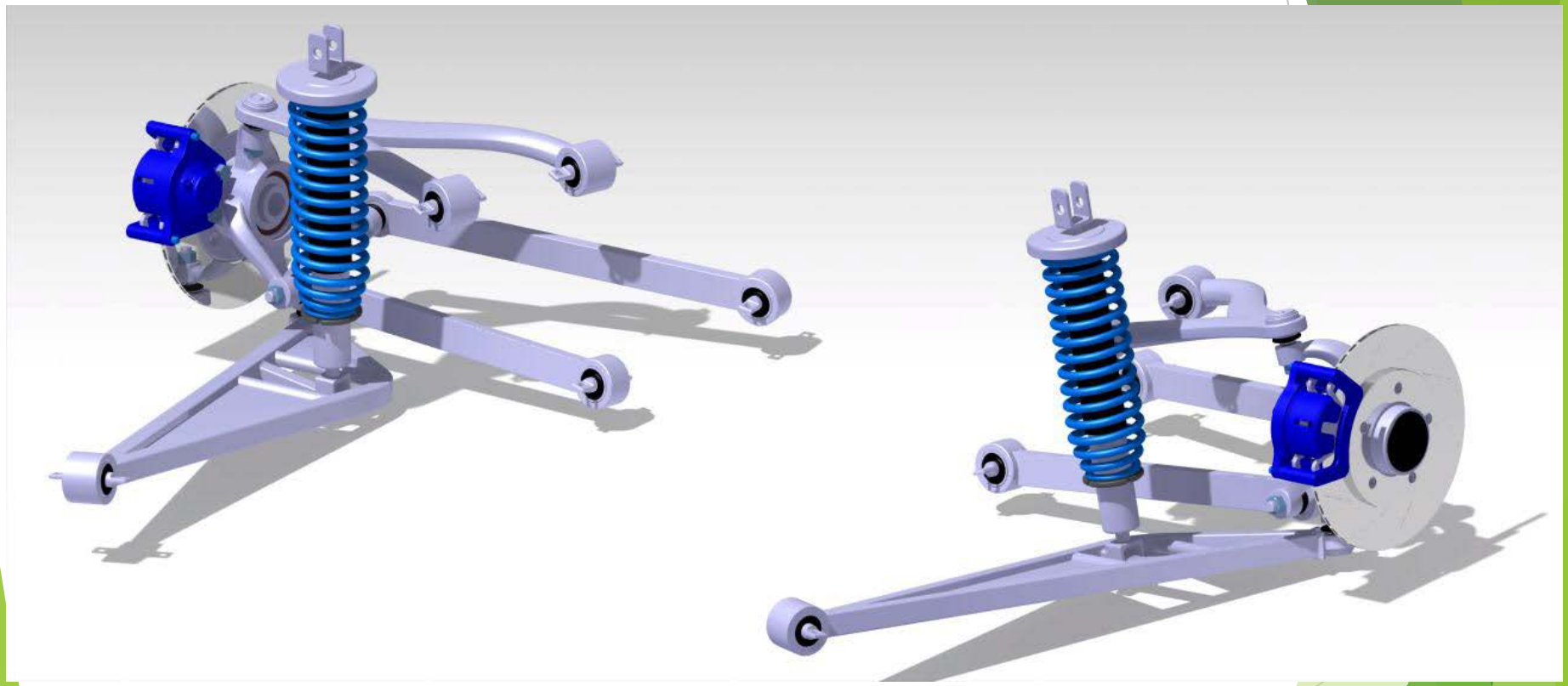


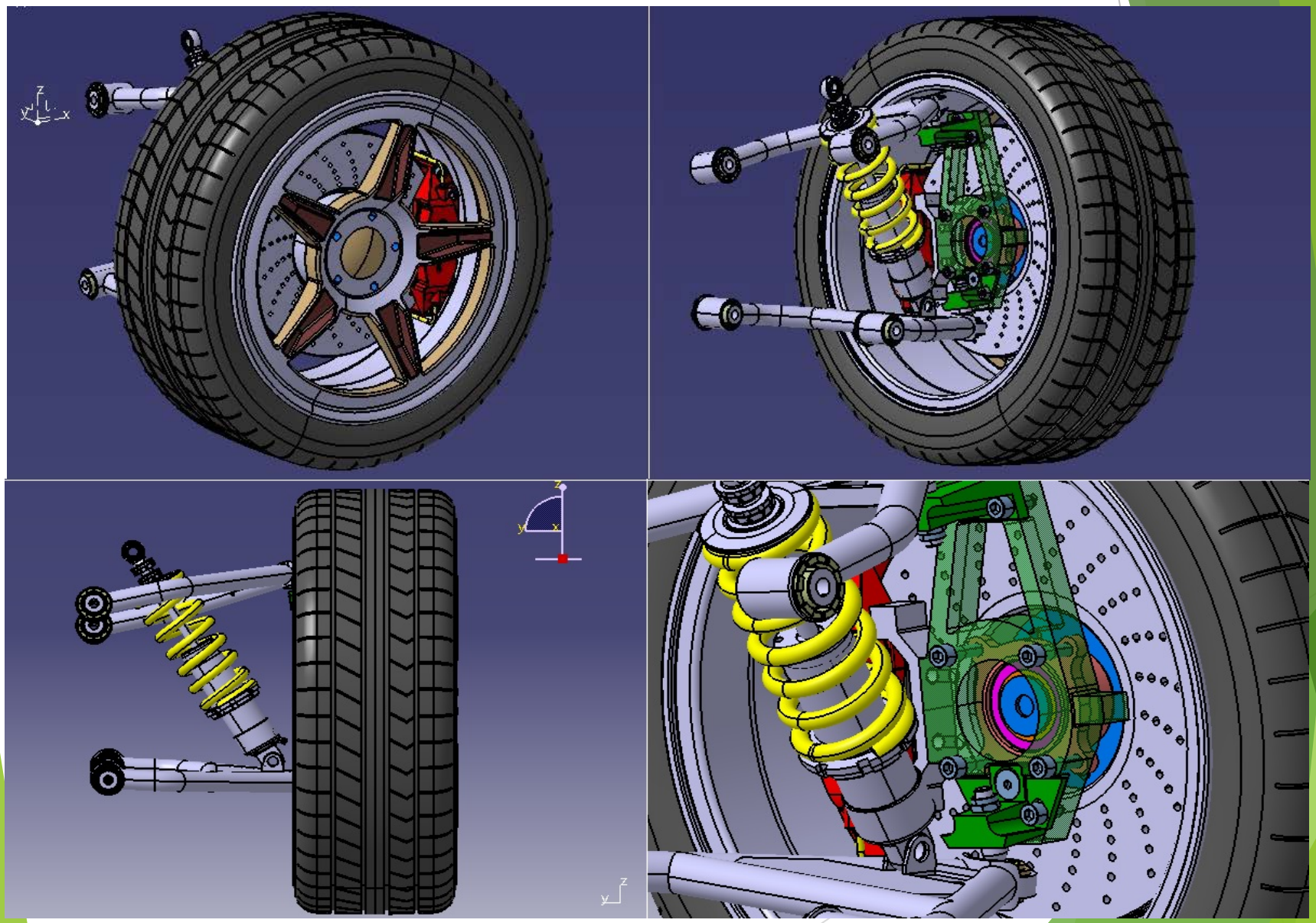
Katona, S.: Parametrický model nápravy MacPherson, Strojnícka fakulta, STU v Ba, 2014



Takács, J.: Parametrický model viacprvkového zavesenia nápravy automobilu, Strojnícka fakulta, STU v Ba, 2014

