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VIRTUAL ASSEMBLY WITH DELMIA DPM

Abstract

Industrial assembly is nowadays subject to quick product changes, increasing numbers of variants and short planning spans of the customer. This can be achieved by using, presented in this paper, new methods and approaches like virtual reality and last but not least virtual verification of processes in assembly.

1. INTRODUCTION

The main goals of nowadays production are quick product changes, increasing numbers of variants and short planning. Because of the relatively high percentage of manual work the cost pressures from low wage countries is especially high. These challenges can be effectively met, however, through a comprehensive rationalization approach to the assembly, highly flexible assembly technology and qualified personnel. Depending on the product complexity, variant diversity and output rate there are a number of concepts available, which are situated between the competing demands of productivity and flexibility. On the other hand enterprises are trying to continually increase their effectiveness in assembly in order to ensure their competitiveness. They want to product quicker and with lower costs. This requires shorter delivery times reduced operating costs, efficient use of resources and optimized material and information flows. Because of that the collaboration of all software systems for design, process planning, manufacturing and assembly is very suitable. This can be achieved by using new methods and approaches, which are described below.

2. VIRTUAL ASSEMBLY

Assembly is divided into 2 sectors, manufacturing and maintenance, where in maintenance disassembling is an important factor, too. Today's vehicle front compartments are filled with numerous additional servos as well as safety and electronic equipment, in opposite to those 20 years ago. Within the factory assembling there are more possibilities to implement intelligent sequences, in maintenance it is sometimes elaborate to find good ways to minimize the effort.

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There exist a lot of tools like interactive digital mock-up (DMU) and automatic space and path finder to find space which could be used for additional parts. The problem of those software tools is that they are usually just observing space and path of the part itself and not the reachability of the position and the space needed for the tools and technicians body parts.

Fortunately there exist many assemblies which can be successfully performed even without the above mentioned techniques and therefore virtual assembly is a much used tool within the Product Development Process (PDP). Advances in the computer power (which is the field of PC cluster) make it possible to visualize millions of polygons at real-time speed on stereoscopic multi-sided displays.

On the fig.1 you can see an example of virtual assembly in praxis. The user is verifying, if there is a collision among parts.

Fig. 1. Virtual Assembling at an L-shaped Display

3. DELMIA V5/V6

Dassault Systemes Delmia V5 provides the enterprises with e-solutions to plan, create, monitor, and control manufacturing systems geared toward build-to-order and lean production. Solutions range from single-device activity to extended-enterprise production flow like process planning, cost estimation, factory layout, ergonomics, robotics, machining, inspection, factory simulation are issues, which can be solved with this tool. Delmia V5 is software solution from concept to implementation, enabling enterprises to increase productivity, lower costs, achieve better quality, and bring their products to market more quickly. All Delmia application suites are interoperable within one Product, Process and Resources data model, the PPR Hub. Engineers throughout the extended enterprise can have at their disposal data that is relevant and always current.

Fig. 2. Digital assembly with Delmia V5 DPM Assembly in Volkswagen AG

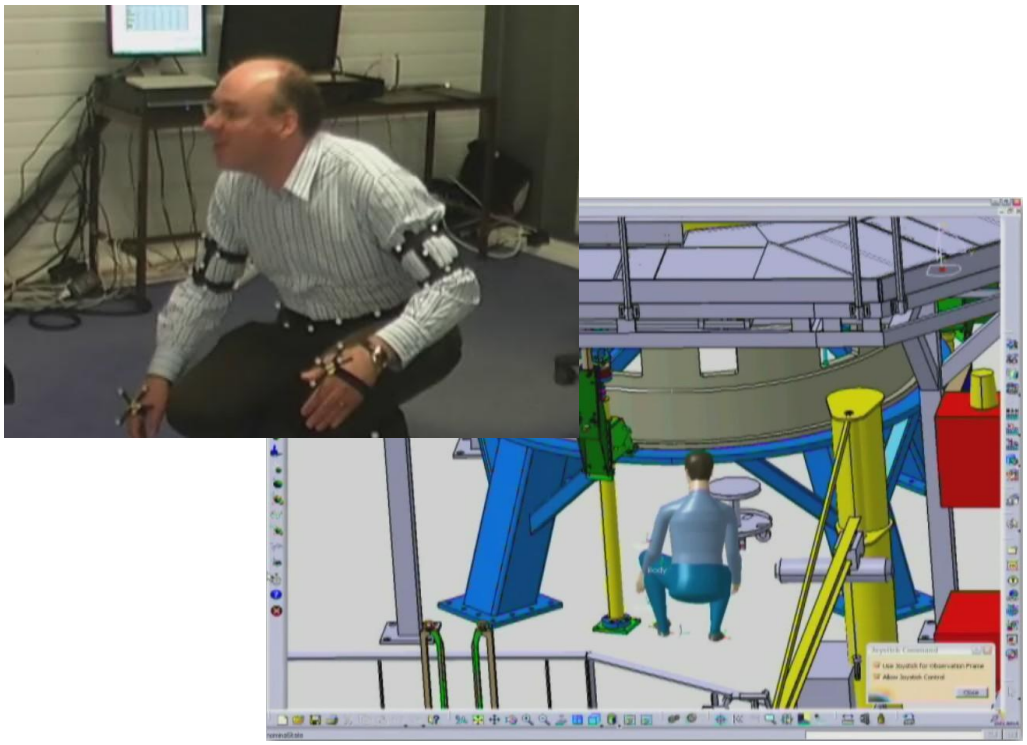

Fig. 3. Interactivity between reality and Delmia V5 DPM

DELMIA V5 DPM Assembly

DPM Assembly is module of Delmia V5 and is comprised of products designed to optimize both the process engineering and the assembly process by enabling users to author and validate their manufacturing process plan long before equipment is installed or moved inside the plant. This module is in praxis often used with another module V5 Human (e.g. in Volkswagen AG), what you can see on fig. 2. Nowadays are users experimenting with interactive collaboration of Delmia and reality, what you can see on fig.3. When the worker is squat, you can see it interactive on the display, that the virtual worker in Delmia is squat too. This is possible due to the sensors, which are placed on the worker`s body, and these sensors are transferring the worker`s movement to the scanning device.

