

Bimanual Haptic Telepresence Technology Employed to Demining Operations

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1 Introduction

At present, more than 100 million undetonated landmines left over from wars are buried worldwide. Each year approximately 3000 individuals (most of them civilians) are maimed or injured by these mines. At least for every 5000 mines causes an expert's injury during its removal. For purpose of reducing the need for deminers to directly operate under these life-threatening conditions, application of telerobotic technology experiences a growing interest in recent years [1, 2]. Corresponding technology should comprise the following key components: reliable sensory detection of mines, mobility over rough terrain, and advanced manipulation capabilities. While the former requirements are research focus in many studies, e.g. [1, 2], the latter is only reported in [3, 4].

Typical task operations in demining are saving the mine for detonation, pulling the saved mine out of the ground, unscrewing and excluding the detonator from the explosive. Most of these actions require the use of both hands or in case of a telerobotic system a *bimanual manipulator*. Moreover, it is well-known that in addition to vision onto the object under consideration, experts need feedback of several other sensory modalities, especially *touch* and *force*, for improved sensitiveness. As consequence, we propose the development of a bimanual haptic telepresence system employed to demining as depicted in Fig. 1.

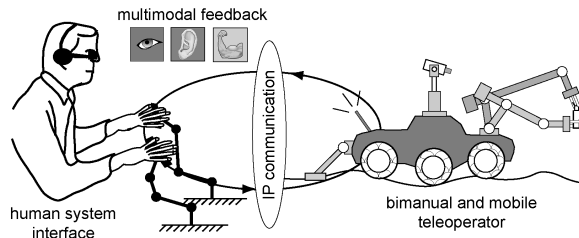


Fig. 1. Demining by use of a telepresence system.

This type of telepresence system enables an expert to perform the required task execution from a central control station located in safe environment. It uses in addition to visual display some sort of haptic display for inputting control commands over an IP communication link to the remote teleoperator. The teleoperator is equipped with multisensory components for sending *multimodal data* back to the expert as well as bimanual manipulators for more complex task execution. Thus complete handling of the mine from safe distance is assumed.

