Controlling a Semi-Autonomous Robot Team From a Virtual Environment

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ABSTRACT

In robotic space missions, different challenges like high latency, unknown environments or bad visual conditions make it hard for the operators to plan and execute the mission. We present our mission control using virtual reality to remotely execute a sample-return mission in the field via satellite.

Keywords

robot control, virtual reality, force feedback

1. VIDEO DESCRIPTION

Our robots Coyote III [3] and SherpaTT [1] where deployed in a Mars-like desert in Utah, USA. The mission control was stationed in our Virtual Reality laboratory in Bremen, Germany, and connected to the robots via satellite link. The SLAM-generated map and position of the robot as well as the motor positions were sent to the mission control center and used to create a three dimensional visualization. This enables the operator to freely move the virtual camera as needed for analyzing and planning further operations (see 1).

The mission control supports controlling multiple robots at the same time and also different input devices like, e.g. an exoskeleton [2]. This enables the operator to intuitively control the arm of SherpaTT and feel force feedback generated by force values of the robots arm.

Utilizing virtual reality for planning and executing a space mission in comparison to widely used video streams has a lot of advantages. Lower bandwidth capacity is needed while giving the operator more freedom of viewing the scene and therefore having a better overview over the current status of the systems. Even in visually challenging situations like sand storms, dusty wind or even missions under bad lighting conditions the operator has enough information to continue the mission safely.

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Figure 1: Mission control using a virtual environment

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