



Education by research in GNSS in Turin



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Overview



- NAVSAS group and research activities
- Master in Navigation and Related Applications
- The internship projects
- The JEAGAL Project: a prototype of world-wide cooperation



Overview



NAVSAS group and research activities

- Master in Navigation and Control
- The internship projects
- The JEAGAL Project:





Galileo @ ISMB and Politecnico



Navigation Signal Analysis and Simulation Group

A Joint Research group focused
on the Galileo user segment





NavSAS Skills



- NavSAS has been established in 1999, as a spin-off of the TLC group of Politecnico di Torino.
- About 20 researchers
- Research activities are mainly focused on:
 - **receiver (GPS and Galileo) technologies.** NavSAS is one of the major academic R&D groups operating in this field
 - Galileo receiver **SDR** implementation
 - **GNSS Local Element** technologies
 - **NAV/COM hybridization**
 - **Advanced signal processing** for GNSS (e.g. Multi-path rejection)
 - Innovative **Interference monitoring and mitigation** strategies
- NAVSAS has a strong scientific background proved by more than 70 publications on navigation topics





Participation to committees



Participation to committee and *working groups*

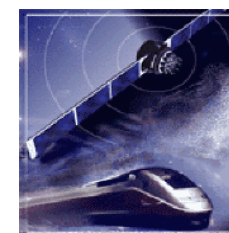
- **Galileo Signal Task Force**
- **CGALIES** working group for E-112
- **GALILEAN Network**
- **International Pseudolite** working group
- **Review** of European projects and journal papers
- **Chairman** of conference sessions



Participation to GJU projects



GARDA	Galileo receiver
GILT	Local Element
ARTUS	Professional receiver
GIRASOLE	Safety-of-life receiver
GR-POSTER	Mass market receiver
GREHDA	Satellite receiver
POP-ART	Alpine rescue





