

Radar Surveillance of Unmanned Aerial Vehicles (Review)

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Abstract—Radar surveillance of unmanned aerial vehicles (UAVs) is actively developing area of scientific research. This article provides a review and analysis of publications in recent years devoted to the methods and radar systems of detection and recognition of classes and types of UAVs. It is noted that the most difficult targets for radar detection are low-sized, low-speed small UAVs (drones) flying at low and extremely low altitudes. If large and medium-sized UAVs can be detected by modern radar systems, then for the detection of small UAVs it is advisable to create specialized highly efficient, highly mobile, portable and inexpensive active UAV detection radars. The technical requirements for such radars are defined and recommendations for their implementation are provided. High-performance protection systems based on adaptive lattice filters are offered to protect UAV detection radars from noise jamming and passive interference. It is shown that the research on the methods of recognizing UAV classes and types is a development of the existing theory and technology of radar recognition of air targets.

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1. INTRODUCTION

Unmanned Aerial Vehicles (UAVs) have become widespread and widely used in many areas of human activity. They perform many different useful functions, but they can also pose a significant physical or informational threat to military, economic, and private life.

There is a worldwide demand for highly effective systems of detection and classification of UAVs. The specific qualities of UAV systems define their role as a highly mobile and combat-ready component of the armed forces, capable of not only collecting reliable reconnaissance information about the enemy in a short period of time over a large territory and at great depth, but also transmitting targeting instructions for precision weapons, striking the most important enemy objects, acting flexibly in conditions of intensive opposition to air defense. These qualities ensure the increasing role of UAVs, which are actively used in almost all recent armed conflicts and can already significantly affect the forms and methods of warfare. The effectiveness of their use in 2020 was clearly demonstrated by Turkey during the fighting in Syria, when UAV strikes destroyed Syrian air defense systems, despite the closure of the Syrian government airspace, as well as Azerbaijan in Nagorno-Karabakh.

In addition, UAVs have attracted widespread attention in various civil and commercial applications. At the same time they can pose a serious threat to public safety, privacy, and airspace security. For example, the media regularly reports on the dangerous use of small UAVs in airport areas and their use for unauthorized surveillance of important facilities, terrorist attacks and sabotage, transportation of prohibited cargo, etc.

Therefore, the protection of various objects against the impact of UAVs carrying a potential threat in the military, economic and everyday activities of people is one of the current challenges of our time.

Radar stations (RS), systems and complexes are considered to be basic tools for UAV detection because they can detect targets in any weather and light conditions and at larger distances as compared to the electrooptical and acoustic means, in particular, under conditions of clutter and jamming, and at the same time they can determine the range, speed, and angular coordinates of targets.

This article is a review and is devoted to the analysis of publications on UAV radar detection and recognition methods.

CONFLICT OF INTEREST

The author declares that he has no conflict of interest.

ADDITIONAL INFORMATION

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