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ADOPT!VE

Automated Design and Optimisation of Vehicle Ergonomics

SAFER Project Result Day, March 19

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Purpose and aim of ADOPTIVE

Digital human models

Accurate body shape

Adapted for seated posture

Represent anthropometric and behavioural diversity

Identification and visualisation of users having problems using the vehicle interior or exterior

Simulation functionality

Accurate posture prediction

Evaluation, adjustment and development of driving strategies

Including activities and traffic situations

Automated virtual population fitting trials

Ergonomics evaluation

Collision/clearance handling

Reach

Vision analysis

Comfort

Force/muscle activity

Visualise the effect of different design alternatives in an optimisation process

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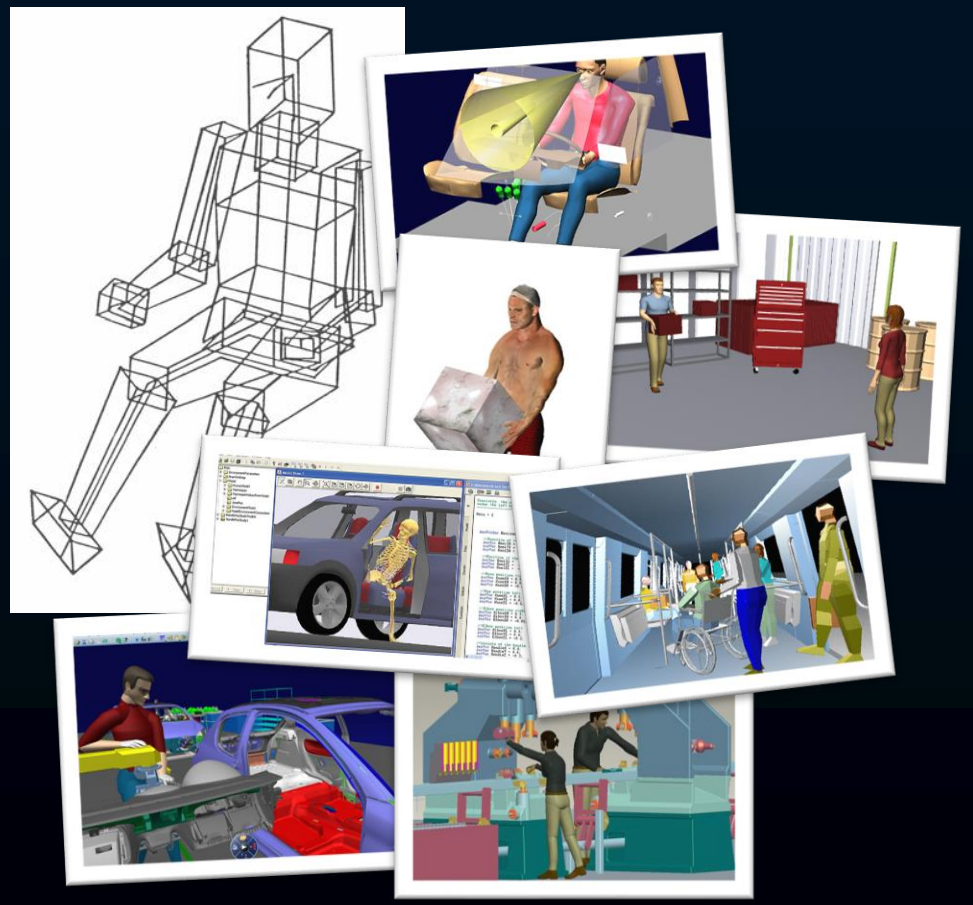
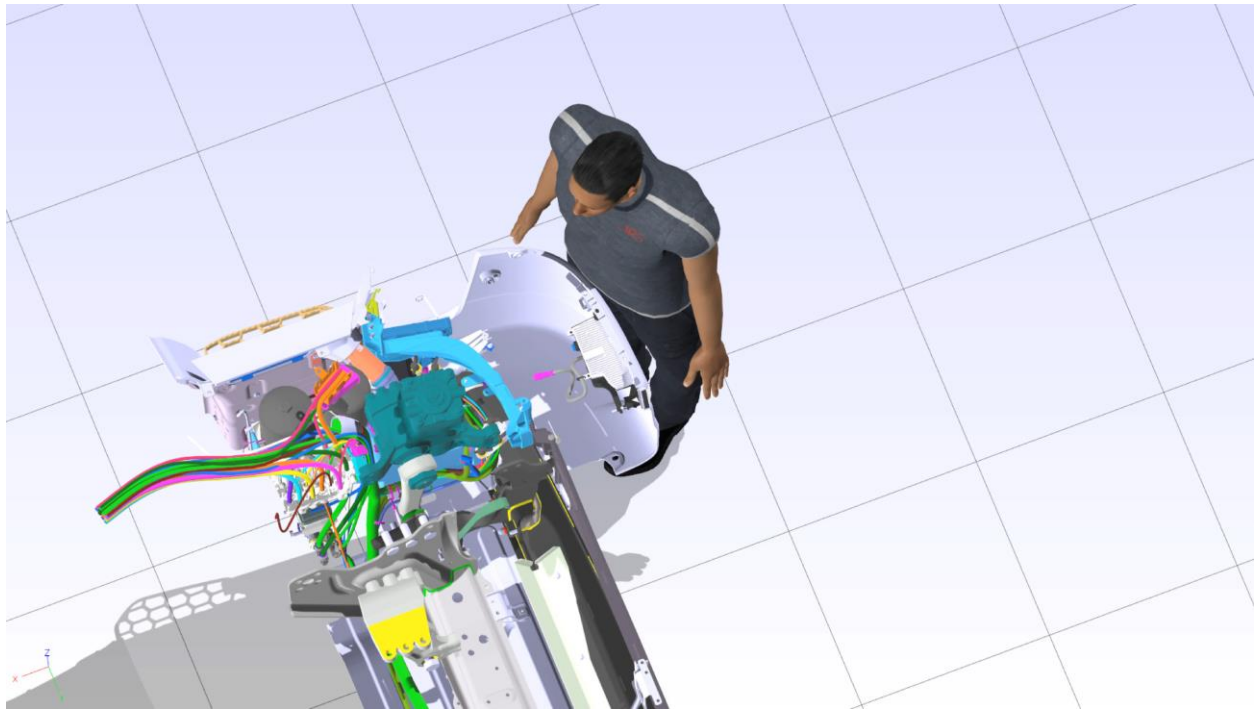
Digital human modelling - DHM