Overview

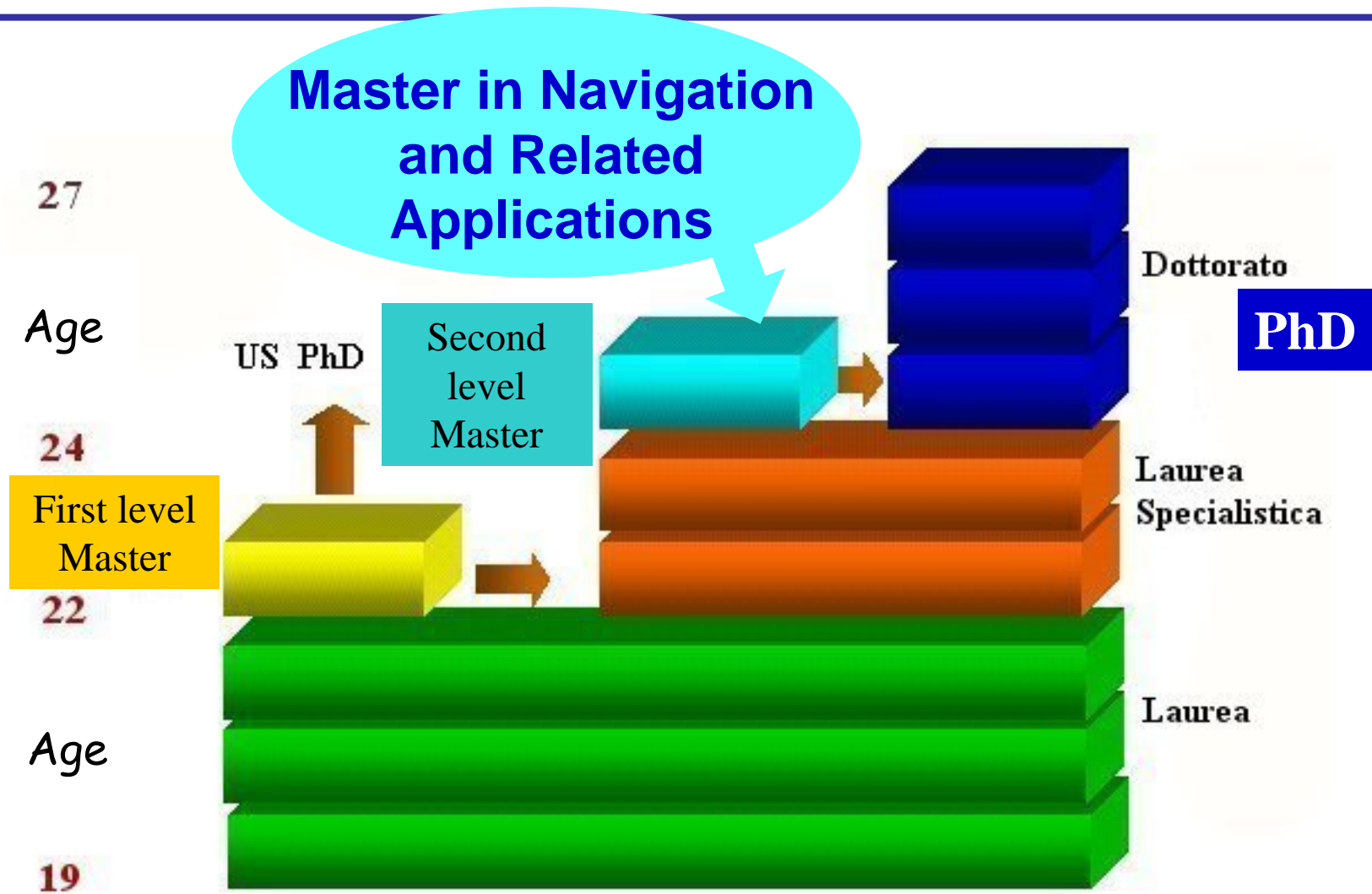


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- The JEAGAL Project: a protocol





Structure of Education in Politecnico





Master in Navigation and Related Applications



A joint initiative of



**Politecnico di Torino and Istituto Superiore Mario Boella
with the cooperation of IEN Galileo Ferraris and UN OOSA**



**United Nations
Office for Outer
Space Affairs**

The objective is to disseminate knowledge, a key element for the future exploitation of Galileo



Requirements for Admission



- Students with a 5 years curriculum

Degree on:

- Information Technology
 - Electrical Engineering
 - Communications Engineering
- Aerospace Engineering
- Environmental Engineering