DELMIA V6 R2009

Nowadays car producers like Volkswagen, Audi, Renault, Chrysler, and many others are using Delmia V5, but the Dassault Systemes early in December 2008 rolled out the new Delmia V6 R2009.

Delmia V6 delivers a natural interactive 3D PLM environment for creating, sharing, and experiencing manufacturing intellectual property (IP). It allows manufacturers in any industry to experience their entire factory production facility and its processes in a virtual 3D environment. It offers breakthrough manufacturing life-cycle management (MLM) business processes to help manufacturers achieve maximum production efficiency, lower cost, improve quality, and reduce time to market. By implementing Delmia V6 to address today's industry challenges, companies have the best solutions available to evaluate and interact with their factory operations. From the impact of small design changes to the impact of changes in global demand, manufacturers can respond quickly to changing competitive demands and take advantage of market opportunities.

New Delmia V6 provides the collaborative environment required to retain, protect, and continuously grow intellectual capital and to drive standardization of products, processes, and resources with the flexibility needed to meet industry demands.

Final assembly with Delmia V6:

Assembly planning – provide comprehensive assembly planning approach in a fully integrated environment where all involved planners can interact concurrently throughout the whole planning cycle

3D assembly validation – validate the product assembly and its processes in a full 3D environment, including tool and human aspects

Line balancing & layout planning – define, plan and optimize assembly line with the targeted cycle time

3D balancing verification & line optimization – validate and optimize balanced assembly lines in a 3D context

Automated station simulation – simulate and optimize assembly stations with automatic devices and robots. Generate and validate resource programs

Manual station simulation – Human solution natively integrated to process and assembly solutions to simulate and validate manual assembly tasks at work cell or line level

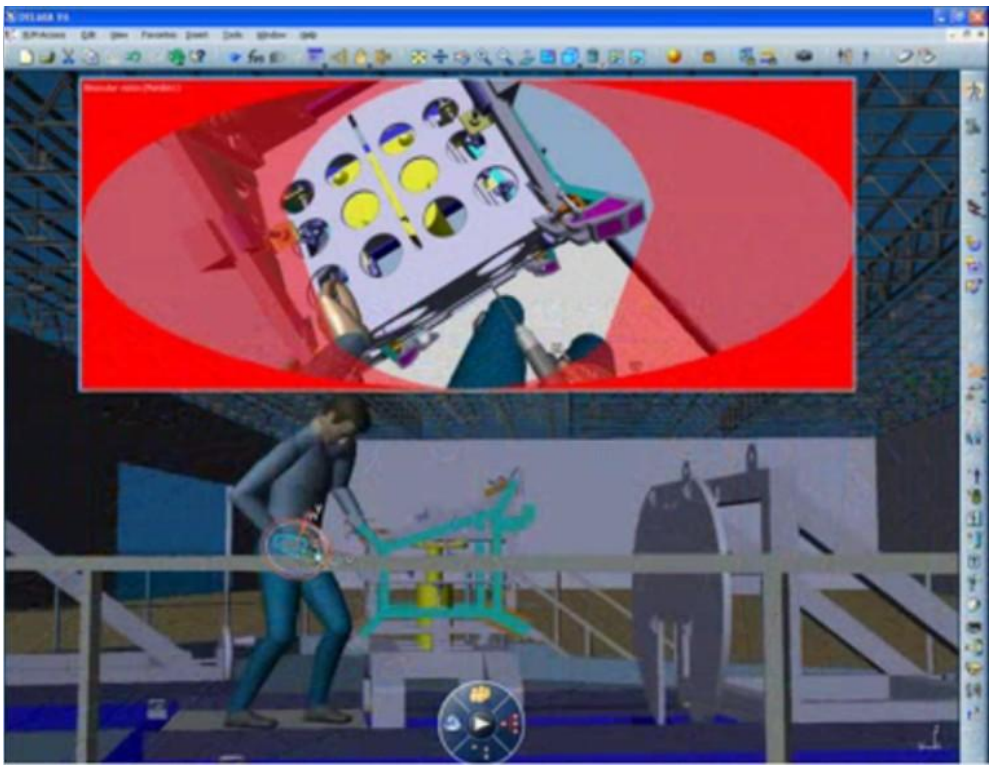

Fig. 4. Assembly with Delmia V6AG

4. CONCLUSIONS

Although virtual reality (VR) and virtual assembly is present for quite some years now, only now its potential is being appreciated from many fields, as until some years ago mainly the automotive industry had shown great interest in systematically utilizing such tools. But on the other hand there are a number of barriers to be overcome, in order to establish VR as a common and valuable tool to all application areas underlined. In particular, what should be proven and made clearly and widely visible in an early stage are the real benefits of VR or virtual assembly as an enabler to fast, cost-effective and valid product management.

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