An Approach to Flight Control with Large Time Delays Derived from a Pulsive Human Control Strategy

While some Unmanned Aerial Vehicles (UAV) can operate fully autonomous, most of all active and planned UAV are being remotely controlled by human operators. The flight control architecture of such Remotely Piloted Aircraft Systems (RPAS) can support different degrees of automation, ranging from low-level attitude control to high-level mission control. One issue with teleoperation over larger distances, notably operation beyond visual line of sight, is the time delay introduced by signal transmission. It is known that excessive time delays deteriorate tracking performance, increase workload, and can even lead to instabilities and make a vehicle uncontrollable. Mitigating this issue by increasing RPAS autonomy and providing higher level control to operators, so that time delays are less critical, is not always a viable option. A control strategy for systems with large time delays that seems to come natural to human operators is pulsive control. Hence, this paper proposes a flight control system that is specifically designed for pulsive control inputs, which may facilitate remote piloting and thereby provide an alternative to increasingly autonomous flight or operation solely within visual line of sight. Preliminary experiments indicate a better handling with the proposed approach, as compared to a more classical flight control system design.