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COST Action TU1208 "Civil Engineering Applications of Ground Penetrating Radar:" a short overview of the main scientific activities and results

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This abstract aims to offer a short overview of the main results achieved by COST Action TU1208 "Civil engineering applications of Ground Penetrating Radar" (www.GPRadar.eu, 2013-2017). More than 300 experts participated in the Action, from 150 institutions in 41 countries. In September 2014, TU1208 was praised among the running Actions in the TUD domain as a "COST Success Story."
The primary objective of the Action was to exchange and increase scientific-technical knowledge and experience of Ground Penetrating Radar (GPR) techniques in civil engineering, while promoting an effective use of this non-destructive method. The scientific structure of the Action included four Working Groups (WGs).
WG1 focused on the design, realisation and testing of GPR instrumentation. Among the main results of WG1: novel pulsed and stepped-frequency GPR prototypes were designed, realized and tested; a cheap frequency-modulated continuous-wave GPR for training purposes was designed and realised and detailled instructions, describing how to build this radar step-by-step, were made available on the Action website; recommendations for the safety of people and equipment during GPR prospecting were produced.
WG2 focused on the use of GPR in civil engineering. The most significant outcomes of WG2 are: the preparation of guidelines for GPR assessment of pavement and concrete structures, and for GPR sensing of underground utilities and voids; the development of case studies, where GPR was used to survey roads, highways, runways, parkings, tunnels, bridges, railways, buildings, to detect cables and pipes and inspect road construction materials, joints, concrete and wood.
WG3 dealt with electromagnetic-modelling, inversion, imaging and processing algorithms for the analysis and interpretation of GPR data. The main outcome of WG3 is the development and release of a new open-source version of the finite-difference time-domain simulator gprMax. Further freeware tools were produced, such as a CAD for the construction of two-dimensional gprMax models, codes implementing integral methods for the solution of scattering problems by buried objects, inversion methods for target detection and localization. Another significant outcome of WG3 is the creation of an open database of GPR radargrams.
WG4 worked on the use of GPR in other areas (archaeology and cultural heritage, agriculture and management of water resources, investigation of polluted industrial sites, inspection of trees, localization of people buried under avalanches and debris, and more). WG4 also studied the integration of GPR with complementary non- destructive testing methods. The most relevant achievements of WG4 are: the collection of thorough information on the state-of-the-art and research needs on the topics of interest; the performance of several case studies in important sites all over Europe.
All WGs contributed to the development of an open-access educational package to teach GPR in University courses ("TU1208 Education Pack"), the organization of fifteen Training Schools, two workshops, many sessions in international conferences, a series of successful dissemination events ("TU1208 GPR Road Show"), and the co-organization of the 15th International Conference on Ground Penetrating Radar.
This abstract is authored by the team of conveners of the 2019 EGU GA session GI4.1 dedicated to the GPR technique, in alphabetical order (we all were Members of the presented Action).