



1. **Object**
2. **Base frame**
3. **Topology optimization**
4. **Reinforced model**
5. **Size optimization**
6. **Final analysis**

Variables

Frame shape

Section size

Objective

Minimize weight

50 kg

Constraints

Bending Stiffness

7000 N/mm

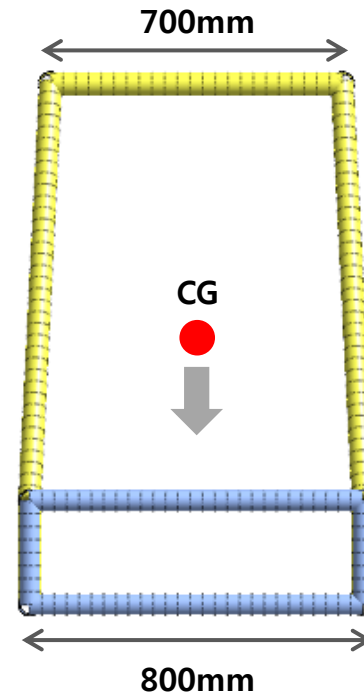
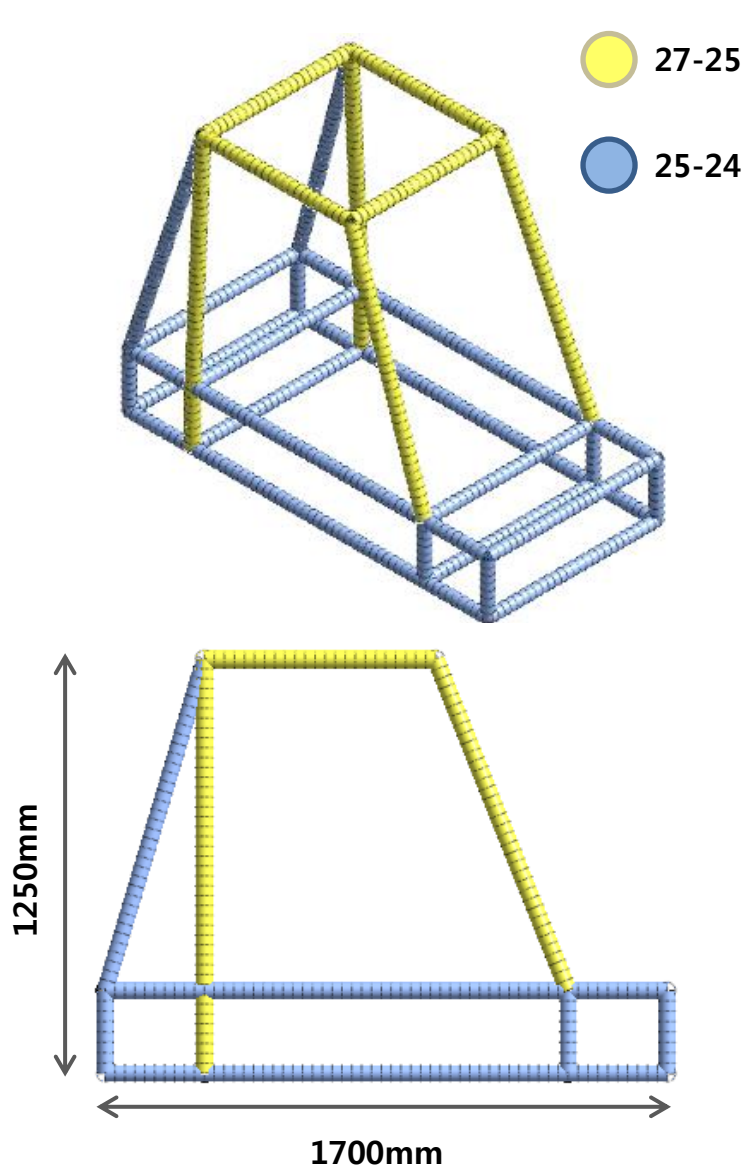
Torsional Stiffness