IMMA – Intelligently Moving Manikins



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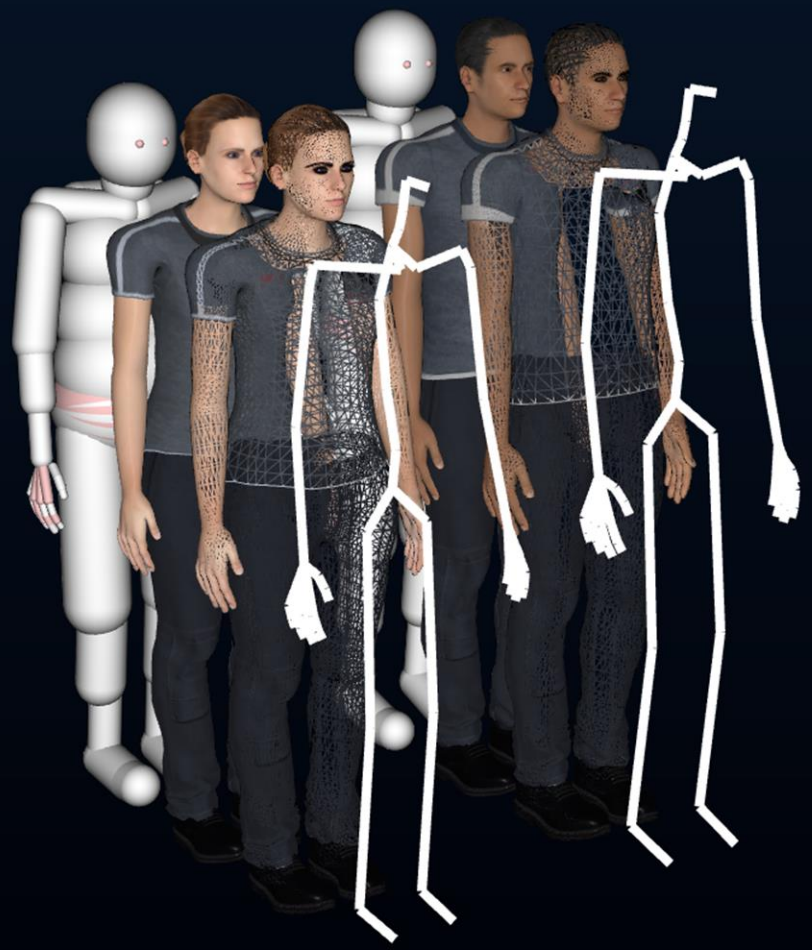
Digital human modelling - DHM



Results from previous Virtual Driver Ergonomics project

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DHM –Diversity consideration

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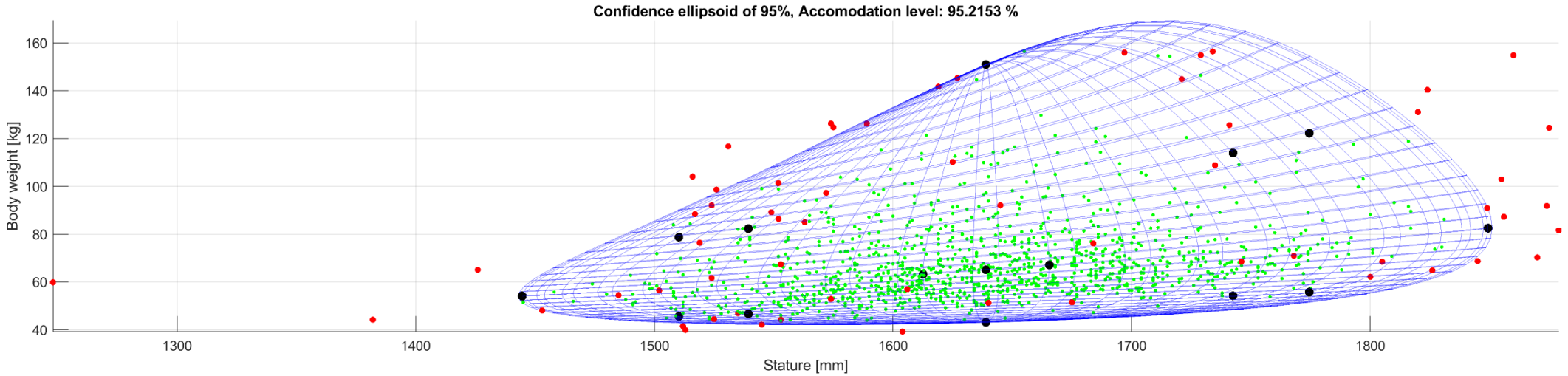

