Task Performance Evaluation for Supervisory Control Systems

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\textbf{Abstract.} Integrated multi-modal Supervisory Control Systems (ISCS) are a new generation of complex and synergistic Human-Machine Interaction Systems (HMIS). This paper deals with multi-modal interaction and control applied to Human Robot Systems (HRS). A task performance evaluation technique dedicated for multi-modal interaction and control is proposed. It enables comparison of task performance carried out by using different selection of control modes or by different operators. Objective and subjective performance measures are defined.

Experimental results have been carried out and some preliminary results will be presented concerning parallel cable-based manipulators.

1. \textbf{Introduction}

Under the pressure of various applications, advanced research in human-machine interaction systems is promoting a new generation of systems that can be named “Integrated Supervisory Control Systems or ISCS”. ISCS are complex, synergistic HMIS. They attempt to integrate multimedia techniques, modern simulation tools and high level programming techniques. They provide various control modes such as tele-manipulation, vision, gesture, speech, etc. Such systems are meant to carry out complex tasks and missions in various environments. ISCS are present in many important industrial domains such as nuclear power plants, space missions, military operations, aircraft industry, undersea, tele-surgery and assistance to disable people, etc. An initial evaluation about the state of the art and the trends in this field can be inferred by surveying some ISCS that have been described in the literature, e.g. \cite{1,2,3,4,5}.

In HMIS, one main automation goal is the reduction of the human involvement in the task while increasing the system performance. In complex systems, task performance evaluation depends on numerous criteria and factors which may be quantitative, qualitative, or both. Some approaches \cite{6,7,8} have attempted to provide means for task evaluation.

In ISCS, new problems emerge due to the possibility to carry out the same task by using various combinations of control modes. For instance, when the operator performs tasks by means of the...