

Guest Editorial

Surveillance is an important component of Defence planning in strategic mode as well as in tactical environment. It requires continuous reconnaissance for gathering intelligence. The platforms employed are satellites (both high altitude as well as low altitude), manned aircraft, unmanned air vehicles (UAVs) and even stabilised balloons. Sensors are employed in the frequency range extending from visible band to microwaves and radio frequencies. These cover wide areas with synthetic aperture radar and provide high resolutions in strip mode as well as spot mode. The desired area can be covered either by repetitive imagery with one sensor or onetime information with multiple sensors. For long duration coverage, power requirements are critical and safety of sensor is important. Large data computation and automatic target recognition algorithms are important from technology update point of view.

In view of enemy sensitivity to information gathering and consequent retaliation, unmanned surveillance becomes important. Satellites and UAVs have, therefore, assumed significance. Added strength in technology has come from the application of computer vision techniques where machine vision takes over human interpretation of data and related decision-making process. With advancement in platform engineering and image processing techniques becoming a force multiplier in the intelligence domain, it was considered desirable to devote a complete issue of *Defence Science Journal* to the aspects connected with unmanned surveillance. The topics covered are: (i) airborne vehicle and space platforms, (ii) onboard instrumentation, preprocessing and telemetry, and (iii) acquisition of data, processing and dissemination of information to the users.

This special issue on 'Unmanned Surveillance' contains seven papers on the topics of concern. Largely, it is a review effort with some papers focusing on technology development. As expected, majority of papers originate from an institution engaged in the development of UAVs. The first two papers describe the technologies involved in the development of UAVs employed for surveillance. Development of suitable sensors for high altitude endurance UAVs and necessity and challenges of development of micro-UAVs have been discussed. Requirement of micro-UAVs for battlefield environment, use of micro-electromechanical systems, tiny CCD cameras and chip size hazardous substance detectors is highlighted. Just as UAV is used for acquiring the data, the ground control station (GCS) provides the facility of data reception and processing. The GCS, is in fact, the nerve centre of activity during the UAV missions. The system incorporates facilities, such as communications, displays, mission planning and data exploitation. The third paper gives an overview of the GCS, its architecture and the state-of-the-art.

Exploitation of the image acquired through UAV is an important aspect of the whole exercise. This includes image processing of data from different imaging sensors in separate spectral bands. It is desirable to combine image/signal processing techniques with artificial intelligence, neural networks, fuzzy set theory, genetic algorithms, parallel processing and cognitive psychology, etc. The fourth paper discusses these aspects of machine intelligence. Fifth and sixth papers also discuss the computer vision techniques related to extraction of desired information from the acquired images.

Automatic detection and localisation of a UAV in-flight is another area that needs attention. The last paper discusses acoustic signature technique for this purpose.

It is hoped that this special issue will generate the desired interest in the development of technologies for the vehicle, instrumentation, and information processing techniques required for unmanned surveillance in the R&D centres associated with this activity.

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