

Katarzyna Bernat, Regina Tokarczyk • **Automation of Measurements of Selected Targets of Photopoints in Application to Photogrammetric Reconstruction of Road Accidents** • Geomatics and Environmental Engineering 2013, Vol. 7, No. 1

Presently, the use of photogrammetric methods in various measurement tasks is becoming more and more popular. More and more often, the achievements of photogrammetry are utilized in the reconstruction of road accidents, thus making it possible to measure the post-accident situation not only on the site but also in desk work conditions based on accident site photos. Before a photo is taken, it is necessary to target measurement points in a proper way. The measurement of those targets takes place most often in an automatic mode. During the reconstruction of road accidents, most often targets in the form of black and white chequered patterns, fixed at the ends of a metal cross, are used. Such targets considerably impede the measurement automation (cf. perspective distortions and scale differences).

In this paper an attempt was made at creating a program for an automatic detection and measurement of those targets. For that purpose, Matlab v. 7.10 package was applied. Due to that type of signalling, only a qualified success was attained, since target measurement needed to be supported by the program user. Also another way of signalling was proposed that enabled encoding of point numbers. Signs in the form of ring codes were selected. Algorithms of automatic detection, measurement and the identification of signals in digital images were developed. The created algorithms performed well under field conditions, and also allowed for the determination of detailed rules of making photos in accident sites.

**Keywords:** reconstruction of road accidents, digital images, automation of measurements, coded targets

Agnieszka Bieda, Jarosław Bydłosz, Piotr Parzych • **Actualization of Data Concerning Surface Flowing Waters, Based on INSPIRE Directive Requirements** • Geomatics and Environmental Engineering 2013, Vol. 7, No. 1

Currently, Poland is at the stage of creating and implementing the provisions of the law related to the formation of infrastructure for spatial information. New legislation is to ensure consistency of the databases on which maps will be generated. It is required that the database created pursuant to the INSPIRE Directive is kept up to date. Implementation of completely new surveys, based on which the correct data collections would be created, is almost impossible due to the time and costs of their execution. Due to the large variability in time, the most vulnerable to obsolescence database elements will be those in the area of surface (sea, flowing and standing) water. It is there, irrevocably, to be checked whether it is necessary to amend the previously existing data collections.

**Keywords:** databases, INSPIRE Directive, surface waters

Marek Bogacki, Paulina Syguła • **The Impact of Biogenic Volatile Organic Compounds Emission on Photochemical Processes Occurring in the Troposphere** • Geomatics and Environmental Engineering 2013, Vol. 7, No. 1

Biogenic volatile organic compounds (BVOCs) have a significant impact on air quality in the ground layer of the atmosphere and they play a major role in forming the climate. They are the main precursors of tropospheric ozone and they are a source of secondary organic aerosols in the atmosphere. Indirectly they also affect the climate-forming processes. The paper presents the influence of BVOCs on photochemical processes occurring in the atmosphere. The main mechanisms of reactions associated with BVOC oxidation in the air and the formation of secondary organic aerosols have been discussed here. Physico-chemical conditions of the course of the indicated mechanisms have been identified. The problems and uncertainties faced by atmospheric chemists while preparing a qualitative and quantitative description of chemical reactions in the atmosphere involving BVOCs have been discussed as well.

**Keywords:** ozone, tropospheric chemistry, photochemical processes, oxidants, anthropogenic emission, biogenic emission, anthropogenic source, biogenic source, volatile organic compounds,  $\text{NO}_x$ , secondary organic aerosols

Krzysztof Deska • **An Investigation into the Influence of a Temperature Load of a Suspended Roof in Measurements for Diagnostic Purposes** • Geomatics and Environmental Engineering 2013, Vol. 7, No. 1

This paper presents issues concerning the necessity and possibility of including a temperature load of a suspended, open structure, especially in terms of correct identifying a displacement caused by snow and ice loads. Using statistical analysis tools, based on the results of periodic measurements, appropriate calculations were carried out. Both possibilities and limitations of this approach and the use of outcomes were indicated and the need for and directions of a continued research in this area were demonstrated.

**Keywords:** suspended roof, measurements, temperature load, snow load

Magdalena Kowacka • **Thematic Map as a Form of Visualization of Information on Landscape Architecture Components** • Geomatics and Environmental Engineering 2013, Vol. 7, No. 1

The present paper presents the possible application of information on landscape architecture components obtained in measurements carried out by means of GPS Nautiz X7, manufactured by Handheld. The identified components include commemorative plaques for artists, and headstones at the Salwatorski, Rakowicki and Jewish Cemeteries in Cracow. Not only do the measurements serve the purpose of preparation of the thematic map, but they are also carries of various information which after adequate processing could be subject to further analyses and widely employed.