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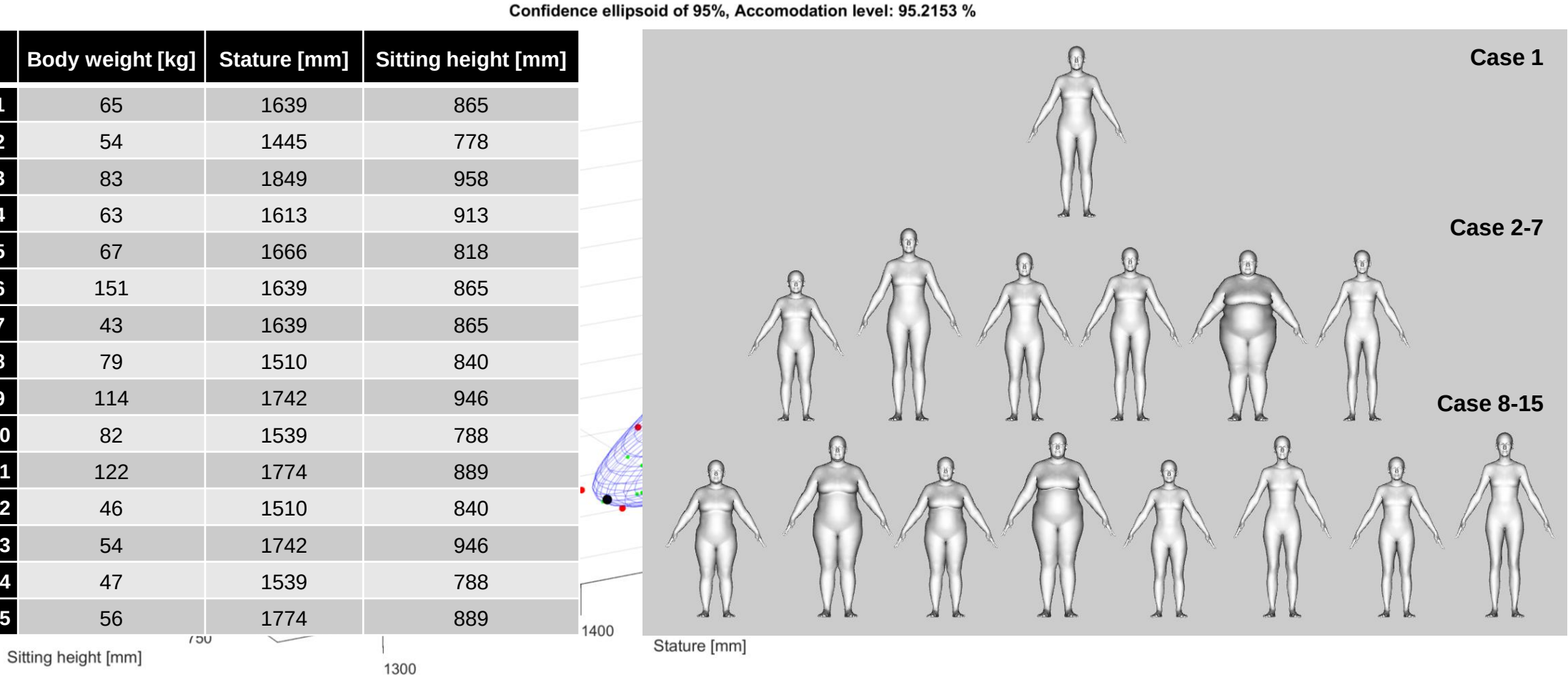
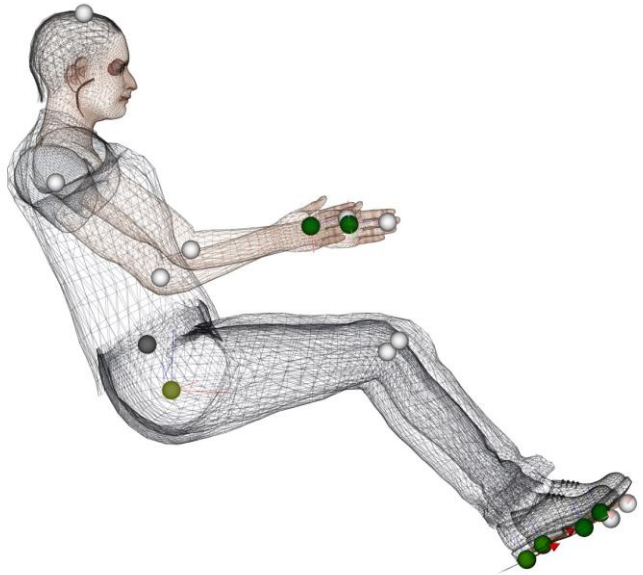
DHM –Diversity consideration

	Body weight [kg]	Stature [mm]	Sitting height [mm]
Case 1	65	1639	865
Case 2	54	1445	778
Case 3	83	1849	958
Case 4	63	1613	913
Case 5	67	1666	818
Case 6	151	1639	865
Case 7	43	1639	865
Case 8	79	1510	840
Case 9	114	1742	946
Case 10	82	1539	788
Case 11	122	1774	889
Case 12	46	1510	840
Case 13	54	1742	946
Case 14	47	1539	788
Case 15	56	1774	889



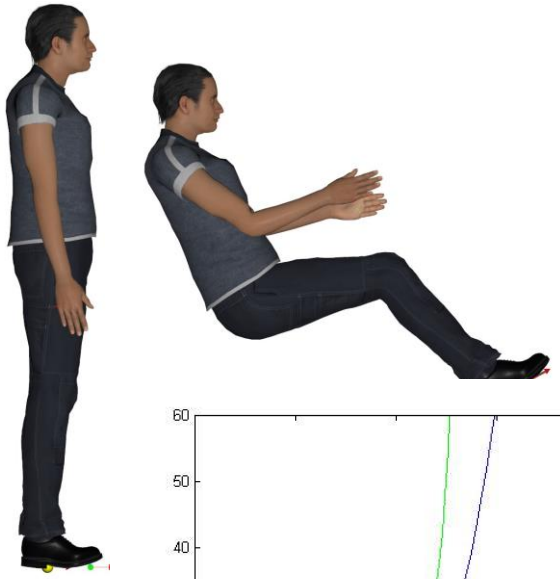
IMMA core simulation functionality

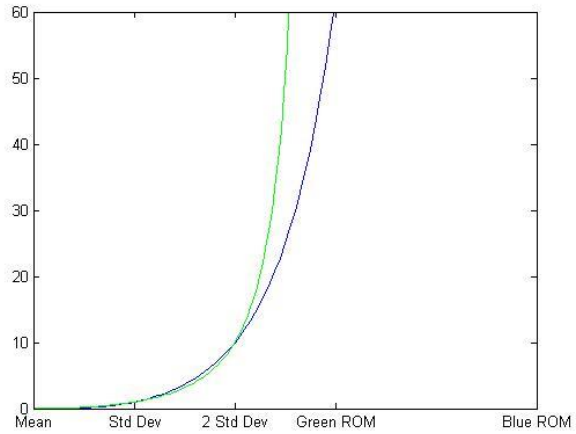


Attachment & Interaction points

Strategies

- The manikin is gravitating towards a preferred posture
  - While maintaining already existing constraints and comfort
- Different weights can be specified for the joints
  - Potential power
  - Scalar multiplier





