Geomatics at the Como Campus of Politecnico di Milano

Background

The Geomatics research group of Politecnico di Milano-DIIAR has been active in Como Campus since '95 and is now composed of two full professors, three assistant professors, one technician and 13 PhD/PostDoc students. The Geomatics researchers are active into international and national scientific associations, either as chairs or members of specific study groups: International Association of Geodesy, International Geoid Service, Open Source Geospatial Foundation, International Society for Photogrammetry and Remote Sensing, European Reference Frame, Scientific Committee of Italian Society of Photogrammetry and Surveying.
The group has also activated the Geomatics Laboratory: Ludovico Biagi and Marco Negretti are respectively its scientific and technical responsibles. Basically the Lab provides informatic support to the researches of the group and to the courses of the faculty of Civil and Environmental Engineering in Como. The Geomatics Laboratory of Como Campus hosts a GNSS permanent station, geodetic and topographic instrumentation and several servers for numerical calculus, GNSS processing, GIS and Internet GIS analyses and publication, DTM analyses and publication.

General objectives

The Group is involved in several research topics: the main are Gradiometry-GOCE, GNSS (Global Navigation Satellite System), Cartography, GIS (*Geographical Information System*), Internet GIS, DTM (*Digital Terrain Model*) and Photogrammetry. Generally, the main research interests are acquisition and analysis of Earth observation data, positioning, algorithms for statistical analyses, web publication and analysis, mainly by open-source platforms. Each research topic is characterized by its own objectives.

Detailed description

GOCE-gradiometry
The laboratory is one of the official European centers for the data analysis of the GOCE (Gravity field and steady-state Ocean Circulation Explorer) mission. This is the first mission of the ESA (European Space Agency) Living Planet program which aims at recovering information on critical variables of the Earth system. By means of GOCE observations it will be possible to map the Earth gravitational field, validate Solid Earth and ocean circulation models and, from the engineering point of view, find applications in construction industry, land planning and positioning (height datum).
The research developed in Como is oriented to the study and the implementation of the so-called space-wise approach for the global gravity model determination, to the solution of possible critical issues in the data analysis and to the investigation on new applications from the GOCE data.

GNSS
At present, our analysis centre monitors two permanent GNSS networks. Moreover, new algorithms are studied and developed to allow the quality check of real time products provided to the surveying community by GNSS permanent networks. The group develops also software to improve the performances of low cost receivers, particularly for navigation applications.
Some researchers are studying the problems of reference frames, from the global spatial scale to the local realizations. Within the IAG-Study Group IC-SG1, new approaches to monitor the geodetic deformations by permanent networks have been studied and implemented. By cooperating with EUREF Commission, with IGM (Istituto Geografico Militare Italiano, the national mapping agency) and with CISIS (Centro Interregionale per i Sistemi Informatici, geografici e Statistici), studies and analyses have been made on the european ETRF2000 reference frame and its Italian realization, named RDN (Rete Dinamica Nazionale, Dynamic National Network).

Cartography, GIS, Internet GIS and DTMs
The activity aims at developing modules able to expand the potential of GIS software, i.e. systems capable to store, analyze and publish geographic data.
The research group studies and develops algorithms for cartographic and environmental analysis (GRASS modules to analyze urban noise, cartographic modules for multiresolution analysis and matching between maps) and deals with data publication through WebGIS (e.g. for the Road Sector of Milan Province, for Po River Basin Authority, for Lombardy Region ARPA).

An ongoing project, named WebCarte, concerns the digitization of Como ancient cartography and the development of automated tools for georeferencing historical data with respect to the current cartography.
In GIS field some projects are also ongoing for the analysis and publication of multidimensional data, such as the spatial and temporal trend of temperatures into a water basin.
The group is also involved in activities relevant to the realization, validation, homogenization and merging of DTM's (Digital Terrain Models), that constitute the databases relevant to the terrain heights. On this topic, a project named HELI-DEM has been founded by the INTERREG program. Other researches regard the computation and transmission of multiresolution DTM's.

Fundings and Cooperations

The group coordinates and is involved in several Research Projects founded mainly by European Space Agency, INTERREG projects, Italian Ministry of University and Research and local public administrations. Moreover it supports several public administrations and private firms: Servizi cartografici della Regione Lombardia, Settore pianificazione urbanistica del Comune di Como, Centro Interregionale per i Sistemi Informatici, Istituto di Ricerca per l'Ecologia e l'Economia Applicate alle Aree Alpine, Leica Geosystems Italia, Galileian Plus.