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Eventual Participation in GMES of Institute of Geodesy and Geoinformation

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The new project has been commenced at the University of Latvia (LU) – "Fotonika-LV". Three institutes, namely institute of Atomphysics and Spectroscopy, Institute of Astronomy and Institute of Geodesy and Geoinformation have succeeded to receive the sources for proposed development of photonics in applied research. Several highly advanced partner institutions have agreed to establish partnership in planned research activities.
The photonics plays an important role at the R&D of the Institute of Geodesy and Geoinformation of the University of Latvia (LU GGI). The Institute applies the space related technologies for the environmental studies in Latvia.
Photonics has been applied in satellite laser ranging systems. The small size modern satellite laser ranging system (SLR) and its control software has been developed at the Institute recently. SLR will be used for the regular observations of low Earth orbiters (LAGEOS, GOCE, GRACE, ERS2, ENVISAT, CRYOSAT, etc.) within the framework of ILRS. The test observations have proved the results of high quality. Sentinel mission satellites could be observed as well if they will have the laser retroreflectors. The developed SLR is a small size. It could be improved for the mobility applications in variety of sites if needed.
Another SLR machine is under construction with planned application for remote sensing satellite calibration by using the white laser beam. Additionally it could be used for Galileo and LAGEOS observation. However, in order to use the SLR for Galileo and other higher orbit satellites the most sensitive photonics are needed. From other side the proper optical devices are needed for SLR observations at the daylight. Additionally, the sky in the Baltic region is frequently covered by the thin clouds which make the satellite observations very complicated and less productive. The optimal choice of photonics in each case is needed and best solutions are required.
The CCD matrices combination with especially made optical devices has been used in SLR system for the visual guidance of the satellite tracking. The R&D in CCD matrices construction and application technologies are developed with increased variety in several countries. The application of advanced CCD techniques in SLR systems is a very powerful tool. To follow the CCD techniques development race and to apply photonics achievements in various devices of geodetic techniques is very important for the Institute.
Also development of the mobile zenith camera for determination of vertical deflection is being carried out. Zenith camera will serve for the studies of anomalies of regional gravitation field. The observation procedure is based on the analysis of the stellar sky imageries obtained on the CCD matrices similarly like in star tracker. Both the resolution quality and the sensitivity of the matrices are the key elements for high accuracy vertical deflection determination.
Application of Global Navigation Satellite Systems (GNSS) in geodesy discovers a powerful tool for the verification and validation of the height values of geodetic levelling benchmarks established historically long time ago. The differential GNSS and RTK methods appear very useful to identify the vertical displacement of landscape by means of inspection of the deformation of levelling networks. Within the European framework of ground based GNSS European positioning augmentation system EUPOS® the local EUPOS®-Riga continuously operating geodetic reference system has been developed by LU GGI in co-operation with Rigas GeoMetrs land surveying company. The system consists of 5 GNSS base station network located within the framework of Riga city. The system has been properly investigated and controlled. The GNSS observation RTCM corrections produced by the EUPOS®-Riga system can be used for high precision position determination in various navigation and land surveying applications.
All the developments carried out at the Institute serve for the studies and for the monitoring of the environmental changes. The satellite imagery maps are used too. The knowledge of photonics discovers additional capabilities in development of airborne and spaceborn applications for earth observation. The ongoing process is accelerated in co-operation with a Riga Technical University. Scientific staff of "Fotonika-LV" project and LU GGI are looking forward for eventual participation in GMES project.