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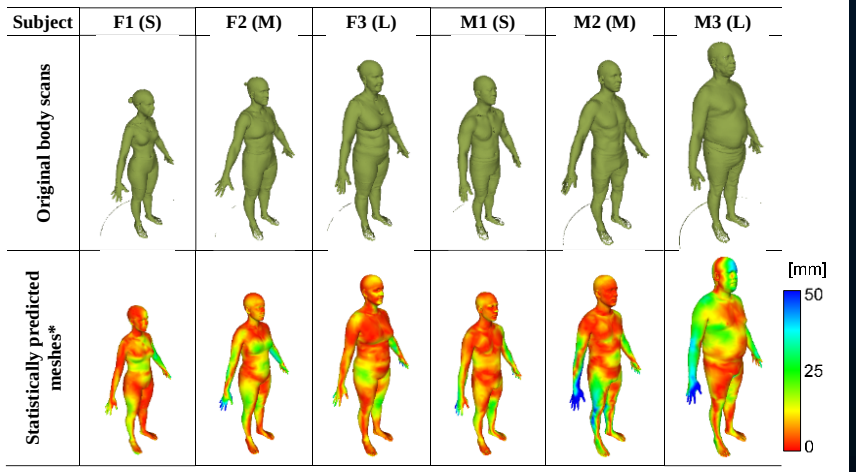
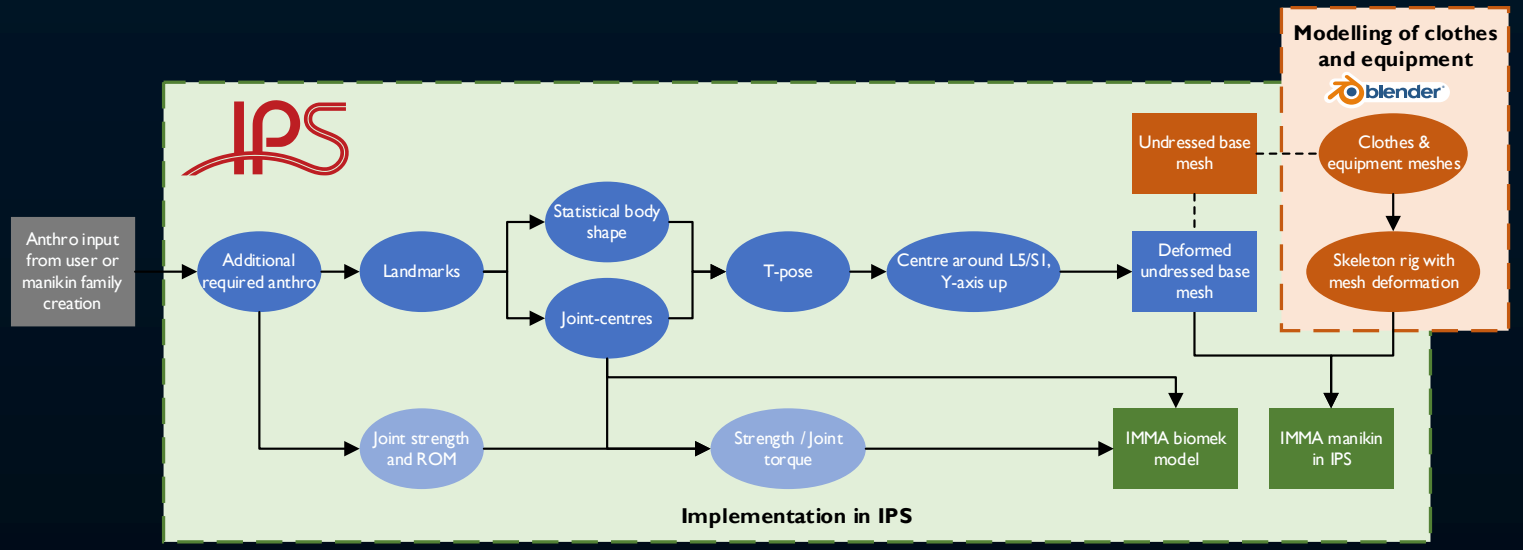
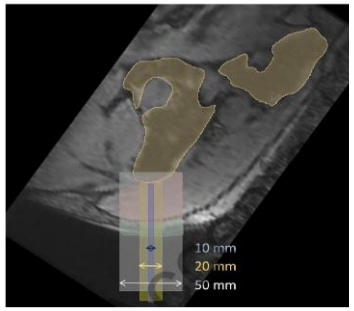
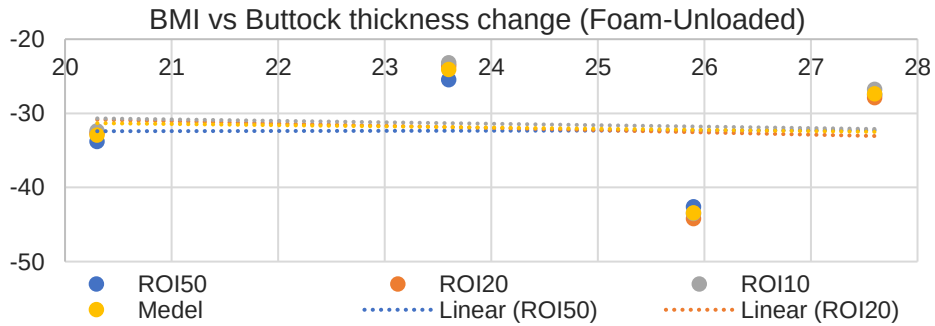
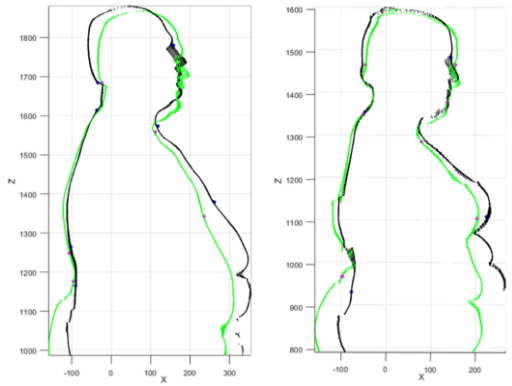
ADOPTIVE – Digital Human Models











Xuguang Wang, Léo Savonnet, Loïc Capbern & Sonia Duprey (2021) A Case Study on the Effects of Foam and Seat Pan Inclination on the Deformation of Seated Buttocks Using MRI, IISE Transactions on Occupational Ergonomics and Human Factors, 9:1, 23-32.

