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Thesis: **"TOWARDS UAV TELEOPERATION BY MEANS OF VIRTUAL REALITY"**

Summary:

This study presents the development of virtual environments as control centers for remote teleoperation tasks of unmanned aerial vehicles (UAVs). Initially, our focus lies on reconstructing outdoor and indoor environments using a ZED mini stereo camera and reconstructing them through point cloud techniques; in this project, RTAB-Map is implemented for this purpose.

The virtual environment is hosted in Unity, a widely recognized platform for designing virtual reality (VR) video games. Within this environment, a digital twin UAV is embedded, tasked with replicating the real positions and orientations of the vehicle. To ensure accurate replication, both PID and PD control schemes are proposed for managing the positions and rotations of the virtual vehicle, allowing it to precisely follow the actual position of the UAV.

This control strategy is pivotal in maintaining the fidelity of the virtual representation to its physical counterpart, ensuring that the teleoperation is both realistic and responsive.

Extensive testing was conducted to assess the effectiveness of these controls. A series of experiments were carried out in both outdoor and indoor settings to validate the functionality

of this approach. These tests not only demonstrated the accuracy of the vehicle's position and orientation replication but also explored the system's operational limits and potential failure points. The results are promising, showcasing the system's capability to perform under various environmental conditions and its potential for broader applications in UAV-based operations.

Further, the study delves into the implications of this technology for real-world applications, including surveillance, inspection, and disaster response, where accurate and efficient remote operation of UAVs is critical. By integrating advanced control systems and realistic virtual simulations, this approach offers a significant advancement in the field of UAV teleoperation, potentially transforming how these vehicles are used in complex and hazardous environments.