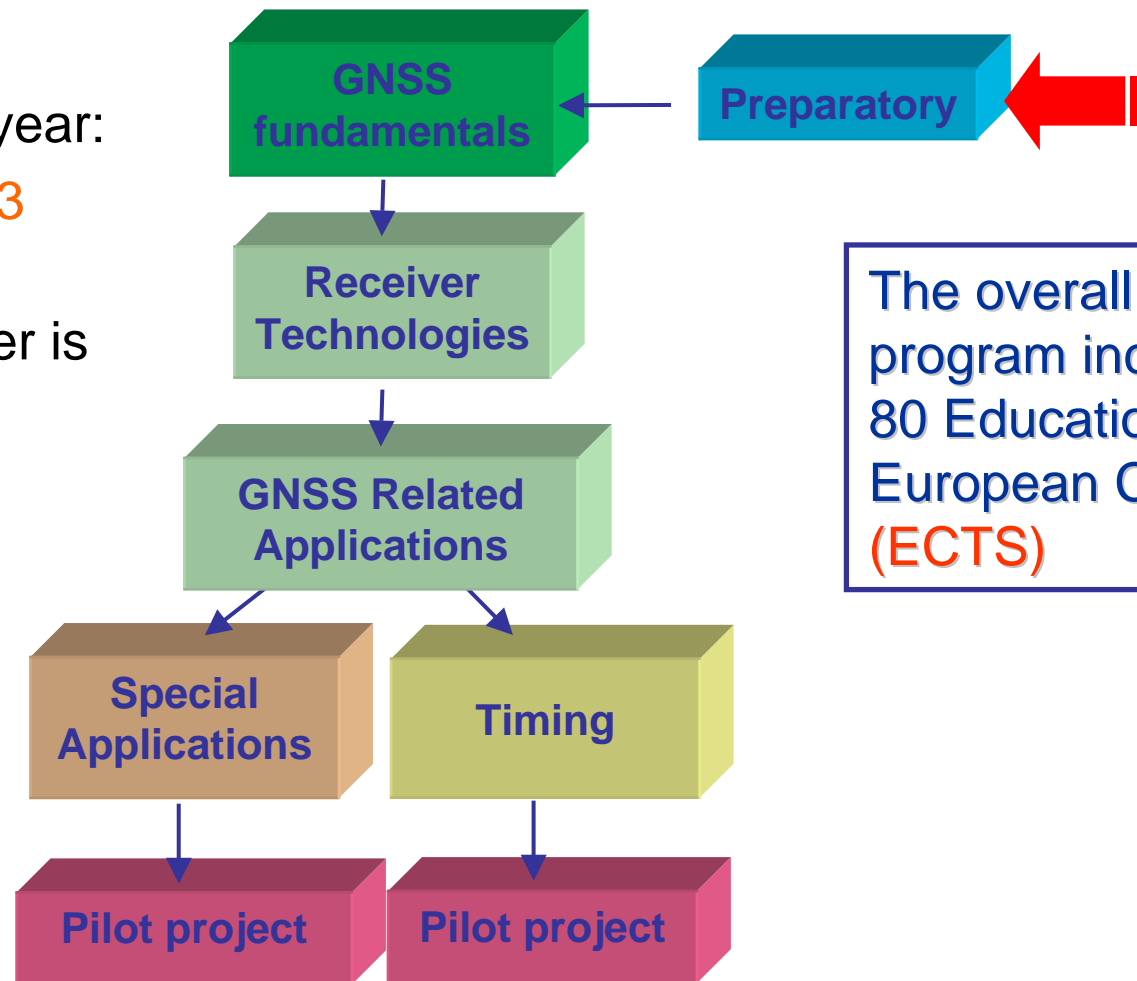


Master Overview



The Master lasts 1 year:

- 12 classes over 3 quarters
- The fourth quarter is devoted to an **internship** to be carried out in a company



The overall program includes 80 Educational European Credits (ECTS)



Fellowship program



- UN-OOSA, ISMB and Politecnico di Torino have developed a long-term fellowship program which will provide students/specialist from developing countries and countries with economy in transition with an opportunity to receive a Master degree in GNSS
- Students will receive a **financial support** for the **tuition fee** and for **other expenses** during their studies

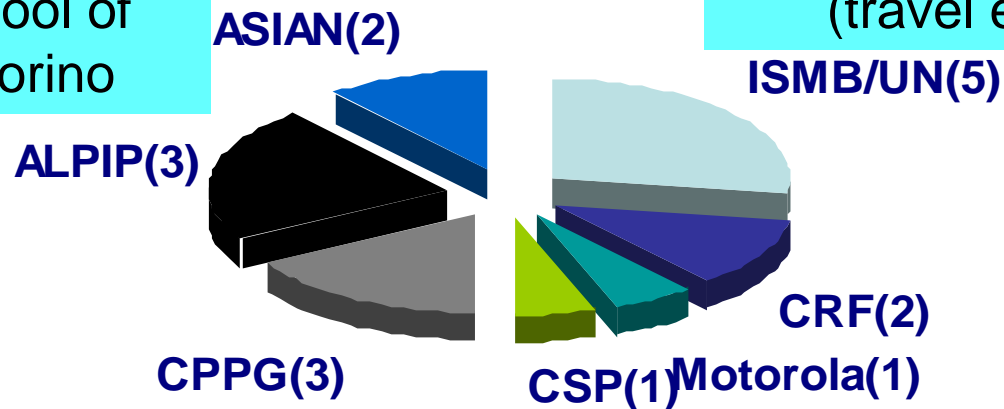


Fellowships in the First Edition



Through the Information
Technology School of
Politecnico di Torino

ISMB (fellowship), UN
(travel expenses)



