



ZGDV in Flux I: Machines Shall Work High tech for maintenance and repair

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A modern, technical asset management is indispensable for being competitive. Maintenance essentially contributes to assure quality and to avoid expensive times of standstill. New technologies like Augmented Reality and Digital Storytelling or innovative systems like ADIVI optimize maintenance.

Technician Jack Miller must carry out a difficult repair of a machine. He is glad, for in the past he had to cart along the manuals, the laptop, and the necessary tools. Today, Miller needs just the MARIO system and tools. The system consists of a wearable computer and data glasses. The computer is fixed to the belt and connected by a cable to the head-mounted display, the mentioned data glasses.

»Start« – with this oral command the expert starts his work at the machine. He demands »continue« or »back«. By speech commands a pre-

viously entered scenario is controlled. On the one hand, the technician sees the real machine and, on the other hand, the repair instructions in form of virtual information. This superposition of reality (therefore called Augmented Reality) enables him to finish the complex repair work quite easily. He can move his hands freely and he must not repeatedly have a look into the laptop or the manual. The MARIO system considerably raises the efficiency of maintenance work.

More information in the video

Jack Miller moans. Even now he must maintain numerous machines. Now he will get two more, very complex machines. How to become familiar with them within a few weeks? When Jack Miller inserts the DVD into the computer he is surprised. This is not a conventional instruction video. In fact, ADIVI opens automatically. Add Digital

German Abstract

Ein modernes, technisches Anlagenmanagement ist unumgänglich für Wettbewerbsfähigkeit. Die Instandhaltung trägt wesentlich zur Qualitätssicherung und zur Vermeidung teurer Stillstandszeiten bei. Das Zentrum für Graphische Datenverarbeitung e. V. ZGDV entwickelt erfolgreiche und innovative Lösungen für den Bereich Maintenance. MARIO, ein mobiles System auf Basis der erweiterten Realität, unterstützt bei Wartung und Instandhaltung durch die Einblendung von virtuellen Informationen in das Sichtfeld des Bearbeiters. Mit Add Digital Information to Video, High-End-Visualisierung oder dem interaktiven Dialog mit virtuellen Charakteren stehen weitere technologische Highlights bereit, die Effizienz und Qualität in der Wartung und Instandhaltung deutlich zu steigern.



MARIO – an easy way to maintain a heat exchanger. At the booth of Rittal during the Hannover Messe Industrie 2006 the highlight exhibit.

Information to Video (ADIVI) shows, besides the video, also nearly unlimited detailed information about the particular area.

The conventional video is static. ADIVI makes it more dynamic and thereby revolutionizes the increasingly used medium. Jack Miller goes with the cursor into the running video. So-called sensitive regions (semi-transparent rectangles) appear. A click onto the marked surfaces in the video shows him the related switchboard of the system. In this way he learns selectively, and therefore faster and effectively the complex system of the machine.

The virtual colleague

Jack Miller sees the functionality of the machine when he clicks a sensitive region on the DVD. He clearly sees all details and can view the processes again and again. Thanks to the high-end visualization, the virtual animation is so realistic that Jack Miller can easily memorize the processes. But the visualization offers even more. Part of the complicated maintenance and repair processes is displayed three-dimensionally. For the machine service expert a real support.

Then Jack Miller discovers the ENGI button. He clicks on it and cannot yet imagine what will happen. »Hello,« says a computer voice. On the screen a kind virtual character is smiling at him. »May I introduce myself. I am Engi, your virtual colleague. Please ask me if you want to know something about the machine.« Jack Miller is astonished. He already has some questions he is bursting to ask and which the DVD has not yet been able to answer. But the answers of ENGI are even more astonishing.

Behind ENGI is the so-called Digital Storytelling. With this technology it is possible to make the increasingly humanlike characters real contact persons for information or problem handling. The ZGDV set the starting point for the interactive dialog with virtual characters in the mid-nineties.



The head-mounted display brings the real and the virtual world together.



The user sees the virtual information in his field of view.

To make further details of the work steps available, additional information can be added optionally.



Sensor herausschrauben Bitte den Sensor herausschrauben.



The 3D visualization supports context-sensitively.

Ende Alle Schritte wurden abgearbeitet.



The system provides immediate feedback about the state of the maintenance.

Benefit and advantages

Jack Miller is enthused. The new technologies of computer graphics enable him to become familiar with the new machines and carry out the maintenance and repair work in the twinkling of an eye. This efficiency is becoming increasingly important in the global business. According to a

study of the Institut für Mittelstandsforschung (institute for the research of small- and medium-sized businesses, ifm) for 87 percent of the interviewed enterprises the avoidance of standstill times is very important. The study even assumes that by selecting the adequate maintenance strategy 20 to 35 percent of the standstill

times can be eliminated and the cost for maintenance be reduced by 23 percent.

The advantages are obvious. Complex processes are easily realizable. The engineer gets all information he needs for handling a task, directly on site and context-related. The merging of information of most different media for the context-sensitive use. With the superposition of real scenes with virtual information we now have possibilities at hand that allow the user to get situation-related information for his work without a media break.

The technological potential, however, is by far not fully developed. The systems are designed for collaborative work. That means that for example a technician in the main office can make the proper repair scenario remotely available to the mobile outdoor staff. Both outdoor staff and the technician in the main office are permanently connected to each other.

The visualization of complex contexts simplifies the understanding. Above all, if the user has the possibility to modify the settings in the displayed scene and view them in real time. The list of technological functions and features could be continued nearly at will. They all follow a basic orientation of the Computer Graphics Center: The use of latest developments shall be as easy, as intuitive as possible whether by natural forms of interaction, mobile information processes, or the proactive support of the user.

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