12000 Nm/°

Frequency

40 Hz

frame



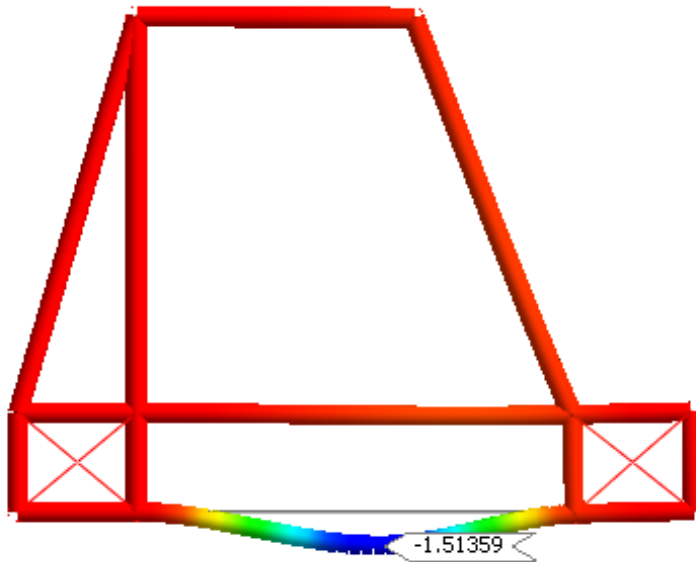
Typical SUV design



Reflect driver's physique

analysis

Bending

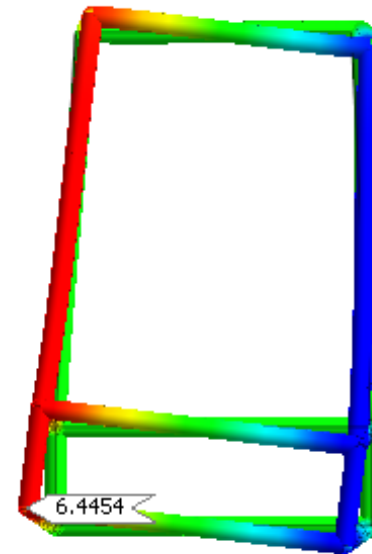


1321.711 N/mm

Frequency

31.104 Hz

Torsion

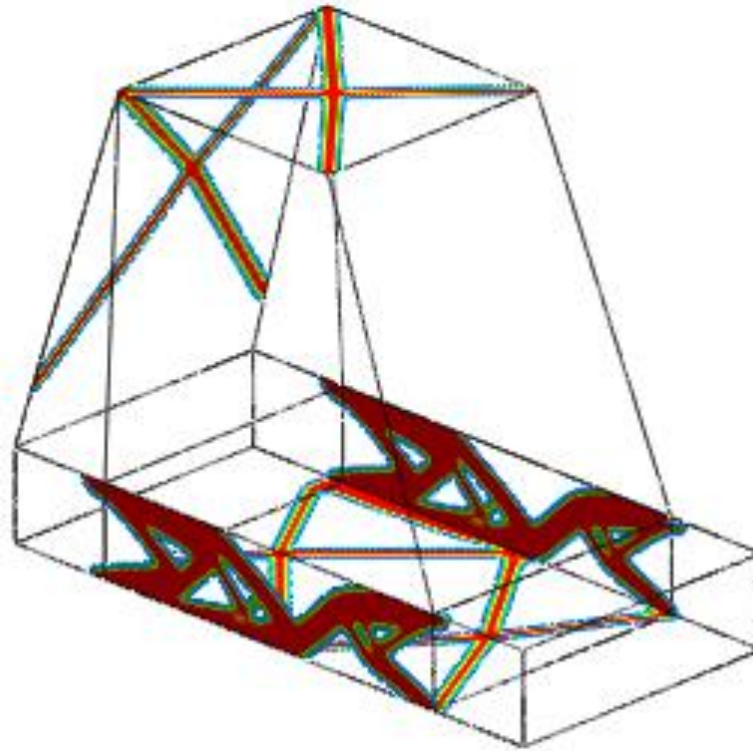


198.591 kNm/rad

Weight

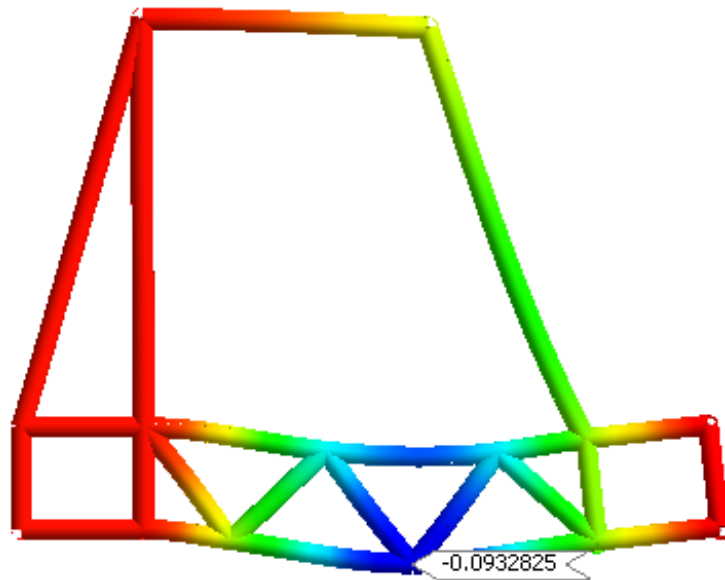
38.65 kg

topology opt.