Comitato Promotore
Programma Galileo

Private sector

More than 60 applications received



Fellowships in the Second Edition



Students from **9 different countries** will be trained on GNSS

Country	Project	Students
Ghana	ISMB/UN	1
Iran	ISMB/UN	1
Algeria	ISMB/UN	1
Nigeria	ISMB/UN	1

Country	Project	Students
Jordan	Other	1

Country	Project	Students
Mexico	ALPIP	1
Ecuador	ALPIP	1

Country	Project	Students
China	JEAGAL	6
Vietnam	JEAGAL	4



Web sites



- <http://didattica.polito/master/navigation>
- <http://www.oosa.unvienna.org>



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Internship Projects



Students will spend 4 months (internship) in a research lab or a company operating in the field of navigation with the goal to develop a specific pilot project

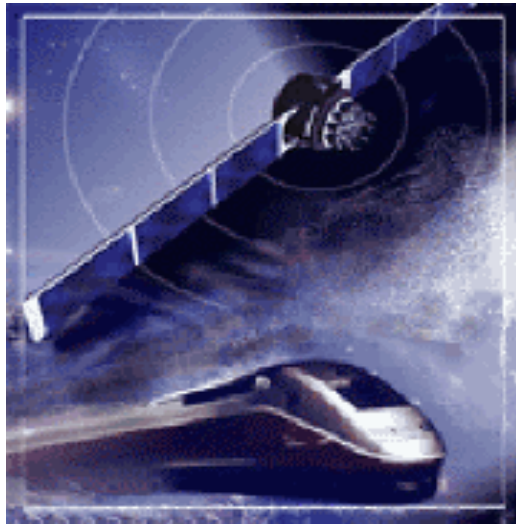


MOTOROLA





Pilot Projects in the II Edition



- “Use of GPS/Galileo receivers for railway applications”
 - Analysis of safety requirements and integrity levels
 - Risk analysis and mitigation actions to determine the Safety Integrity Level for the user terminal equipment
 - Validation of the proposed safety design for the GNSS subsystem
- “Indoor Positioning Using WLAN Radio Signals and GNSS signals”
 - Analysis of existing solutions
 - Study of possible improvements with the Galileo signals



Pilot Projects in the II Edition

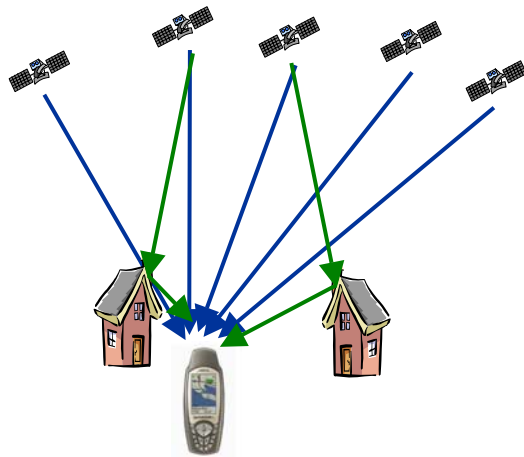


- “GPS-GALILEO/INS integrated navigation systems for maritime applications”
 - Analysis of existing solutions and their drawbacks
 - Study of an innovative algorithm to determine the ship attitude matching real-time requirements

- “Integer Ambiguity Resolution of the Integrated navigation system based on GPS/Galileo”
 - Analysis of GNSS signal structure and parameters relevant to ambiguity resolution
 - Applications of the nonlinear particle filtering to obtain improved solutions

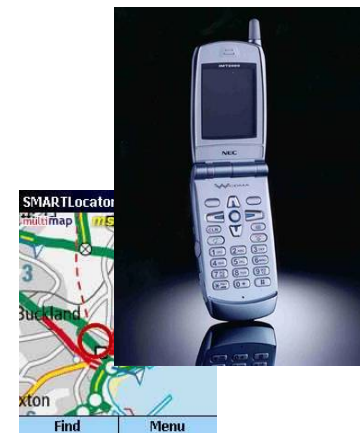


Pilot Projects in the II Edition



- “Effects and Mitigation of Multipath on GPS and Galileo Signals”
 - Characterization of GPS and Galileo signals
 - Multipath effects on code and carrier phase measurements
 - Analysis of antenna-based mitigation methods

