

Focus on IFA's work

Edition 1/2010

617.0-IFA:610.1

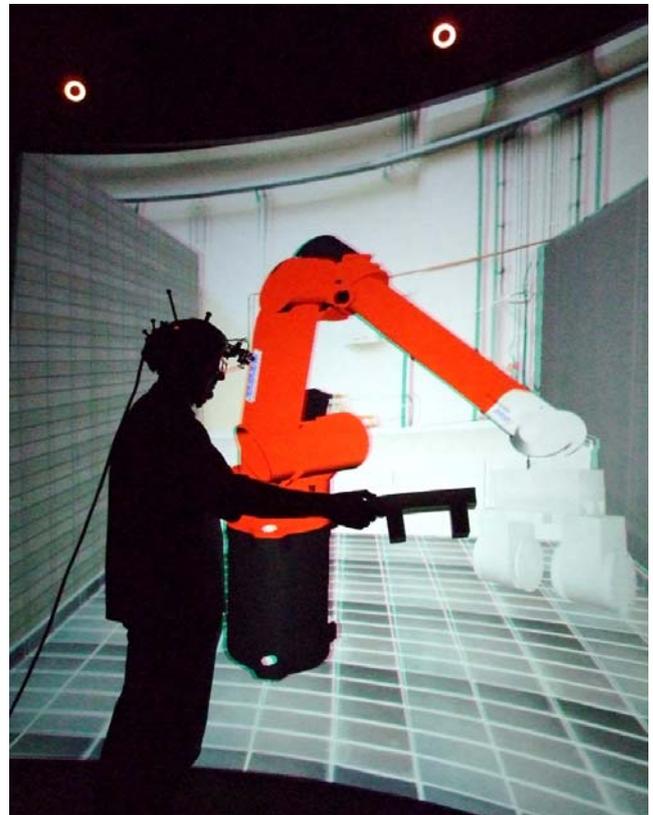
Using virtual reality to prevent occupational accidents

Problem

Every year, some 51,000 accidents occur on stationary machines and installations in trade and industry in Germany. Accident studies show that around a third of these accidents have technical causes. Conversely, many other accidents can be attributed to deficits in usability: ambiguities in the design of human-machine interfaces lead to maloperation; safeguards that obstruct the flow of work incite operators to defeat them.

If these accidents on machinery are to be prevented, the usability of machines must be increased. This means that machines must be as user-friendly and intuitive to operate as possible. Were it possible for a universal, user-oriented operating and safety concept to be implemented whilst a machine is still at the development stage, maloperations, accidents and bypassing could be prevented.

In order for this to be achieved, problems in the synergy of machines and human beings must first be identified, together with the measures and technical solutions for their elimination. Bringing human beings into contact with machines for development purposes must not mean exposing them to unnecessary hazards, however. The solution lies in simulation techniques in a virtual, interactive working environment: virtual reality (VR). In such an environment, human beings behave as they do in the real world, but work completely safely; a simulated reality is presented to them by means of clever optical techniques.



Usability study of a collaborative robot in the VR laboratory

Activities

Virtual environments can be used in a number of areas, for example in pilot training or in architecture. Modern industrial design methods of this kind are already found in the automotive industry, for example: crash tests of vehicles are now largely simulated.

If computer simulation is also to be used in the future in the search for causes of accidents on machines, the techniques and methods of virtual reality must first be transferred to the problems of occupational safety. Technologies which work in the area of occupational safety and health are not available off the shelf. The methods of occupational psychology must also be developed for this area.

The IFA is currently examining how this may be done. The objective is the creation of a laboratory in which the usability of technical protective measures can be studied and optimized in virtual reality. Specifically, this means that VR would be able to assist in the analysis of working tasks, the development and variation of operating concepts, and the performance of tests among users. The first projects involving the BG expert committee responsible for machine construction, production systems and steel construction are already in progress; lathes and collaborative robots have been selected as examples.

Results and Application

Preliminary studies in the IFA's new usability laboratory started in the end of 2009. A systematic start can now be made in studying possible usability-related causes of machine accidents. Concurrently, the IFA is pursuing its development of a range of VR technologies. The objective is that of developing further prevention approaches which will assist manufacturers and operators in improving the usability of their machines.

Area of Application

Manufacturers of machines and equipment in all sectors; test bodies, occupational accident insurance institutions

Expert Assistance

IFA, Division 5: Accident prevention – Product safety