**Keywords:** thematic map, commemorative plaque, GPS, Cracow, artist

Grzegorz Lenda, Grzegorz Mirek • **Parametrization of Spline Functions to Describe the Shape of Shell Structures** • Geomatics and Environmental Engineering 2013, Vol. 7, No. 1

Description of the shape of shell structure surfaces by means of spline functions is a competitive method of approximation to the approximation with a surface of the second degree. They allow us to present local deformations of the structure. However,

they demonstrate sensitivity to a variety of factors, among which the most important is related to the shape of the structure, determining the appropriate choice of spline function arguments. Determining of the arguments is carried out in the so-called parametrization process, which is crucial for the accuracy of the obtained approximations.

This paper focuses on the application and comparison of several popular parametrization methods for approximating the shape of the surface of shell structures. The main task of the conducted test study was to select the parametrization method bringing the most accurate results for the description of the structures measured with a not too high density of points (every tens of centimeters – meters) for example, using popular reflectorless total stations. For this purpose, two test models were analyzed, with one- and multi-directional variable curvature, from which sets of points distributed alternately were considered, used to construct spline surfaces and to determine the deviations of the surfaces from the test models.

The study involved three most common types of parametrization [2–4]: with a fixed distance, with the distance between the points and with its root. The conducted analysis of the results allowed us to identify the most accurate parametrization method to describe the shape of the shell structure surface.

**Keywords:** shell structures, spline functions, parametrization

Oleg Mandryk, Katerina Radlovska • **Contamination of Soils with Heavy Metals in the Industrialized Region of Western Ukraine: Western Podole Upland** • Geomatics and Environmental Engineering 2013, Vol. 7, No. 1

Contamination of surface soil horizons with heavy metals is usually related to long-lasting air pollution and might potentially affect soil fauna, as well as plant growth, harvesting and health of plant consumer. In order to estimate potential health risk, we investigated surface and subsurface soil contamination with heavy metals in arable area in one of the most industrialized region of western Ukraine, western Podole Upland. In total 80 samples from the area of about 35 km<sup>2</sup> were sampled and analyzed for content of zinc, nickel, copper, cobalt, lead, arsenic and quicksilver. The research revealed several anomalies, where the content of these elements exceed 3–5 Ukrainian quality guidance

for arable soils. Soils are the most contaminated with arsenic and quicksilver, with maximum concentrations exceeding local geochemical background about 20 times. Maximum nickel and zinc concentrations are about 10 times higher than the background while the content of copper and cobalt is elevated up to several times.

**Keywords:** soil contamination, heavy metals, air pollution, industrial emission, western Ukraine

Katarzyna Bernat, Regina Tokarczyk • **Automatyzacja pomiaru wybranych sygnałów fotopunktów na potrzeby fotogrametrycznej rekonstrukcji wypadków drogowych** • Geomatics and Environmental Engineering 2013, Vol. 7, No. 1

Obecnie popularne staje się korzystanie z metod fotogrametrycznych w różnych zadaniach pomiarowych. Coraz częściej dorobek fotogrametrii wykorzystuje się w rekonstrukcji wypadków drogowych, dzięki czemu możliwy jest pomiar sytuacji powypadkowej nie tylko na miejscu zdarzenia, ale także w warunkach biurowych na podstawie zdjęć miejsca zajścia wypadku. Przed wykonaniem fotografii konieczne jest jednak zasygnalizowanie w odpowiedni sposób punktów pomiarowych. Pomiar tych sygnałów odbywa się najczęściej w sposób automatyczny. W rekonstrukcji wypadków drogowych stosuje się zwykle sygnały w postaci czarno-białych szachownic umieszczonych na końcach metalowego krzyża. Sygnały takie znacznie utrudniają automatyzację (zniekształcenia perspektywiczne i różnice skali).

W artykule opisano próbę stworzenia programu służącego do automatycznej detekcji i pomiaru tego rodzaju sygnałów. Do jego utworzenia wykorzystano pakiet Matlab v. 7.10. W przypadku użycia tego typu sygnałów pomiar wykonywany jest w sposób półautomatyczny. Zaproponowano również inny sposób sygnalizacji, który pozwalał także na zakodowanie numerów punktów. Wybrano znaki w postaci kodów pierścieniowych. Opracowano algorytmy automatycznej detekcji, pomiaru i identyfikacji na obrazach cyfrowych. Utworzone algorytmy sprawdziły się w warunkach terenowych, a także pozwoliły na określenie szczegółowych reguł wykonywania fotografii miejsc zdarzenia.

**Słowa kluczowe:** rekonstrukcja wypadków drogowych, obraz cyfrowy, automatyzacja pomiaru, sygnały kodowane