- “Switch Strategies of Location-based Services in Combined GNSS and B3G Mobile systems Environment”
 - Analysis of solutions based on existing Communication systems
 - Study of innovative solutions





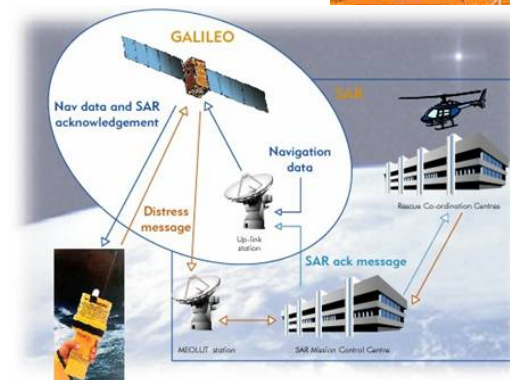
Pilot Projects in the II Edition



- “Development of a GNSS-based map-aided positioning system in urban environment”
 - Creation of a digital map of the city
 - Development of the application using the Java programming language



- “Navigation payload design for NIGCOMSAT1”
 - Analysis of possible applications of the navigation payload in the field of search&rescue
 - Design and configuration of the navigation payload





Pilot Projects in the II Edition



- “Development of a GIS for installations of an Electricity Network using GNSS signals”
 - Field measurements using GPS receivers
 - GIS software development
 - Integration of network data in the developed application

- “Performance Analysis of Code and Carrier Tracking with Galileo Software Receiver”
 - Review of existing techniques
 - The impact of Galileo and modernized GPS signals
 - Development of a software tool for performance evaluation



Photo: ESA - P. CARRIL



Pilot Projects in the II Edition



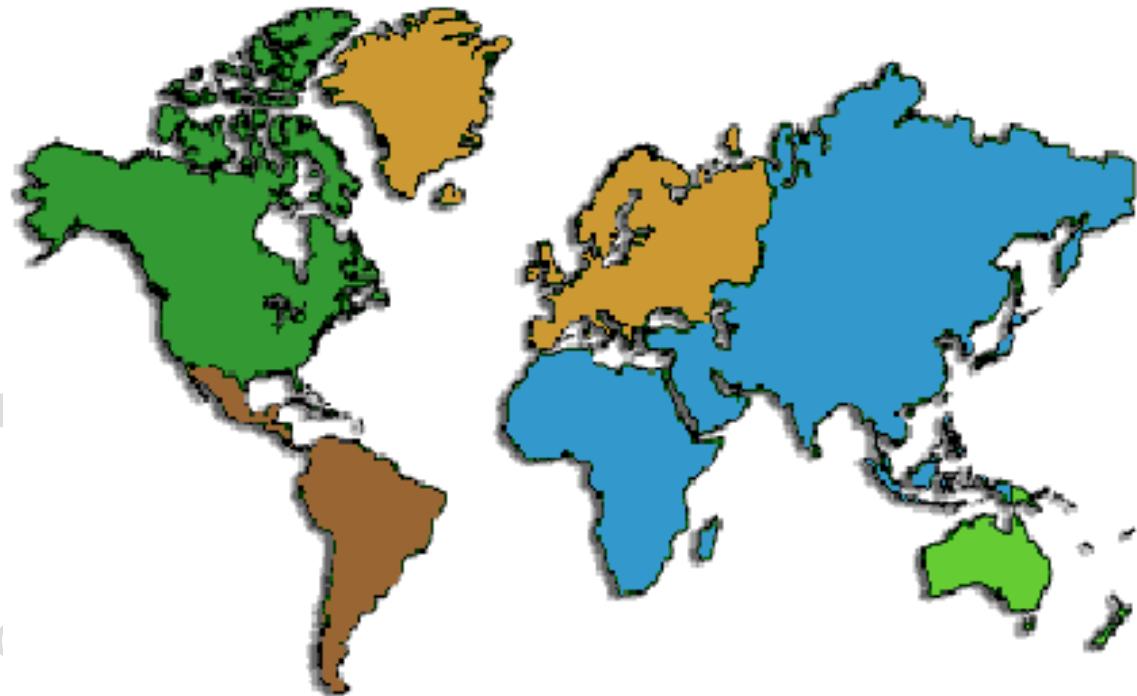
- “Estimation of clocks for Timing in GSTB-V1”
 - Analysis of main characteristics of timing aspects in the Galileo system
 - Analysis of clocks characteristics in the Galileo system
 - Analysis of the results of GSTB-V1

