

Human-in-the-Loop Teleoperation Modes for Autonomous Unmanned Aerial Vehicles

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Abstract

In all future scenarios of fully autonomous ground or air vehicle networks, human intervention is expected to take place in the form of remote immediate involvement/assistance. The use of telemanipulation with various "human-in-the-loop (HITL)" schemes is anticipated to instil the necessary degree of trust in autonomous vehicles (AVs) while operating in a highly volatile environment with other vehicles and a multitude of obstacles. According to numerous research papers, autonomous uninhabited aerial vehicles (A-UAVs) will reach higher penetration levels in mixed air traffic in the coming years. However, there hasn't been enough research in the literature on efficient A-UAV management in real-world use cases with a lot of uncertainty. This paper attempts to bridge this gap by examining the telemanipulation schemes between two smart agents: human telemanipulators (HTMs) and A-UAVs. HITL telemanipulation described in this report can i) play a key role in enabling A-UAVs to instantly handle a multitude of uncertainties and ii) expedite the integration of A-UAVs into mixed air traffic.

Index Terms—Teleoperation, telemanipulation, human–vehicle co-activity, human-vehicle teamwork, human-in-the-loop (HITL), autonomous unmanned aerial systems (UASs).

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