

Fundamentals of satellite navigation and positioning

May 3, 14:30-18:30 - Sala Riunioni DIMA

May 4, 9:30-13:30 - Sala Riunioni DPIA – ex DIEG

Description

The use of position This course provides an overview of the positioning and navigation based on Global Navigation Satellite Systems, such as the American Global Positioning System, the European Galileo, the Chinese BEIDOU and the Russian GLONASS. It introduces current systems and presents future systems that are currently under development. The course discusses the concepts behind global positioning, how the signal is used to determine location by a receiver and examples end-user applications. The course discusses the sources of GNSS errors, as well as the modern techniques available for service enhancement.

Day 1

- Positioning and navigation principles
- Global Navigation Satellite Systems and signals
- Error sources and mitigation

Day 2

- The role of the GNSS receiver: signal processing and architectures
- Integration of GNSS and other positioning techniques: inertial systems and mobile networks

Fabio Dovis

Fabio Dovis is associate professor at the Department of Electronics and Telecommunications of Politecnico di Torino. He significantly contributed to the creation of a research group named Navigation Signal Analysis and Simulation – NavSAS -, specializing the telecommunication skills in the satellite navigation field. The group is currently a joint group of Politecnico di Torino and Istituto Superiore Mario Boella and it is currently composed of 30 people (professors, researchers, Ph.D students).

Research activities

The research interests cover many fields of signal processing and communications, and are currently mainly focused on the satellite navigation and positioning systems.

Navigation and Positioning

His research focus is mainly on the design and development of a receiver for GPS and Galileo by means of software defined radio and fully-software techniques and using advanced signal processing techniques. The design aims at obtaining low-complexity flexible architectures for navigation-only and integrated navigation/personal communication receivers. This research activity is performed both for the GPS/Galileo signals and addresses the strategies for the fully software and software-defined implementation of the functional blocks (HW/SW partitioning, low complexity constraints, etc.). As far as the Galileo system is concerned he is addressing in particular the design of user receivers architectures for the Galileo signals, the study of effective demodulation schemes for Binary Offset Carrier (BOC) modulated signals and Alternative BOC, and the study of performance of Multiplexed BOC signals.

His research activities addressed also the theoretical study of hybrid algorithms based on raw NAV/COM measurements for the position computation, and the study of assisted architectures for indoor positioning. He studied and designed signal processing techniques for multipath removal in professional GNSS receivers (e.g. Turbo DLL) and is also addressing issues related to interference identification and rejection.

Currently he acts as consultant for the European GNSS Supervisory Authority and the Galileo Unit of the European Commission, as external technical advisor for monitoring on-going projects. In 2005 and 2006 he provided consultancy to the Galileo Joint Undertaking on the technology aspects related to the development of navigation receivers and miniaturization, as well as external expert for the evaluation of proposals. In June 2011 he has been appointed as member of the Mission Evolution Advisory Group of the European Commission, the group of 23 experts has the task to propose and evaluate evolutions of the mission objectives for the European satellite navigation programmes Galileo and EGNOS.

He published more than 50 papers on navigation topics, and he is member of the editorial board of the GPS Solutions journal.