Research Fellowship in Mathematical Analysis for GNC Applications

Directorate of Technical and Quality Management

ESTEC, Noordwijk, The Netherlands

ESA/RF-ESTEC(2015)013

Overview of the Division's mission

The Control Systems Division is responsible for project support and technology development of space applications in the following areas.

- Design and implementation of Guidance, Navigation and Control Systems for Planetary exploration missions, Launchers, Ascent and Re-entry vehicles, Formation Flying Systems;
- Design and implementation of Attitude and Orbit Control Systems for Earth Observation, Telecom, Navigation Satellites and Astronomy Observatories;
- Failure Detection Isolation and Recovery of GNC and AOCS;
- Technology development of AOCS/GNC sensors and inertial actuators;
- Development of advanced control, estimation and optimization techniques and tools;
- Enabling R/D activities for Autonomous Rendezvous and Formation Flying, Ascent and Re-entry vehicles, Entry, Descent and Landing Systems, Vision-based and Hybrid Navigation;
- Performance analysis for launchers and re-entry vehicles including safety;
- Definition, maintenance and operation of the necessary tools and laboratory facilities in support of above activities.

Overview of the field of research proposed

The Research Fellow will work in mathematical analysis of relevant techniques and technologies for GNC applications:

- Mathematical treatment of spacecraft pointing error engineering: to investigate the statistical and stochastic interpretation of spacecraft pointing errors; the mathematical analysis of worst case pointing error engineering.
- Global optimisation mathematical methods: to investigate and assess the use of global optimisation mathematical methods for space engineering problems. The success of WORHP (now used in about 20 European companies and more than 100 Universities) provides an excellent starting point to extend the current local optimiser methods and augmenting them with global methods.
- Stochastic mathematical modelling of break-up spacecraft re-entry events: the implementation and testing of a mathematical model able to forecast the formation of a fragmentation cloud generated by a sub-orbital explosion and its characteristics.

- Taylor differential algebra applied to the propagation of uncertainties in GNC systems: the use of a software framework (DACE) that uses Taylor Differential Algebra as the main computational engine and that exploits its potentials in the field of uncertainty propagation in a GNC system.
- Mathematical methods and algorithms for orbital propagators (asteroids and spacecraft): the implementation of new techniques and technologies in the area of orbital propagators using numerical methods to allow the propagation of orbital elements for a long period of time and using a large number of orbital perturbations.

Who can apply

The programme is open to suitably qualified women and men. Preference will be given to applications submitted by candidates within five years of receiving their PhD.

The Research Fellow Programme is open to nationals of the following states: Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, and the UK, or Canada as a Cooperating State, Bulgaria, Estonia, Hungary, Latvia, Slovakia and Slovenia as European Cooperating States (ECS).

Required qualifications

Applicants must have recently completed their PhD studies in mathematics.

Applicants should have good analytical and communication skills and should be able to work in a multi-cultural environment in an autonomous manner.

Applicants must be fluent in English and/or French, the working languages of the Agency. A good proficiency in English is required.

How to Apply

Please fill in the online application form attaching to it, **in one document only,** your CV, your motivation letter and your research proposal.

Candidates must also arrange for up to **three letters of reference** to be sent by e-mail, before the deadline, to **temp.htr@esa.int**. The letters must be sent by the referees themselves. The candidate's name must be mentioned in the subject of the email.

Applications satisfying the general conditions for eligibility, to be submitted **by 6 May 2015**, will be evaluated and successful applicants will be invited for an interview.

Interested candidates are highly encouraged to visit the ESA website: www.esa.int.