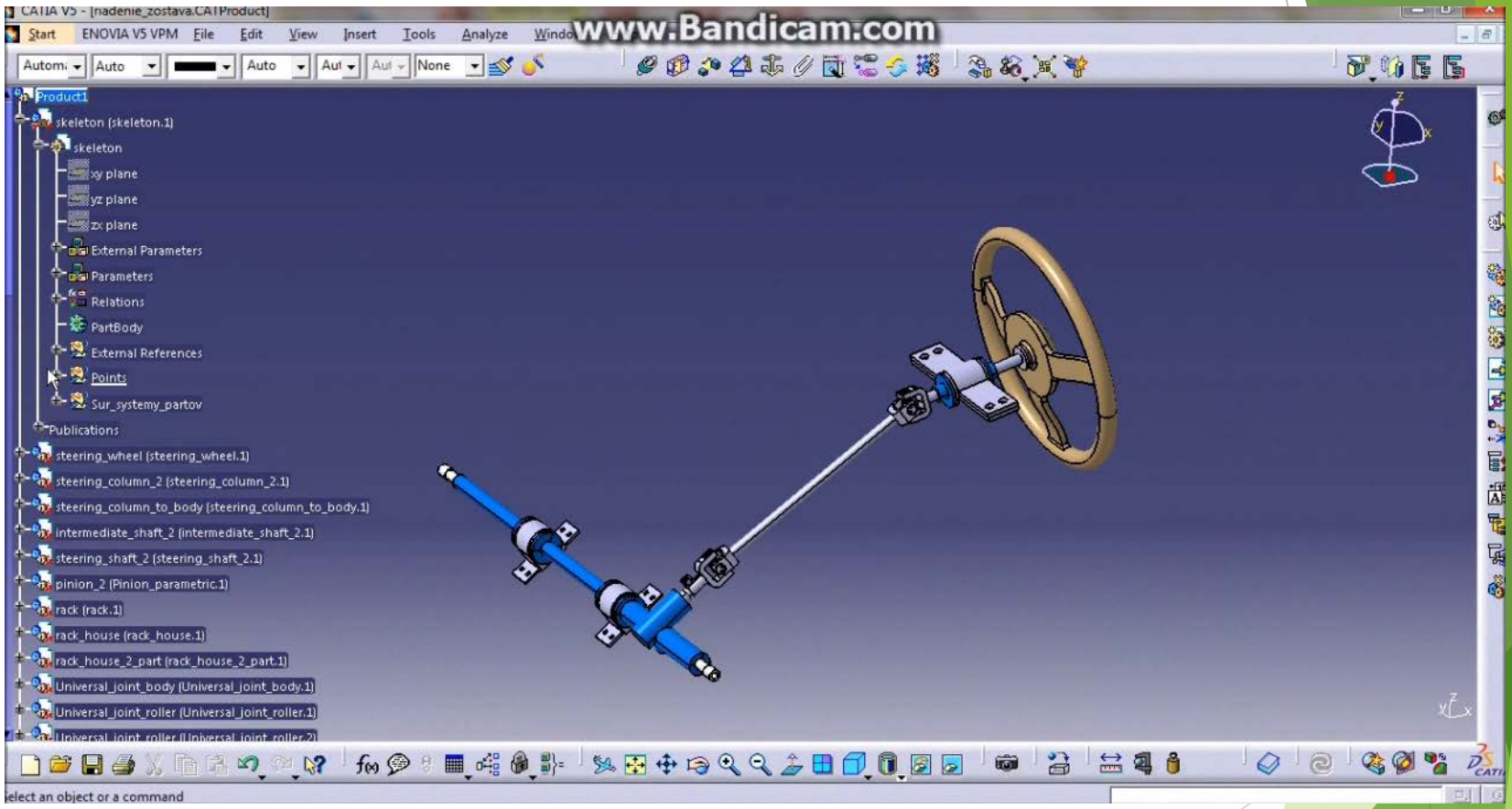


Kiripolský, T.: Parametrický model lichobežníkovej nápravy automobilu, Strojnícka fakulta, STU v Ba, 2014