- “Assessment of stability on the Experimental Galileo System Time scale to UTC/TAI”
 - Analysis of needs of time accuracy and stability in Galileo
 - The Galileo EPTS
 - EGST performance assessment





Overview



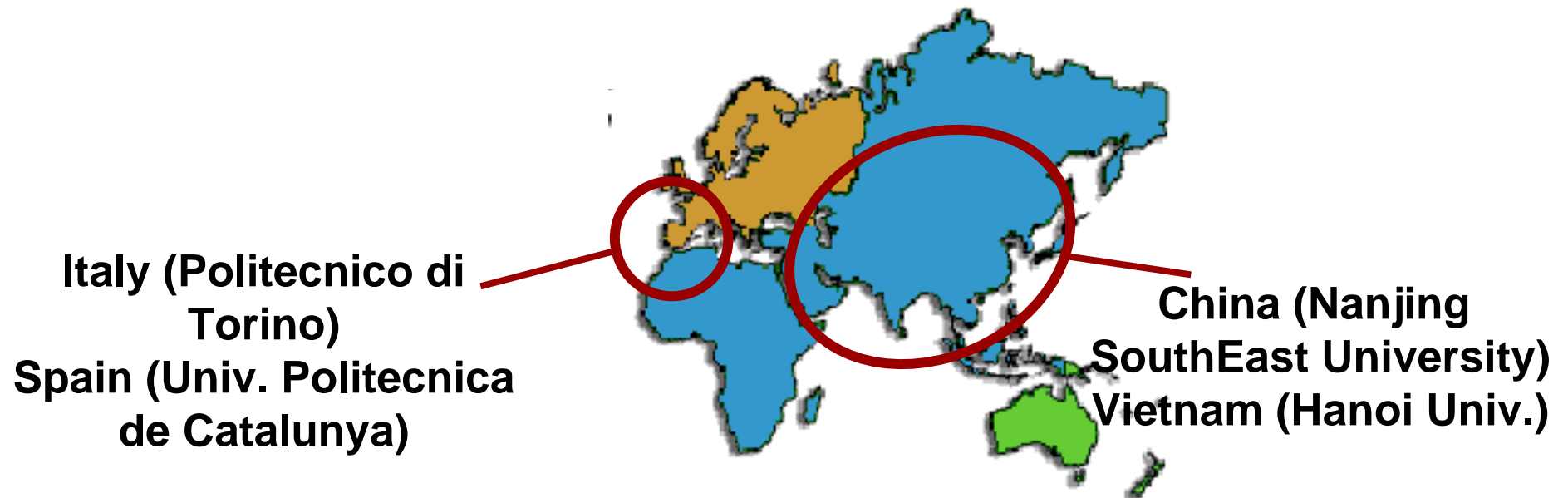
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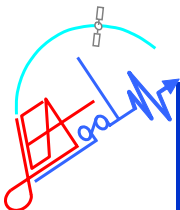
JEAGAL project (2005-2007)



EU-Asia Information Technology & Communication Program



A Galileo 'train-the-trainer' program for China and Vietnam





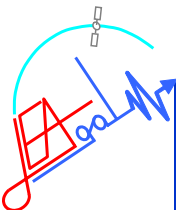
The JEAGAL Project



Main Activities

- **Four workshops held in the two Asian countries for technicians and decision-makers**
- **The training of ten Asian technicians attending the Master in Navigation and Related Applications in Turin**
- **The setup of laboratories on Galileo in the Asian partner Universities**
- **The preparation of related educational material**

