Project Introduction

State of the art virtual reality requires low latency, on the order of single-digit milliseconds to present a scene to an operator using immersive tracking devices. In conventional teleoperation, the operator's movements are used to directly control a remote camera, requiring a fast response time to avoid simulator sickness, an approach not feasible for interplanetary robotic control with limited bandwidth, high latency communications. The proposed work develops a hybrid architecture to present a model of a coarse virtual world to an operator, while the real imagery slowly refines the presentation as bandwidth allows. An online physics engine allows an actuation command in the virtual world to be faithfully executed in the real world without direct operator feedback. The end goal is a smooth, visually realistic operator interface that allows for remote operation of an exploration vehicle in a blended world scene of virtual and actual data.

Anticipated Benefits

The end goal is a smooth, visually realistic operator interface that allows for remote operation of an exploration vehicle in a blended world scene of virtual and actual data.

Primary U.S. Work Locations and Key Partners

<table>
<thead>
<tr>
<th>Organizations Performing Work</th>
<th>Role</th>
<th>Type</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Colorado at Boulder</td>
<td>Lead Organization</td>
<td>Academic</td>
<td>Boulder, CO</td>
</tr>
</tbody>
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Organizational Responsibility

- Responsible Mission Directorate: Space Technology Mission Directorate (STMD)
- Lead Organization: University of Colorado at Boulder
- Responsible Program: Space Technology Research Grants

For more information and an accessible alternative, please visit: https://techport.nasa.gov/view/91502
Space Technology Research Grants

Augmented Reality Telepresence for Robotic Exploration

Completed Technology Project (2015 - 2019)

<table>
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<th>Primary U.S. Work Locations</th>
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<tbody>
<tr>
<td>Colorado</td>
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</tbody>
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**Project Website:**

https://www.nasa.gov/directorates/spacetech/home/index.html

**Project Management**

**Program Director:**
Claudia M Meyer

**Program Manager:**
Hung D Nguyen

**Principal Investigator:**
Nisar Ahmed

**Co-Investigator:**
Steve Mcguire

**Technology Maturity (TRL)**

Start: 2
Current: 2
Estimated End: 3

**Target Destinations**

The Moon, Earth, Mars

For more information and an accessible alternative, please visit: https://techport.nasa.gov/view/91502