side reinforced

Bending

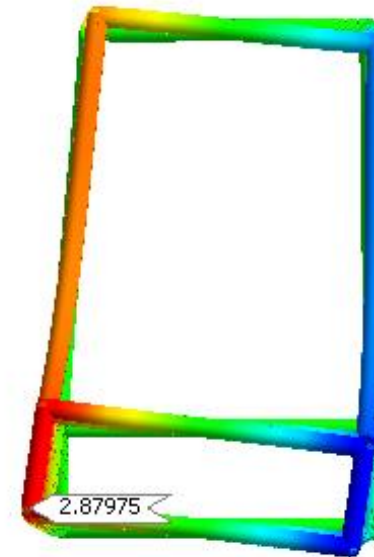


21400.82 N/mm

Frequency

45.673 Hz

Torsion



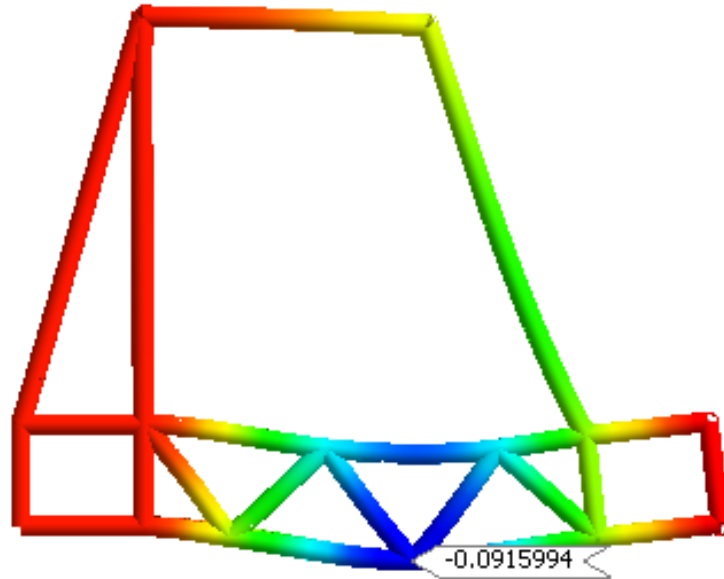
444.483 kNm/rad

Weight

42.6 kg

cross members reinforced

Bending

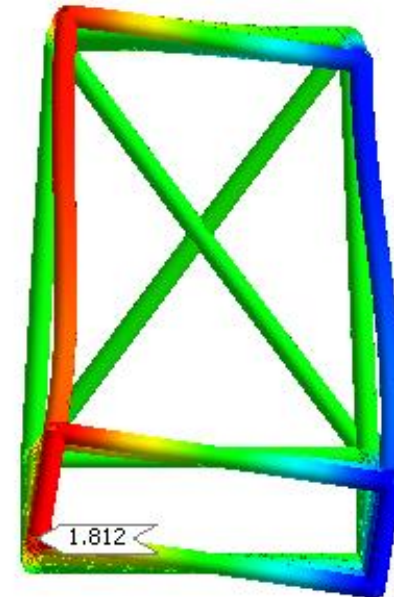


21836.45 N/mm

Frequency

56.355 Hz

Torsion



706.401 kNm/rad

Weight

52.612 kg

Variables

Objective

Constraints

Section size

Minimize weight

Bending Stiffness

Roll cage

50kg

20000 N/mm

Base frame

Torsional Stiffness

Side beams

650 kNm/rad

Cross members

size opt.

