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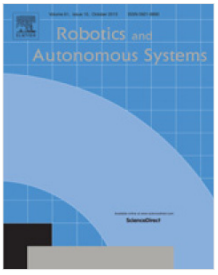

Autonomous and scalable control for remote inspection with multiple aerial vehicles

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Autonomous and Scalable Control for Remote Inspection with Multiple Aerial Vehicles

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Abstract

A novel approach to the autonomous generation of trajectories for multiple aerial vehicles is presented, whereby an artificial kinematic field provides autonomous control in a distributed and highly scalable manner. The kinematic field is generated relative to a central target and is modified when a vehicle is in close proximity of another to avoid collisions. This control scheme is then applied to the mock visual inspection of a nuclear intermediate level waste storage drum. The inspection is completed using two commercially available quadcopters, in a laboratory environment, with the acquired visual inspection data processed and photogrammetrically meshed to generate a three-dimensional surface-meshed model of the drum. This paper contributes to the field of multi-agent coverage path planning for structural inspection and provides experimental validation of the control and inspection results.

Keywords: Automatic Optical Inspection, Photogrammetry, Swarm, Unmanned Aerial Vehicles.

1. Introduction

This paper considers the challenge of using autonomous unmanned aerial vehicles (UAVs) to visually inspect structural assets such as tanks, flair stacks, chimnes, and wind turbines. Results are presented for a mock inspection of a nuclear intermediate level waste (ILW) storage drum chosen for its convenient size, which enabled laboratory based research, and relevance to industrial partners (National Nuclear Laboratory). Visual structural inspection, using UAVs, has seen interest in the literature through its application to the inside and outside of buildings, for example [1, 2, 3], industrial facilities