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# 飞机推出和跑道掉头滑行行为计算方法

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## Aircraft Behavior Simulation Investigation During Pushback and U-turn Maneuvers

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摘要

针对飞机推出和跑道掉头两种地面滑行特殊行为的位置和姿态计算问题进行了研究。从机场塔台管制运行模拟仿真的角度出发,提出了非完整运动学约束下飞机推出滑行和跑道掉头运动计算方法。依据飞机推出实际和非完整运动路径跟踪模型,设计出适合仿真推演计算的飞机推出运动求解方法。根据飞机跑道掉头的几何约束和转弯角运动约束,设计出开环控制下完整刻画飞机运动的求解方法。与动力学求解模型相比,该方法具有计算简便,适合于视景仿真驱动的优点,并通过数学仿真验证了方法的有效性。

关键词:   推出   跑道掉头   滑行   非完整约束   视景仿真

Abstract:

Aircraft pushback and U-turn maneuvers belong to the special ground taxiing behaviors, and these behaviors are not accurately demonstrated in the current visual simulation system. In this paper, we study the position and attitude computational problems during aircraft pushback and U-turn maneuvers. From the perspective of airport tower control simulation, aircraft movement calculation methods constrained by nonholonomic kinematics are proposed to accurately describe aircraft pushback and U-turn maneuvers. The aircraft pushback motion algorithm suitable for simulation-driven calculation is designed according to aircraft actual movement and nonholonomic path following model. In addition, under the open-loop control, aircraft U-turn maneuver algorithm constrained by runway geometry and steering angle variation is designed to completely describe aircraft behaviors during runway U-turn. Compared with dynamics model, the methods we have proposed have the advantages of being easier to calculate and more suitable for visual simulation. The validity of these methods is verified by numerical simulation using aircraft geometry data.

Keywords:   pushback   U-turn   taxiing   nonholonomic constraints   visual simulation

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