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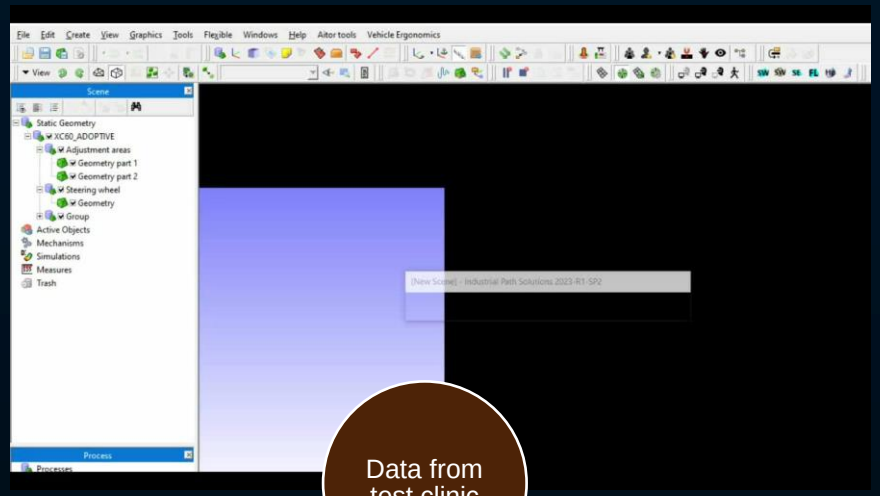
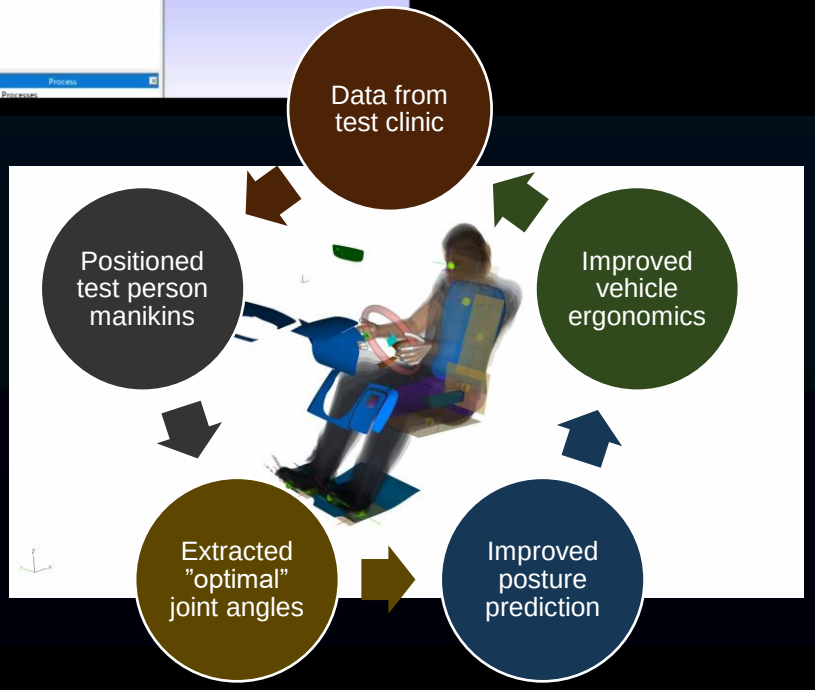
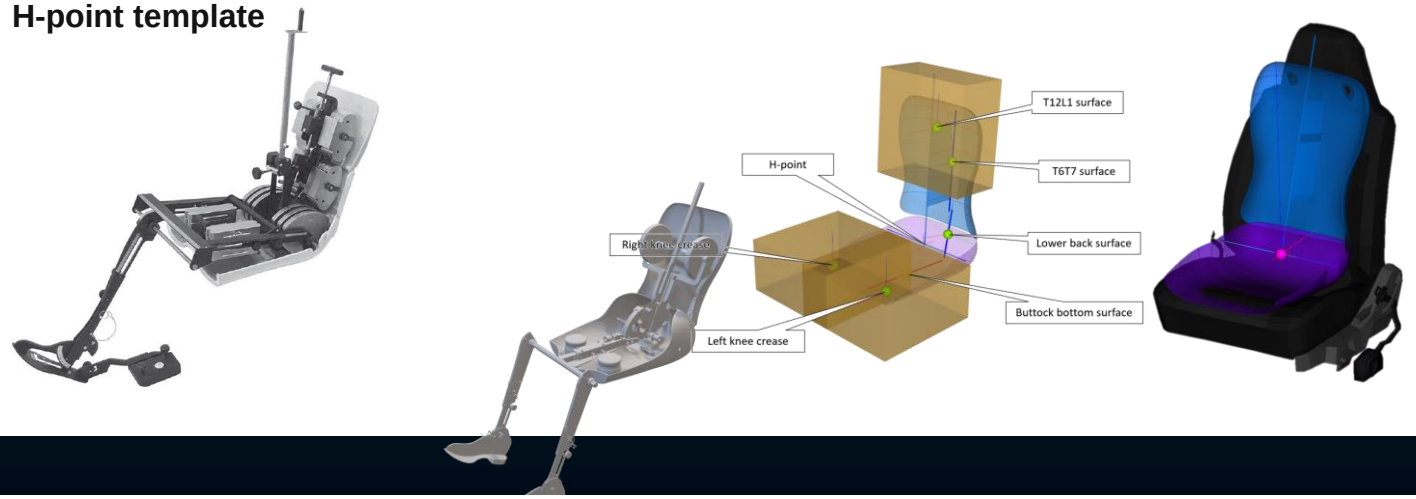
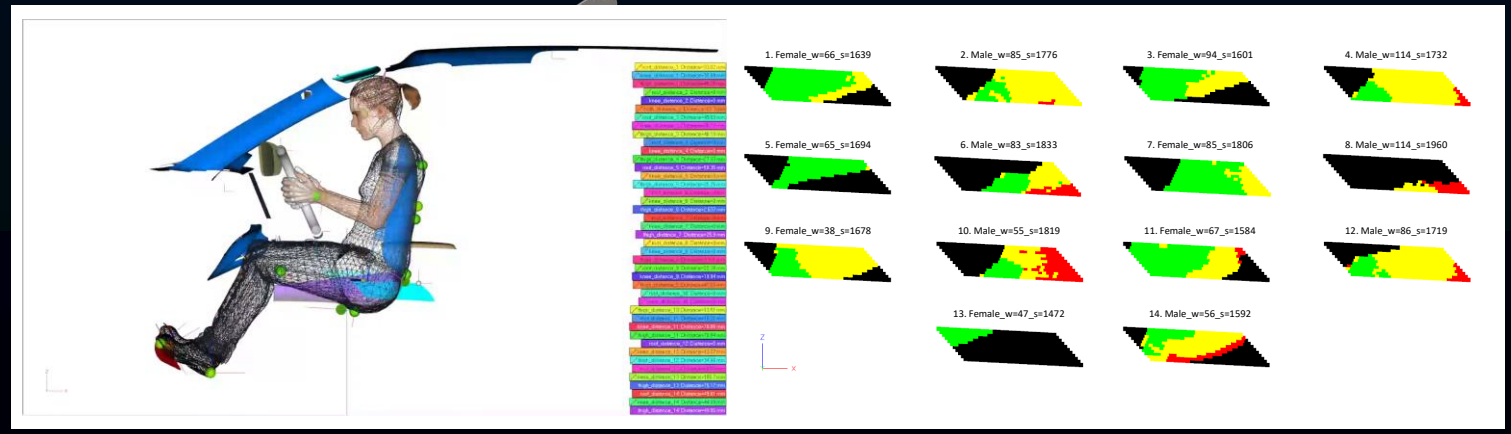
ADOPTIVE – Static posture prediction





