Optimal Guidance of a Relay MAV for ISR Support Beyond Line-of-Sight

By John H. Hansen

Biblioscholar Okt 2012, 2012. Taschenbuch. Book Condition: Neu. 246x189x4 mm. This item is printed on demand - Print on Demand Neuware - This thesis developed guidance laws to optimally position a relay Micro-UAV (MAV) to provide an operator with real-time Intelligence, Surveillance, and Reconnaissance (ISR) by relaying communication and video signals when there is no line-of-sight between the operator at the base and the rover MAV performing the ISR mission. The ISR system consists of two MAVs, the Relay and the Rover, and a Base. The Relay strives to position itself to minimize the radio frequency (RF) power required for maintaining communications between the Rover and the Base, while the Rover performs the ISR mission, which may maximize the required RF power. The optimal control of the Relay MAV then entails the solution of a differential game. Applying Pontryagin's Maximum Principle yields a nonlinear Two-Point Boundary Value Problem (TPBVP). Suboptimal solutions are also analyzed to aid in solving the TPBVP which yields the solution of the differential game. One suboptimal approach is based upon the geometry of the ISR system. Another suboptimal approach envisions a stationary Rover and solves for the optimal path for the Relay. Both suboptimal approaches showed...

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