

Chapter 65

Flying Adhoc Networks Concept and Challenges

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ABSTRACT

Flying adhoc networks (FANETs) are getting popular among the research community due to their wide area of applications in civilians and tactical areas. FANETs are the new family member of the mobile adhoc networks (MANETs) class. Situations such as flooding, war zone, and rescue operations where traditional MANETs cannot be deploy because they used ground moving nodes. FANETs can play significant role in those situations because they employ a swarm of UAVs to form adhoc network. In this chapter, FANET concept along with its applications and challenges is discussed. Future research directions in the area of FANETs are discussed.

INTRODUCTION

In case of a calamitous event, when traditional communication methods are out of service or simply not available, in those situations mobile adhoc networks (MANETs) plays an important role in established communication. MANETs employ grounded mobile nodes which are capable to collect information with the help of sensor, camera and other devices. Nodes in MANETs communicate with each other through wireless communication without use of existing infrastructure. The data collected with nodes in MANETs are transmitted to the base station using a multi - hop path. These networks are economical and can be formed in quickly whenever required as they do not require existing infrastructure. MANETs have several application areas such as natural disaster, sensor networks, etc.. But there are some extreme situations (such as flooding, battlefield and rescue operations, etc.) where MANETs cannot be deployed. In those situations, flying ad-hoc networks (FANETs) can play vital role in established communication. FANET is a subclass of MANETs and made up of a swarm of small flying vehicles enable with camera, sensor and GPS system. Swarms of UAVs arrange themselves to communicate with large operational area using

DOI: 10.4018/978-1-5225-7598-6.ch065

wireless network without any centralized device. According to muller (2012) UAVs communicate with each other locally, with base station and also interact with their environment to get information. FANETs use different types of UAVs based on the various application areas. FANETs employ unmanned aerial vehicle (UAVs), UAV is an aircraft which flies without a pilot. The UAV can manage itself and fly based on preprogrammed flight plans or can be operated using complex dynamic automation systems which are versatile and flexible in implementation (Muller, 2012). FANETs use multi-UAVs to perform operations because of the limitations of a single UAV system such as limited surveillance capability, scalability and flexibility (Bekmezci, 2013). The multi - UAV system has various advantages over single UAVs such as:

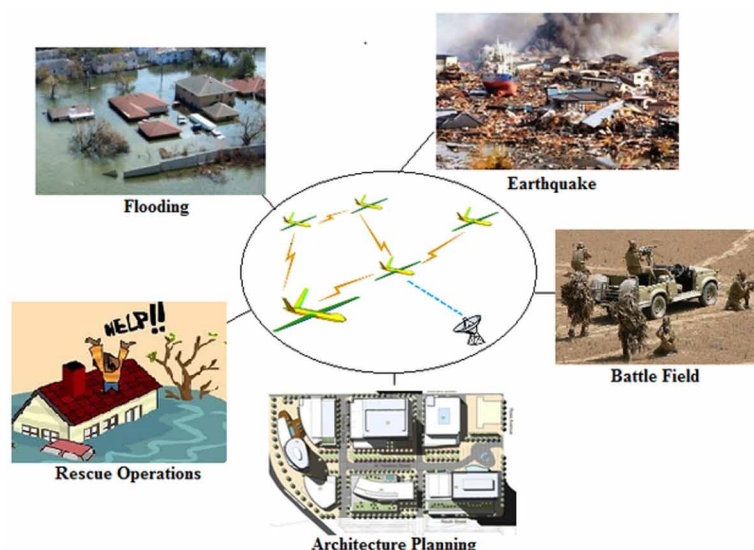
- With more number of UAVs, tasks can be parallelized which in turn reduce the completion time of mission. This kind of behavior is very useful for search and rescue applications;
- In case of a single UAV system, whole mission collapse if UAV fails. In multi-UAV systems, nodes can distribute tasks among themselves. Fault tolerance of the network increases with multi-UAVs;
- In multi-UAV environment, heterogeneous UAVs can form a network. It is possible to use capabilities of other UAVs as and when required for task completion. So multi-UAV systems are very advantageous for critical applications.

FANET Applications

Due to various advantages and wide range of application areas FANETs are getting attention from the research community around the globe. Various applications of FANETs are explained and shown in Figure 1:

- **Military Services:** FANET are very useful in military services. Setting up the proper communication system is very difficult in military areas. So FANETs are used for information exchange among soldiers, military headquarters;

Figure 1. FANET applications



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