H-point template





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ADOPTIVE – Scenario simulation

Virtual Representation of Driver Behaviour and Sitting Posture

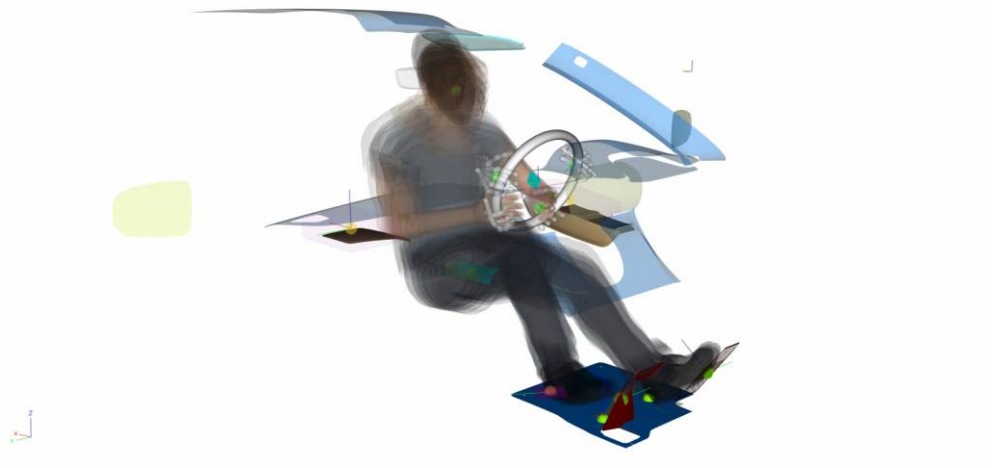
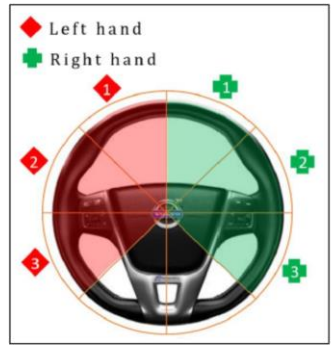
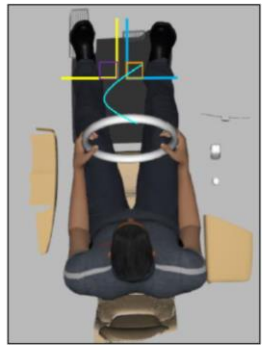


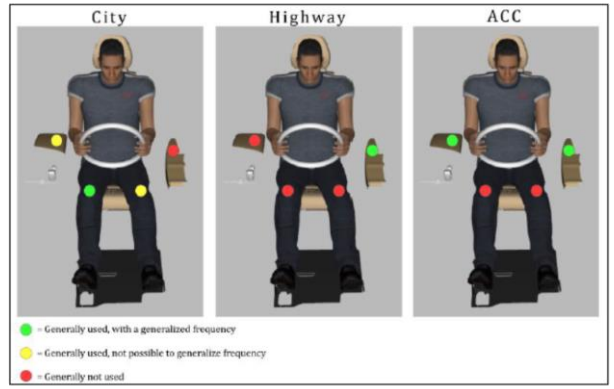
Figure 4.18 Drivers leaning forward on a) steering wheel and b) mainly on arm support.

Figure 4.19 Deviating driver behavior, a) pushing body back at 9.22 min, b) standing up straight at 9.24 mint, and c) going into a crossing at 9.26 min.

Figure 4.17 Crossings in the city where many drivers leaned forward for visibility: a) the crossing between Lilla Bergsgatan and Haga Kyrkogata, b)the crossing over Vasa Allén and c) when turning to Parkgatan.







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ADOPTIVE – Ergonomics evaluation

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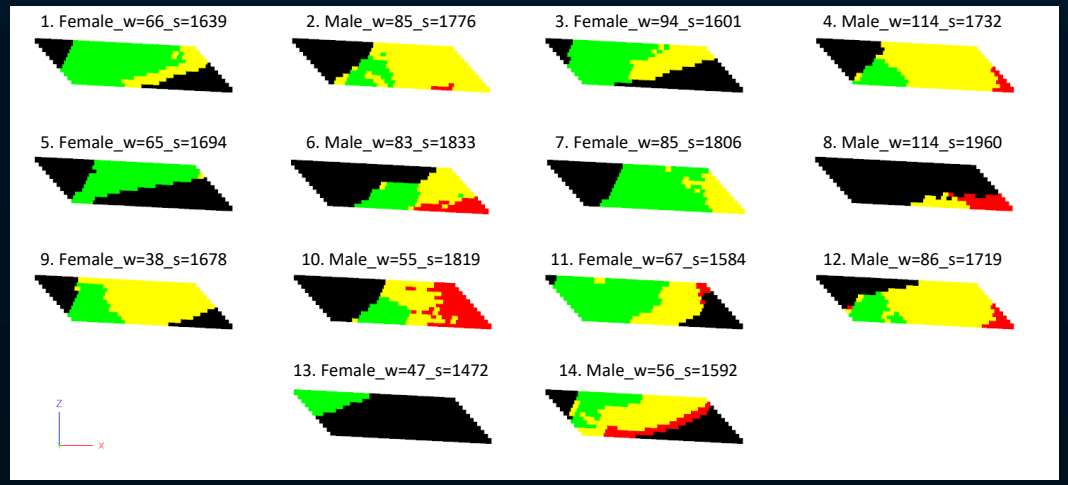

