

Center for Computational Simulation

The Research Center for Computational Simulation (CCS) emerges to encourage outstanding interdisciplinary international research in a very dynamic area. Given the multidisciplinary and evolving nature of computational simulation-based science and engineering we envision the need to group these common research areas in one Center. Since January 2015, CCS is the home of several research groups of different universities in Madrid: Universidad Politécnica de Madrid (UPM), Universidad Rey Juan Carlos (URJC), Universidad Complutense de Madrid (UCM) and Universidad Autónoma de Madrid (UAM). This increases the ability to adapt and meet the needs of a rapidly changing world of research and applications that is enabled by new computers, communications and algorithms.

Facilities and infrastructures

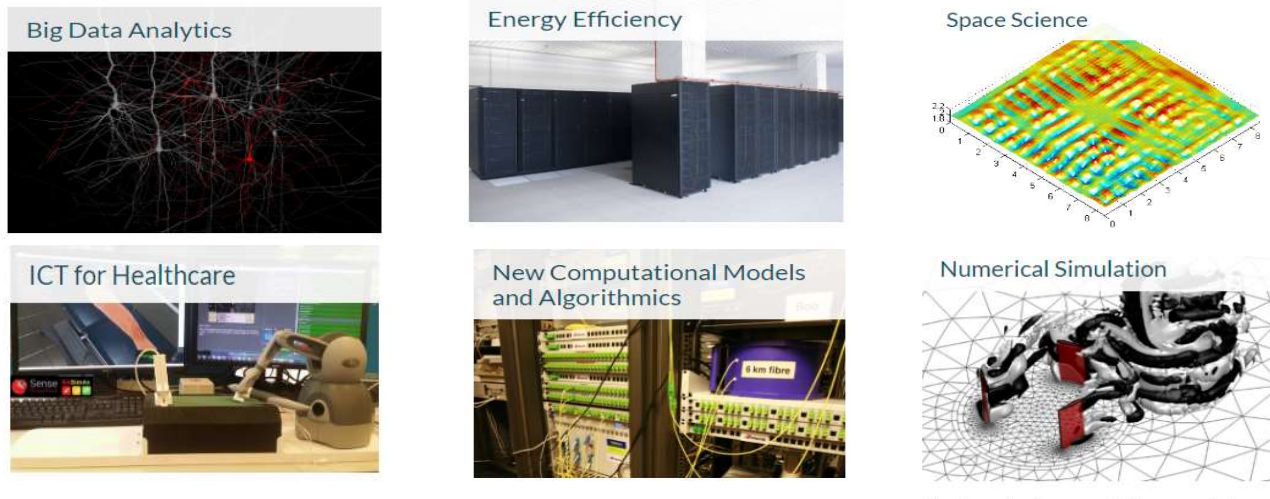


The Center consists of several research groups scattered in different schools and universities in Madrid. The E-USOC is one of the groups forming the CCS. They have different facilities of their own, including a Control Room (This is the heart of E-USOC, where the Ground Controllers (GCs) and trained Operators (OPS) carry out their duties related to the operation of experiments (or payloads, in aerospace terminology) on board the International Space Station (ISS)); a Clean Room (which accommodates a 21 m2 clean room complemented with a gray room (anteroom)).

The CCS is also a heavy user of the Madrid Supercomputing and Visualization Center (Centro de Supercomputación y Visualización de Madrid, CeSViMa). CeSViMa is a UPM facility and has one of the largest computers in the country. With close to 5.000 cores it was the fastest computer in Spain in 2011, according to the Top500 list.



Research areas associated with Big Science



Main projects in Big Science

- *A Computational Design Approach to Haptic Synthesis.*
- *Rapid Biomechanics Simulation for Personalized Clinical Design.*
- **NAVIPHY:** *Navegación, simulación física e imagen en procedimientos intraoperatorios.*
- *Natural Hands for Intuitive Virtual 3D Interaction.*
- **HBP SGA2:** *Human Brain Project Specific Grant Agreement 2.*
- **InnoLOG:** *Innovative geophysical logging tools for mineral exploration.*

Collaboration with Large European Scientific Facilities

- **ESA:** *The E-USOC (Spanish User Support and Operation Center) is a delegated center of ESA whose function is to provide to the scientific community the necessary assistance for the preparation, execution and post-flight analysis of space experiments in the ISS, involving the payloads which E-USOC is responsible for.*
- **ESA:** *The HRE-SDC (Human and Robotic Exploration – Science Data Center) is a data management center to manage the scientific data generated in the scientific missions developed by ESA of the HRE Division.*

Software, tools and licenses to be applied to Big Science

- **ViSimpl:** *Multi-View Analysis of Brain Simulation Data*

ViSimpl provides 3D particle-based rendering that allows visualizing simulation data with their associated spatial and temporal information, enhancing the knowledge extraction process. It also provides abstract representations of the time-varying magnitudes supporting different data aggregation and disaggregation operations and giving also focus and context clues. In addition, ViSimpl tools provide synchronized playback control of the simulation being analyzed. Finally, ViSimpl allows performing selection and filtering operations relying on an application called NeuroScheme. All these views are loosely coupled and can be used independently, but they can also work together as linked views, both in centralized and distributed computing environments, enhancing the data exploration and analysis procedures.

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