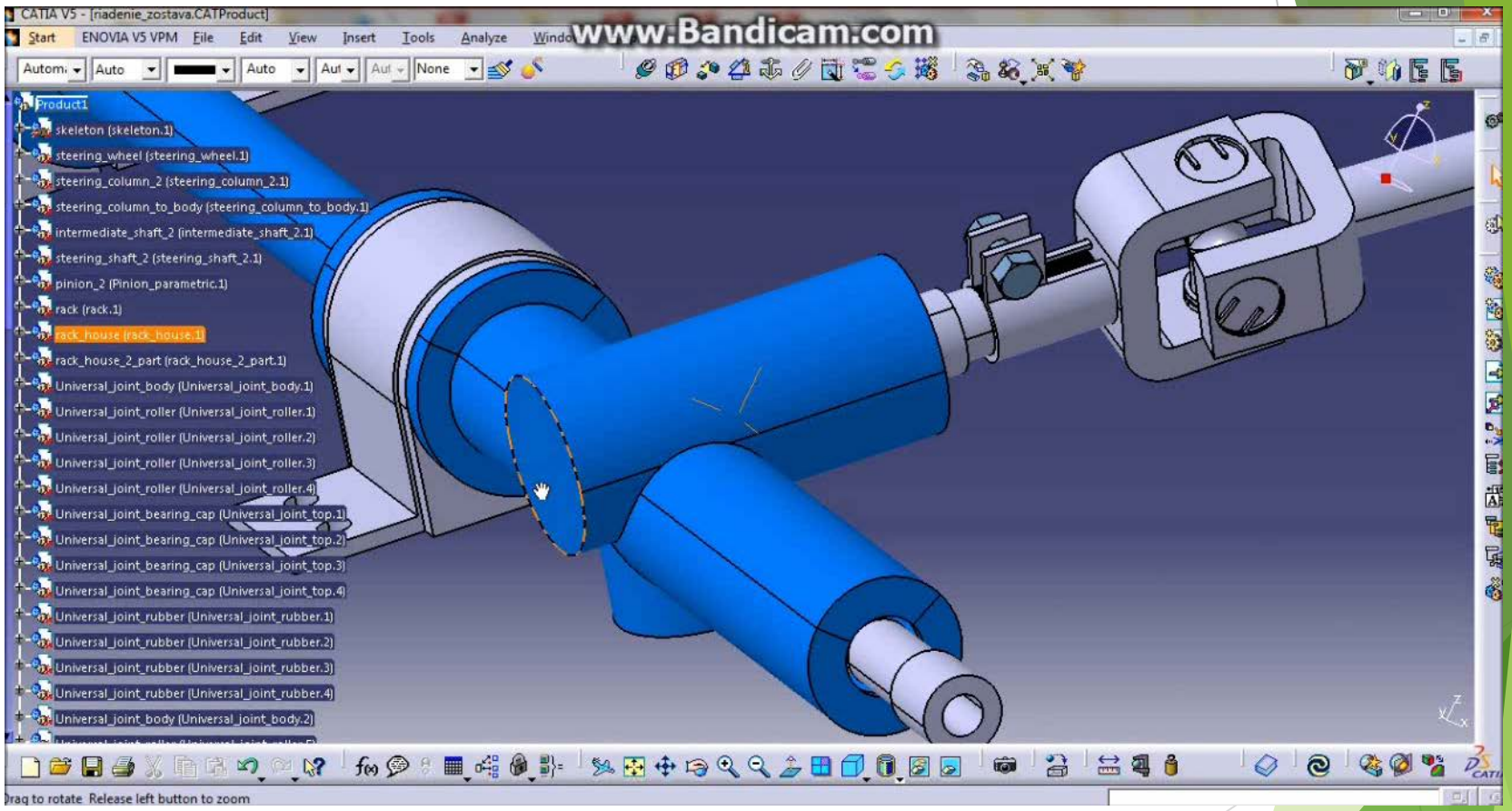


Šimurka, D.: Parametrický model hrebeňového riadenia automobilu, Strojnícka fakulta, STU v Ba, 2014