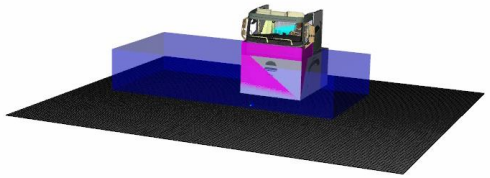

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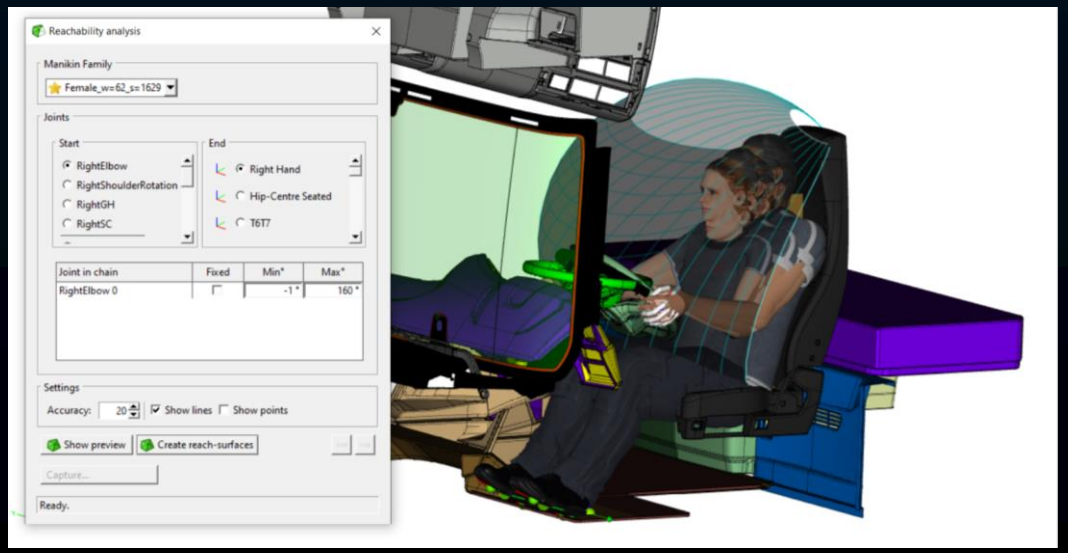
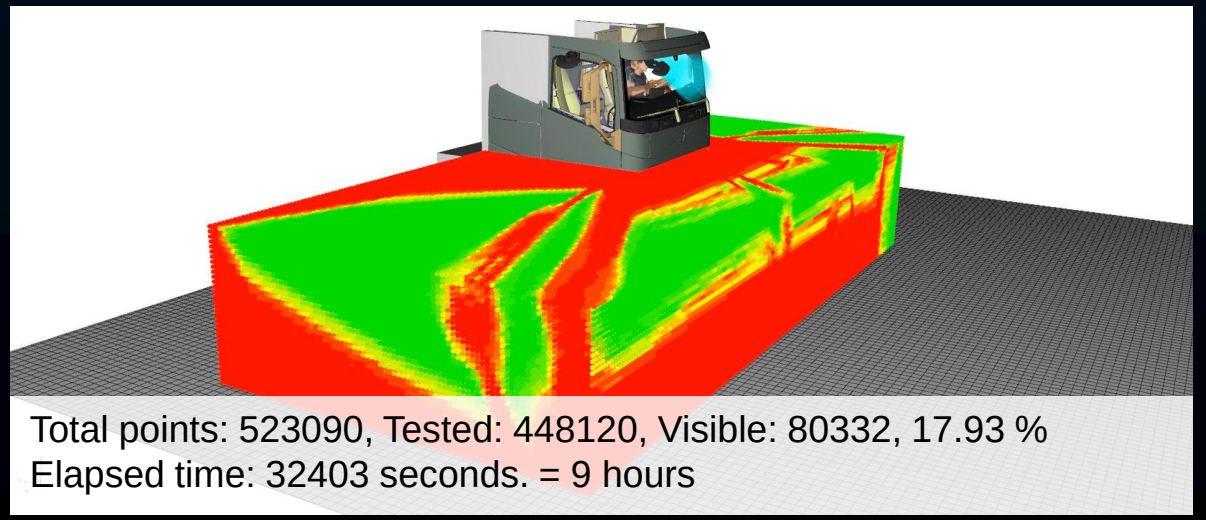
Elapsed time: 44 seconds





Total points: 523090, Tested: 448120, Visible: 80332, 17.93 %
Elapsed time: 32403 seconds. = 9 hours

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ADOPTIVE – Relation to SAFER

