

## **Application of Artificial Intelligence in Tracking Control and Synchronization of Spacecraft**

Papers are invited for a special topical issue of *Advances in Space Research* (ASR) entitled “**Application of Artificial Intelligence in Tracking Control and Synchronization of Spacecraft**”

Future spacecraft will be expected to ensure an accurate and fast response to different attitude maneuvering commands, thereby applying reliable controllers is one of the most crucial issues in the design of spacecraft. In addition, most spacecraft are in the presence of large uncertainties, large environmental disturbances, control input limitation, and even failures in actuators. The dynamics of the spacecraft are complicated, with strong coupling between rigid and flexible modes. Also, the parameters of these nonlinearities cannot be known precisely. All these challenges result in significant difficulty in the design of the attitude control system for effective performance and stability.

Artificial intelligence, which does combine a wide variety of new technologies to give systems an ability to make decisions in new and unfamiliar conditions, has excellent potential for shaping a smart control policy for complex systems. Notably, in the twenty-first century, we can see an explosion of artificial intelligence and neural networks in different study fields. In this regard, it is confirmed that intelligent controllers have significant advantages among the stated control strategies for various systems. Due to the high value of their tasks and their remarkable risks in some applications, implementing a reliable controller is the main concern. Where the degree of uncertainty is high, classical methods of control may fail. Hence, artificial intelligence-based controllers are rational choices for such systems. Moreover, robust and adaptive controls that could be provided based on artificial intelligence are fruitful for controlling complex systems because of their ability to deal with uncertainties and disturbances.

To efficiently exploit all possible engineering applications of artificial intelligence for spacecraft, open problems in this field must be addressed by offering novel practical and theoretical approaches focused on control and synchronizing these systems. This concern has motivated the current special issue. Contributions can consider control, synchronization, and identification of all types of spacecraft through different kinds of intelligent techniques.

**TOPICS OF INTEREST** Any contribution that provides an added value to spacecraft's control, synchronization, and identification using intelligent methods is of interest to this special issue. The topics of interest include – but not limited to– the following:

- • Reinforcement learning-based methods for spacecraft
- • Application of neural networks and intelligent estimators to spacecraft
- • Application of recent identification techniques to spacecraft
- • Intelligent synchronization and anti-synchronization techniques for spacecraft
- • Gaussian process and its application to spacecraft

Manuscripts must be submitted electronically to <https://www.editorialmanager.com/AISR>. To ensure that all manuscripts are correctly identified for inclusion into the special issue, authors must select “**Special Issue: Spacecraft AI Control**” when they reach the “Article Type” step in the submission

process. Submitted papers must be written in English and should include full affiliation postal addresses for all authors. The general format for submission of papers can be found on the ASR Elsevier web site at [http://www.elsevier.com/wps/find/journaldescription.cws\\_home/644/authorinstructions](http://www.elsevier.com/wps/find/journaldescription.cws_home/644/authorinstructions).

Only full-length papers will be considered for publication, subject to peer review by a minimum of two reviewers. There are no page limits although the length of the paper should be appropriate for the material being presented. While the deadline for submissions is **31 December 2021**, papers will be published electronically as soon as they are accepted. The printed issue will be assembled within a reasonable time with late papers being printed in regular issues of ASR. All articles will be typeset at no cost to the author; there is a charge for printing color figures although there is no charge for color figures on the electronic version.

**Dr. Hadi Jananshahi**, University of Manitoba, Canada, ([Jahanshahi.hadi90@gmail.com](mailto:Jahanshahi.hadi90@gmail.com)) and **Dr. Oscar Castillo**, Tijuana Institute of Technology, Mexico, ([ocastillo@tectijuana.mx](mailto:ocastillo@tectijuana.mx)) are Guest Editors for this special issue. Questions can be directed to Dr. Jananshahi or Dr. Castillo, or to the Co-Editor for ASR Special Issues, Dr. Peggy Ann Shea ([sssrc@msn.com](mailto:sssrc@msn.com)).