DIM1	<input type="text" value="27"/>	mm
DIM2	<input type="text" value="25.3721"/>	mm

DIM1	<input type="text" value="27"/>	mm
DIM2	<input type="text" value="25.3819"/>	mm

DIM1	<input type="text" value="25"/>	mm
DIM2	<input type="text" value="23.9139"/>	mm

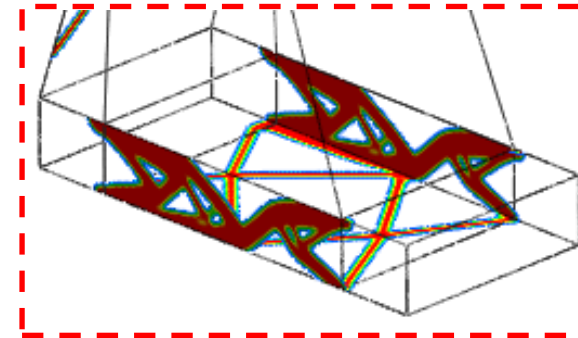
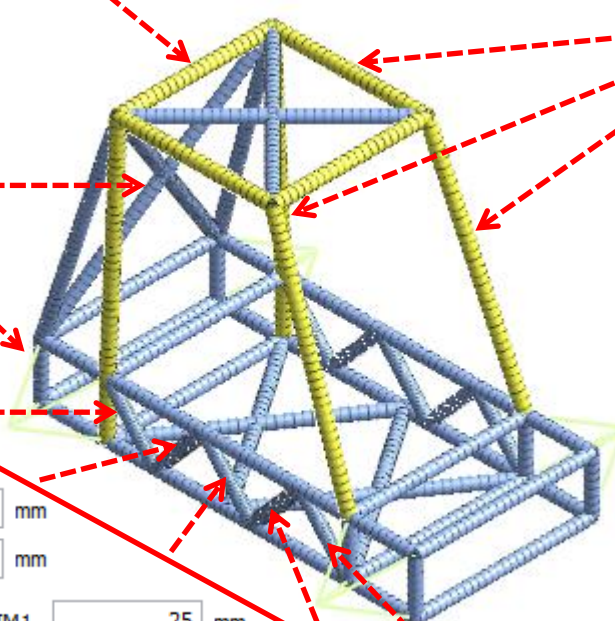
DIM1	<input type="text" value="25"/>	mm
DIM2	<input type="text" value="23.8569"/>	mm

DIM1	<input type="text" value="25"/>	mm
DIM2	<input type="text" value="23.9717"/>	mm

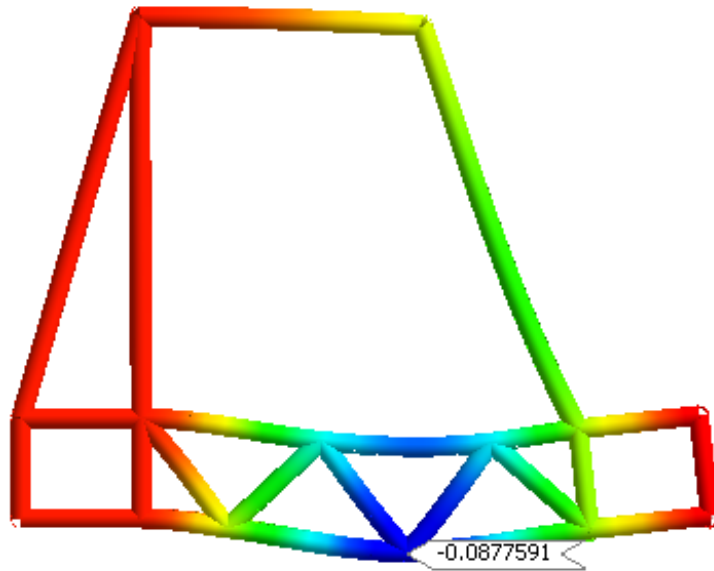
DIM1	<input type="text" value="25"/>	mm
DIM2	<input type="text" value="24.0998"/>	mm

DIM1	<input type="text" value="25"/>	mm
DIM2	<input type="text" value="23.9735"/>	mm

DIM1	<input type="text" value="25"/>	mm
DIM2	<input type="text" value="24.0212"/>	mm



Bending

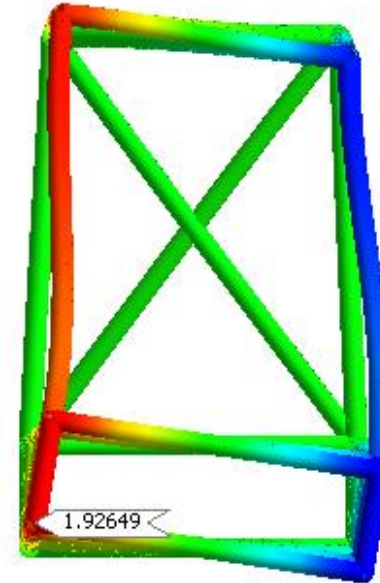


22789.69 N/mm

Frequency

59.431 Hz

Torsion



664.421 kNm/rad

Weight

49.95 kg

Q & A