

Pointer: Portable Intelligent Trainer for External Robotics

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Intelligent Tutoring Systems (ITSs) will play more and more a role in the training and education of people with different levels of skill and knowledge. ITS research emerged from the Artificial Intelligence world. As compared to conventional Computer Based Training (CBT) an ITS is much more flexible in that sense that it provides more tailored instruction by trying to mimic the teaching behaviour of a human instructor as much as possible. In general an ITS has four modules to realize this target. An expert system module containing knowledge about the learning domain, a problem generator and solver and an explanation mechanism. A tutorial module takes care of the proper instructional strategy (drill and practice, exploratory learning etc.) based upon information in the student model module that is covering the student's knowledge state, misconceptions, scores etc. Finally an interface module takes care of communication between student and training system.

Currently TNO Physics and Electronics Laboratory is carrying out a feasibility study for an ITS-application for ESA, co-sponsored by NIVR. The project, called Pointer (Portable Intelligent Trainer for External Robotics) investigates the feasibility of training an (astronaut) operator in monitoring and controlling robotic arm procedures with an Intelligent Training System. The robotic arm will be used for exchange of equipment between a space laboratory and a spacecraft involving very critical and accurate movements of the robotic arm. The operator is monitoring and acknowledging the pre-programmed automatic movements of the arm and can switch to manual mode for contingency operations, which implies that he has to perform manual adjustments to the automatic movements of the arm. To perform these operations, the operator has available a portable workstation running on a portable computer. In the context of Pointer, the operator workstation role is fulfilled by the ERA Portable Brain (EPB) application running on a SparcBook 2.

The feasibility of an ITS is investigated by developing a demonstrator in which a general ITS-framework is combined with the EPB application. In fact Pointer is the merging of ITS and simulation technology. The EPB application is a portable simulator containing a kinematic model of the arm, a simplified version of its control software as well as man-machine interface software. Also the ITS can be connected to the EUROSIM simulation facility containing both kinematics and dynamic simulation models.

Ultimately the ITS, developed on a workstation, is transferred to the same portable computer as the EPB making training of the operator on the ground as well as in space possible.

Although the domain is space related it is clear that use of Intelligent Training Technologies on a portable computer has many non space related applications (military, operator control rooms, etc.).

KEYWORDS

Intelligent Training System, Computer Based Training, Portable Intelligent Trainer, Expert System, Robotic Operations, Simulation.