

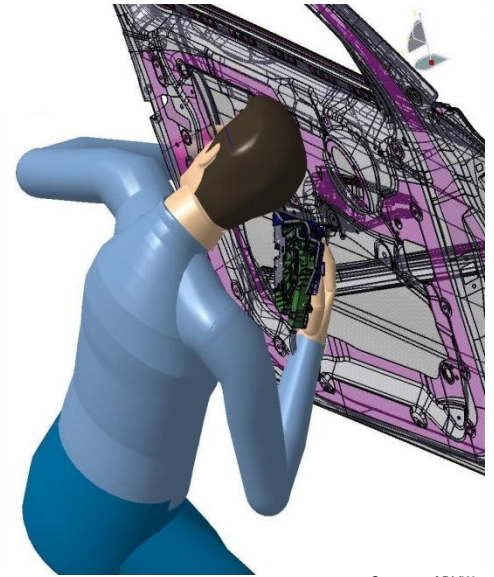
Kineo Human Path Planner for fast validation of Human Task Operations chosen by BMW - virtual prototype division

Introduction

The most valuable asset of any company is its workforce, and employees' health should therefore always be at the heart of workplace design. For this reason the BMW Group uses computer simulations to enable early and exact planning of assembly tasks. The core aim of computer-aided ergonomic analyses is the reduction of physical effort during the assembly work.

To enable production processes to be planned as early as possible and avoid errors in workplace design that would otherwise result in high costs, BMW Virtual Prototype division dedicates itself to optimizing work procedures and assembly tasks by validating component integration processes. For this they carry out a wide range of feasibility studies throughout the development cycle of a vehicle.

A critical point here is the human task operations, the validation of visibility and accessibility in different assembly scenarios, respecting kinematic constraint of human.



Courtesy of BMW

Technical Issues and Challenges

Validating the assembly and extraction feasibility for different parts in a complex geometry by respecting kinematic constraints of humans including any production tolerance variation is an important part of the validation process in the virtual prototype division.

Moreover, due to ongoing design development, it is often necessary to repeat validation studies several times as the design evolves either at a component level or around items with close proximity to the component.

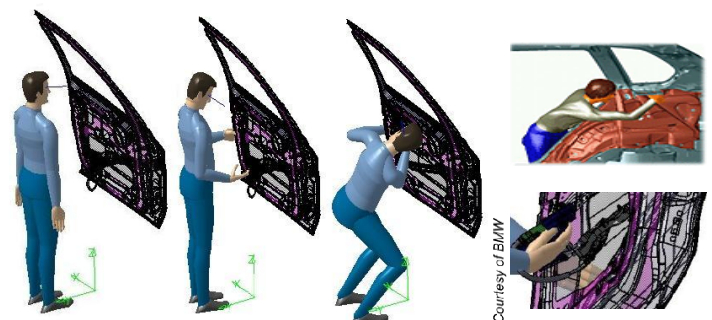
The ability to document the results with high quality simulations for effective communication purposes is therefore one of the challenges of a successful prototype development study.

Before working with Kineo Human Path Planner the virtual prototype division used to manually search for the collision-free human task by moving the component with the manikin along a desired assembly path within a 3D digital mock-up session.

Beyond the time required to complete the assembly study, a greater challenge in the process was to identify and communicate precise information (when mounting/dismounting was not feasible) which would lead to the issue resolution.

If a collision-free human task had been found, there was no chance to easily and quickly analyse the path with different tolerance values.

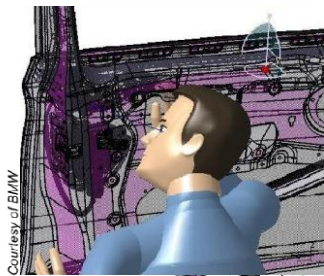
Furthermore, with no possibility to re-use the path from the initial check, repeating the study (for instance after a design modification) was the only viable method of validating a design change and was just as time consuming as the initial check. Different results would be obtained by different users for the same study.



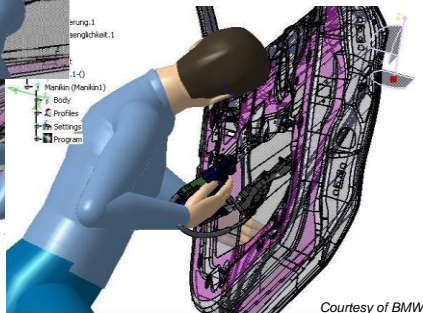
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Solution

Today, with Kineo Human Path Planner, the virtual prototype division of BMW simply selects the geometry, specifies the human kinematic constraints and the human task, and launches Human Path Planner which assesses automatically a collision-free human task or human activity group, transforming in extremely short time a colliding human task into a new collision-free human task.



If no collision-free human task exists, they can easily identify and document the bottlenecks for a precise communication of design changes.



If the human task proves to be feasible for a design, the prototype division saves the resulting path for future re-use on repeated changes to speed up the re-validation. From a resulting path, they can also rapidly assess different scenarios with different tolerances/obstacles and repeat the study to evaluate robustness of the output path.

Courtesy of BMW

Conclusion

The main benefits of using Kineo Human Path Planner for the studies in the virtual prototype division are:

- Evaluation of visibility, accessibility and restrictions of the human body during disassembly operations
- A safer global Design process: Thanks to unmatched performance, computational times are so short that it is possible to increase the number of case studies resulting in an improved process validation
- Confidence in results is high in all cases due to the ease and speed with which it is possible to re-run the solution with differing tolerances/obstacles allowing different scenarios to be assessed
- Repeat studies are speeded up with the re-use of the previous path
- Different users achieve very similar results

In today's market not only are geometrical aspects more and more relevant in virtual prototyping, but also the capability of evaluating visibility, accessibility and restrictions of the human body during disassembly operations. With KINEO Human Path Planner the Vehicle Virtual Prototype division is quickly able analyze these issues, allowing them to communicate precise change information to the Design office early in the design phase, avoiding late design changes and reducing global costs and time-to-market.