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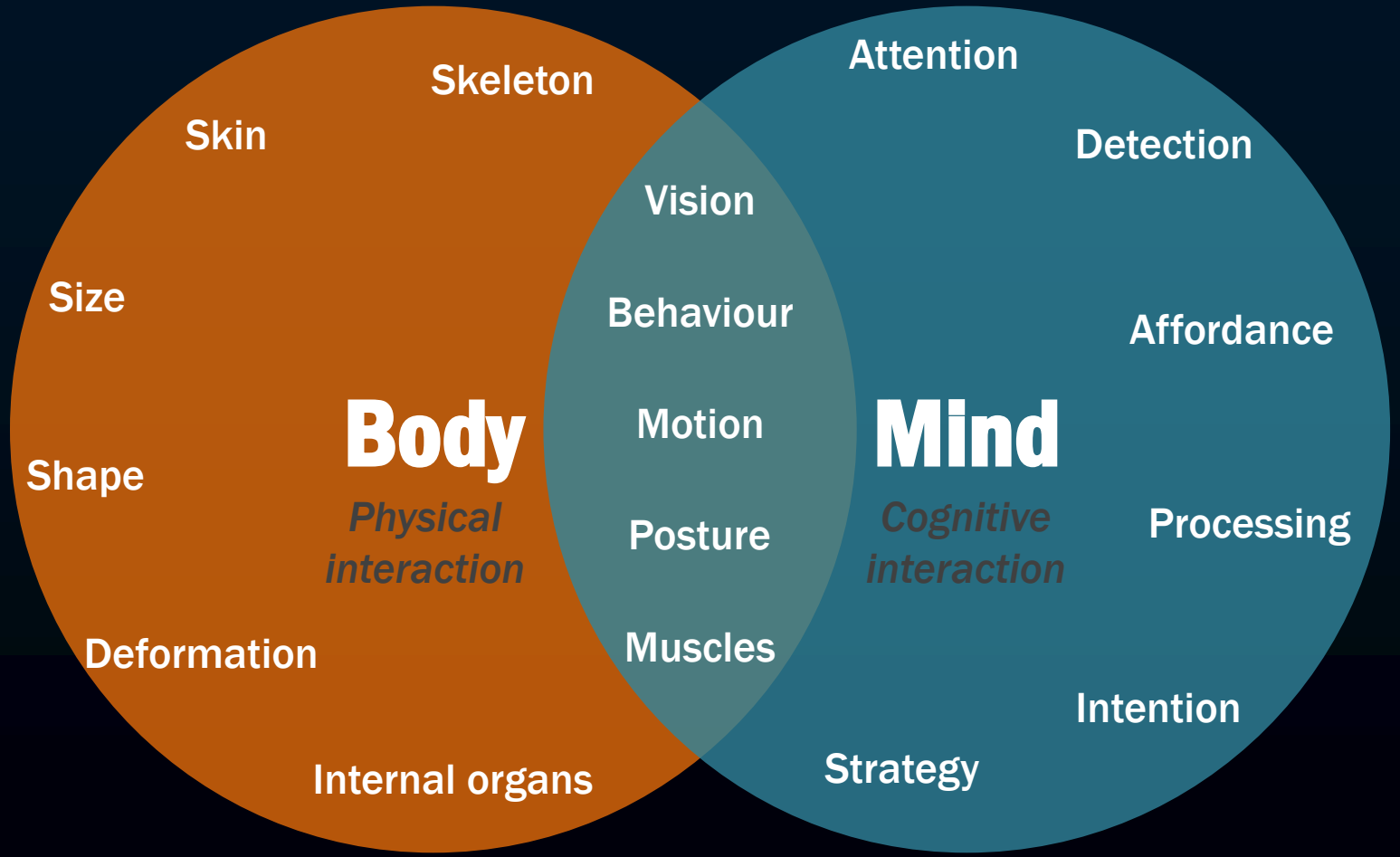
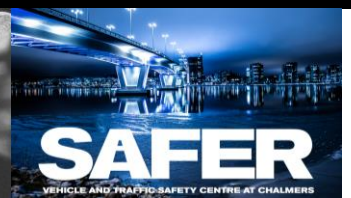


Technology to measure
Sensors for eye gaze, mocap, etc.

Technology to be designed
UI systems, security systems, etc.



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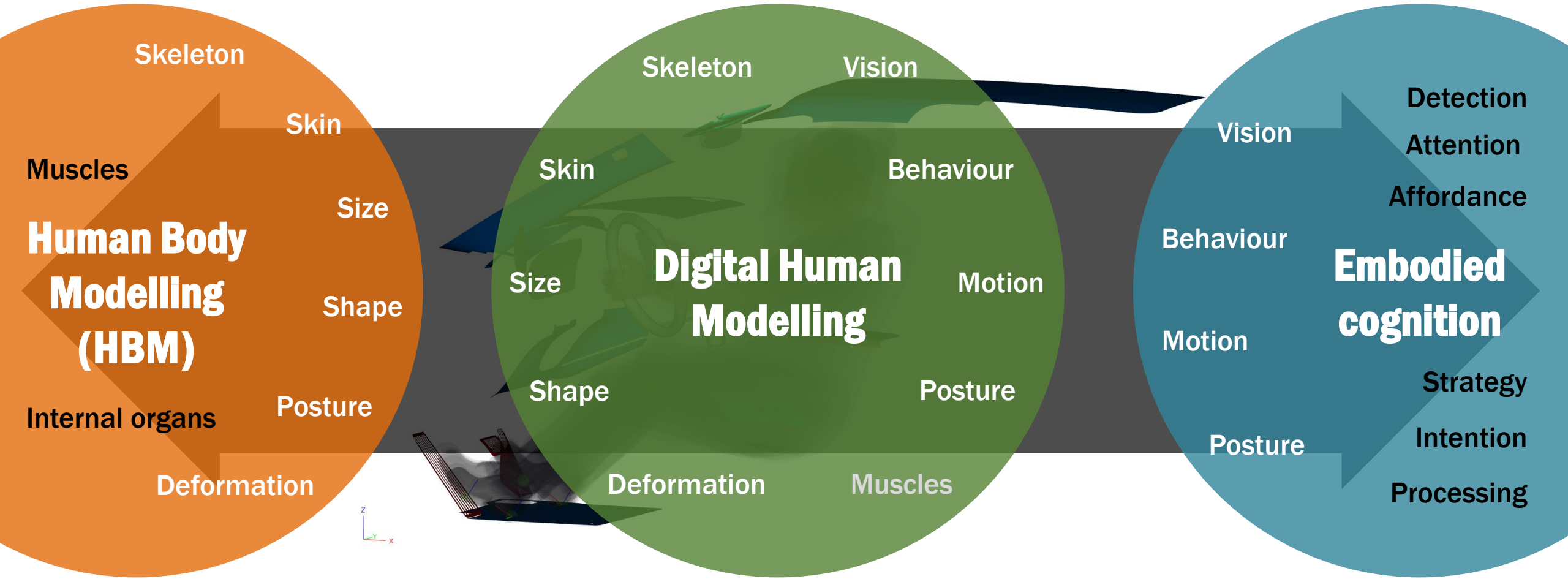

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Welcome to the final presentation of the ADOPTIVE research project!

Day: March 25th 2024
Time: 13:00-15:00
Place: Demostudion, Lindholmen, SAFER, Lindholmspiren 3A, second floor & Online (Zoom)

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