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Manipulation of the Multi-Vehicle System for the Industrial Applications

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Abstract

INTRODUCTION: This approach should indicate some challenges in routing and scheduling for the multi-vehicle system.
OBJECTIVES: The proposed method delivers a novel method to generate the free-collision trajectory as well as optimal route from starting point to destination.
METHODS: The estimated time at one node and the classification of load level support vehicle to decide which proper route is and stable movement is reached.
RESULTS: From these results, it could be observed that the proposed approach is feasible and effective for many applications.
CONCLUSION: The proposed method for routing and scheduling might be useful in the multi-vehicle system. In the large-scale system, some intelligent schemes should be considered to integrate.

Keywords: Robotics, Intelligent System, Motion Control, Complex System

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1. Introduction

In the rapidly evolving landscape of Industry 4.0, technology's transformative power extends its reach far beyond the confines of traditional manufacturing and production processes. It seeps into every corner of modern life, sparking innovations that reshape how human work, live, and move. One such innovation that has garnered significant attention and holds the potential to revolutionize transportation and logistics is the Multi-Vehicle System (MVS) [1-4]. MVS represents a paradigm shift, a convergence of cutting-edge technologies and strategies that are redefining the way human think about mobility, automation, and connectivity.

Industry 4.0, often referred to as the Fourth Industrial Revolution, is characterized by the fusion of the physical and digital worlds [5-7]. It encompasses a vast array of technologies, including the Internet of Things (IoT) [8], big data analytics [9], artificial intelligence (AI) [10], and autonomous systems [11]. These technologies have been harnessed to drive efficiency, productivity, and sustainability across various industries, and transportation and logistics are no exception.

The core concept of the Multi-Vehicle System lies in its ability to create interconnected networks of vehicles, whether they be drones [12], material handling vehicles [13], delivery robots [14], or even conventional trucks [15] and forklifts [16]. These vehicles operate in concert, leveraging real-time data, advanced algorithms, and automation to optimize their movements and tasks. The result is a transportation and logistics ecosystem that is not only more efficient but also smarter and more adaptable.

One of the fundamental pillars of the MVS is automation. Autonomous vehicles, equipped with sensors, cameras, and sophisticated AI, can navigate their environments without human intervention. They can make decisions in real-time, avoiding obstacles, optimizing routes, and ensuring the safe and efficient delivery of

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