

Chapter 4

A Systematic Approach of a Flying Ad-hoc Network for Smart Cities

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ABSTRACT

Recently, a flying ad-hoc network (FANET) has been employed in modern warfare for monitoring and reconnaissance to produce a healthy living environment in smart cities through multiple unmanned aerial vehicles (UAVs). FANETs allow multiple UAVs to communicate in 3D space to establish an ad-hoc network. FANET applications, among others, can deliver cost-effective services to help future smart cities achieve their goals. However, adopting FANET technology in smart cities is difficult due to its challenges from UAV mobility, energy, and security considerations. Therefore, this study analyzed the new trends and technologies of smart city research and proposes research directions through FANET. This chapter aims to look at FANET's possible applications in smart cities and the implications and issues that come with them. Furthermore, it also goes over the current state of recent enabling technologies for FANET in order.

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INTRODUCTION

Smart cities can maximise their resource use and offer efficient and effective services to their citizen's thanks to recent developments and breakthroughs in Information and Communication Technologies (ICTs). One of these technologies is the Flying Ad-hoc Network (FANET), which has the potential to cover large geographic regions utilizing several Unmanned Aerial Vehicles (UAVs) and enable numerous applications for future smart cities that will positively affect society. Intelligent transportation, product distribution, demographic and environmental monitoring, on-board health planning, civic security, object identification, smart agriculture, and more uses are possible with FANET. (Bekmezci et al., 2013). FANET applications, among others, can deliver cost-effective services to help future smart cities achieve their goals. However, implementing FANET technology in smart cities is a very difficult task due to several issues. Furthermore, FANET-enabled smart cities will likely become a significant component of human existence, and UAVs will significantly increase real-time information distribution. They are the best option because UAVs have the most operational capacity in any worst-case damage scenario (Siddiqi et al., 2021).

In this sub-section, the paper starts with a theoretical background of smart city and FANET technology in Section 2. Further, Section 3 discusses some potential applications of FANET for smart cities. Sequentially, Section 4 presents the issues and challenges of FANET for smart cities. Section 5 discusses some key technologies with the fusion of FANET in future smart cities. Finally, Section 6 separately covers the conclusion.

THEORITICAL BACKGROUND

Smart Cities

By 2050, the population of the world is expected to have doubled. People are also shifting from rural to urban areas such as cities, which is a growing trend. City officials will have various obstacles in maintaining or improving city services and inhabitants' quality of life due to the rapid increase in population. As a result, there is an increasing interest in integrating robots, intelligent solutions, and current ICTs into developing smart cities. These technologies will aid in developing intelligent, automated services that will improve infrastructure performance and resident comfort (Figure 1). A smart city is a concept that connects technology to long-term economic growth and outstanding quality of life (Trindade et al., 2017). Europe has recently taken the lead in the construction of smart cities worldwide. Europe has taken the initiative to encourage its member countries to construct smart cities. Additionally, smart city technologies seek to improve accessibility and efficiency for daily tasks while addressing issues with public safety, traffic, and the environment (Joshi et al., 2016; Mohanty et al., 2022). Some of the most often used smart city components are as follows:

Smart Infrastructure

Buildings and urban infrastructure need to be built more sustainably and effectively for cities to remain viable, and digital technologies are becoming increasingly important. Cities should invest in electric and self-propelled vehicles to lower CO₂ emissions. Modern technology is needed to provide an infrastructure

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