In the last decade, aerial robotics and unmanned aerial vehicles (UAVs) experienced significant growth from a scientific and technological point of view. Moreover, drones appear in the media almost daily and are becoming a suitable alternative to help humans in many complex tasks and applications such as cinematography, surveillance, environment monitoring, search and rescue, agriculture, transportation, and even inspection and manufacturing, in addition to the military applications that have dominated practical UAV functions until recently.

The IEEE Robotics and Automation Society Technical Committee (RAS-TC) has contributed to promoting the emergence of new concepts and technologies as well as new applications. It has also provided services such as the assessment of regulations for development, which play an important role in the consolidation of the applications.

The committee received the award for the Most Active IEEE Robotics and Automation Society at the IEEE International Conference on Robotics and Automation (ICRA) in 2016.

Research and Development
The RAS-TC recently defined three interest groups.

Unmanned Aerial Systems
This interest group emphasizes UAVs from large platforms to small vehicles as well as a wide variety of systems and applications (Figure 1).

Aerial Robotic Systems Physically Interacting with the Environment
This interest group focuses on the methods and technologies required for the development of aerial robots physically interacting with objects and with other aerial vehicles. Aerial robotic manipulation is a main subject of this interest group (Figure 2).

Perception-Based Aerial Robotics
This interest group focuses on aerial robots with onboard intelligence and perception that allow positioning, simultaneous localization and mapping, navigation, object recognition, and tracking with limited power and computational capabilities (Figure 3).

Activities
Over the past several years, the Aerial Robotics and Unmanned Aerial Systems RAS-TC has consolidated its growth and the services provided to the community, while concurrently promoting innovation.

Figure 1. (a) The autonomous landing of fixed-wing UAVs on mobile platforms, demonstrated by the German Aerospace Center (DLR) in the European FP7 EC-SAFEMOBIL project. (b) The University of Denver robots.

Figure 2. Aerial manipulators developed in the H2020 AEROARMS project. (a) The AEROX system developed by the Center for Advanced Aerospace Technologies, being used for a contact inspection (pipe-wall depth measurement using an ultrasonic sensor). (b) The Long Reach dual-arm manipulator, developed by the University of Seville, transporting a bar that is executing a planned trajectory.
The International Conference on Unmanned Aircraft Systems (ICUAS) annual events continue to grow and impact the community. We organized ICUAS 2015 (9–12 June 2015, Denver, Colorado), ICUAS 2016 (7–10 June 2016, Arlington, Virginia), ICUAS 2017 (13–16 June 2017, Miami, Florida), and ICUAS 2018 (12–15 June 2018, Dallas, Texas).

We also consolidated the Workshop on Research and Education on Unmanned Aerial Systems (RED-UAS), organizing RED-UAS 2015 (23–25 November 2015, Cancun, Mexico) and RED-UAS 2017 (3–5 October 2017, Linköping, Sweden).

We generated a new event, the International Symposium on Aerial Robotics, which held annual conferences in Philadelphia, Pennsylvania, on 19–20 June 2017 and 11–12 June 2018.

Moreover, we continued the organization of ICRA workshops: “Aerial Robotics Manipulation and Load Transportation” (26 May 2015, Seattle, Washington); “Aerial Robotics Manipulation: From Simulation to Real Life” (16 May 2016, Stockholm, Sweden); “Autonomous Structural Monitoring and Maintenance Using Aerial Robots” (29 May 2017, Singapore), a full-day workshop; and “Aerial Robotic Inspection and Maintenance: Research Challenges, Field Experience, and Industry Needs” (25 May 2018, Brisbane, Australia), also a full-day workshop. Recently, we also organized a full-day workshop “Aerial Manipulation” at the 2018 IEEE/RSJ International Conference on Intelligent Robots and Systems.

Additionally, the RAS-TC sponsored workshops in the European Robotic Forums: “Aerial Robotics for Inspection and Maintenance” (21 March 2016, Ljubiana, Slovenia), “Aerial Robotics Inspection from Prototypes to Industrial Applications” (24 March 2017, Edinburgh, United Kingdom), and “Aerial Robotics for Industrial Inspection, Maintenance, and Transportation” (13 March 2018, Tempere, Finland). The RAS-TC also sponsored national events such as those organized by the Spanish Society of Research and Development in Robotics (the sister Society of the RAS): “Workshop on Aerial Robotics for Inspection and Maintenance” (7 July 2016, Madrid, Spain), “Workshop on Robotics and Unmanned Systems for Security Applications” (2 December 2016, Madrid, Spain), and “Robot 2017: Third Iberian Robotics Conference” (22–24 November 2017, Sevilla, Spain).

Additionally, we have contributed to new and relevant publications, including the following collective works:


Future Directions
We believe the following topics will have a scientific and technological impact on the future of the aerial robots:

- next-generation designs to increase flight endurance and safety in interactions with people, as well as hybrid aerial–ground locomotion robots
- aerial robotic manipulation by including multi-UAV aerial manipulation
- very agile and fast aerial robots and large teams of robots based on environment perception with limited computation and power capabilities

These three topics are fully compatible with the interest groups noted previously.

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Figure 3. (a) The University of Pennsylvania’s aerial robot performing an agile maneuver through a small gap. (b) The University of Seville’s Robot Laboratory aerial robot demonstrating factory logistics in the EUROC-ARCOW European project.