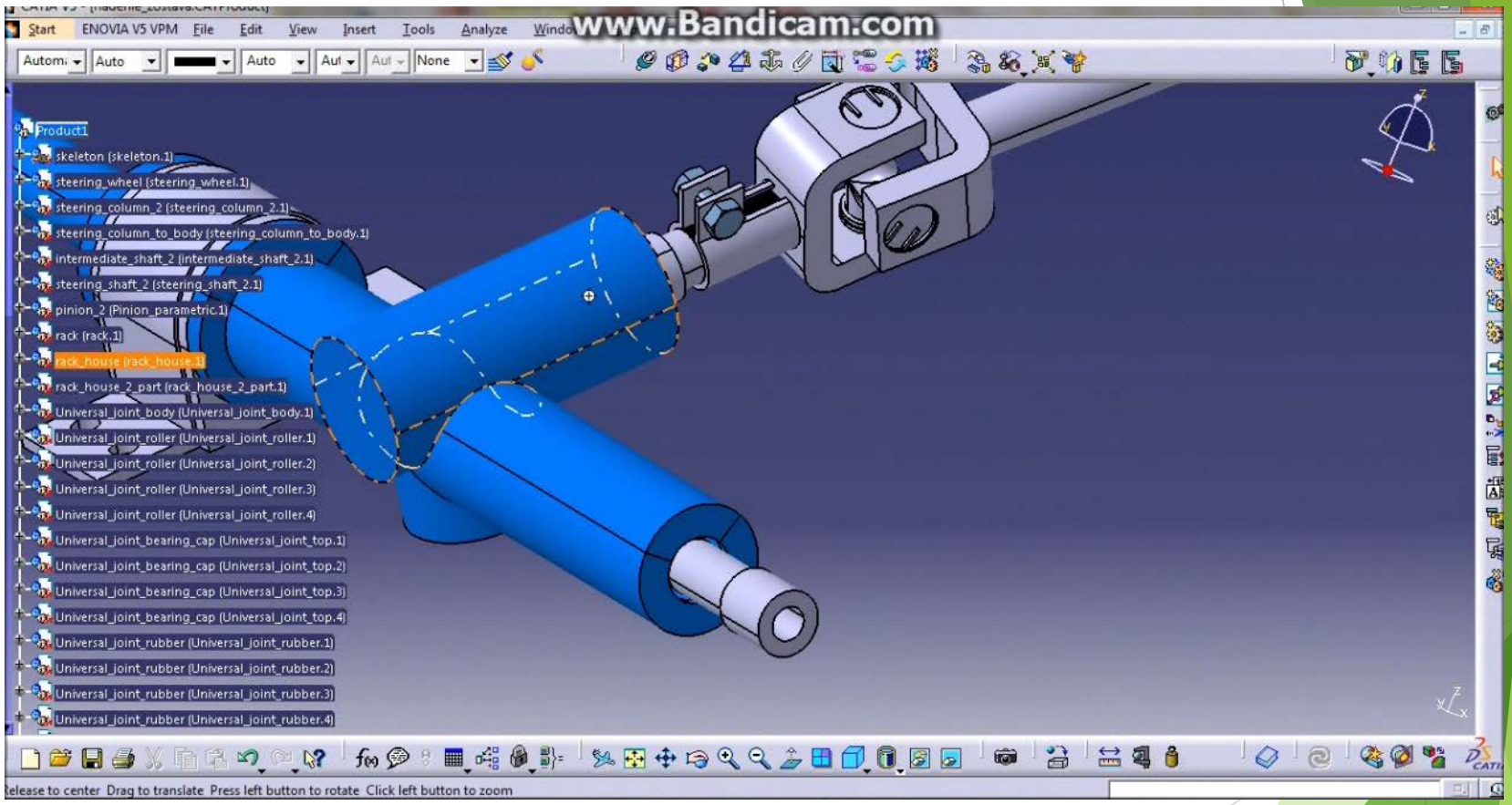
Change of Cardan joint position



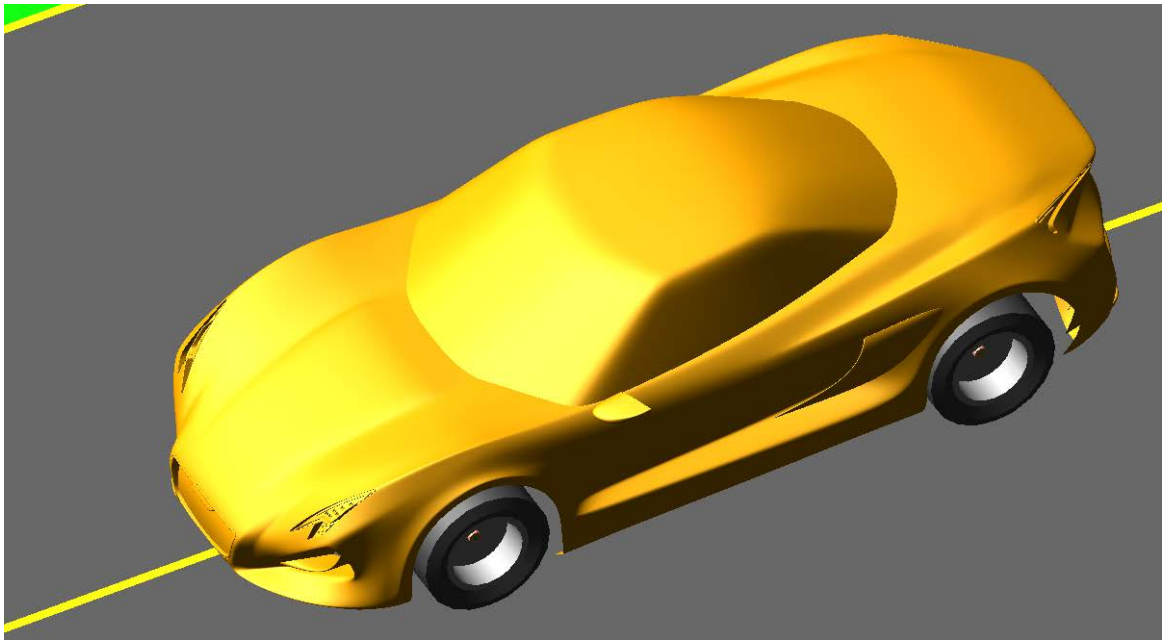
Change of pinion position on rack



Change of pinion parameters



Thank you for your attention



ESF 26240220076 ***Industrial research into the methods and procedures in generative design and knowledge engineering in car development,*** **OP VaV**