- **Starting date: 1st March 2005**
- **Duration: 24 months**





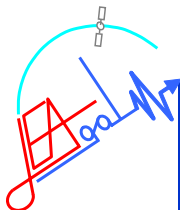
Lectures in Asia



Nanjing



Hanoi

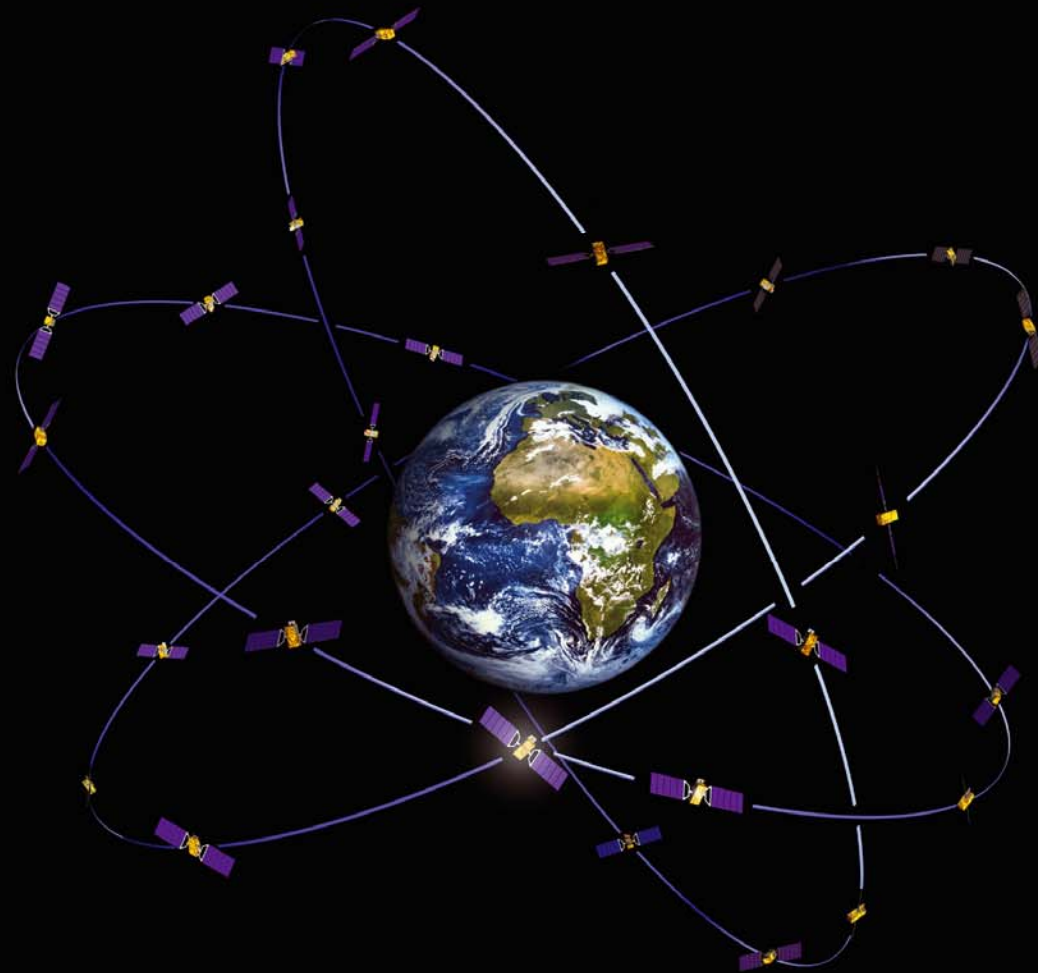




Dissemination activities



- **Scientific conferences**
- **ISMB Navigation Laboratory and NavSAS group:**
www.navsas.polito.it
- **Short seminars tailored to a specific audience (decision makers, high school teachers, potential users, etc..)**
- **Interview with journalists (for newspaper articles and/or television shows)**



Thank you!