



UDC: 621

ISSN 1451-2092

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University of Belgrade  
Faculty of Mechanical Engineering

# FME TRANSACTIONS

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**New Series, Volume 45, Number 2, 2017**

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## Published by:

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## On line service:

<http://www.mas.bg.ac.rs/transactions>

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# MoNGeometrija 2016

This Special Issue of FME Transactions publishes papers selected among the others which were exposed at the 5th International Conference MoNGeometrija 2016. (The conference was named 'MoNGeometrija' in honor of the French engineer and mathematician Gaspard Monge, the inventor of descriptive geometry. Furthermore, 'NG' is the acronym for the term 'Nacrtna Geometrija' – descriptive geometry in Serbian language.) The conference was organized and supported by Serbian Society for Geometry and Graphics (SUGIG) and the following faculties of the University of Belgrade: Faculty of Civil Engineering, Faculty of Architecture, Faculty of Mechanical Engineering, Faculty of Forestry, Faculty of Transport and Traffic Engineering and Faculty of Applied Arts. Moreover, MoNGeometrija 2016 was under the auspices of Ministry of Education, Science and Technological Development of Republic of Serbia and was held in Belgrade, Serbia, from 23 - 26 June 2016. Since SUGIG considers geometry and graphics as the universal languages of science, technics and all visual arts, the conference offers a wide range of topics: theoretical graphics and geometry, geometry of curves and surfaces, kinematic geometry, descriptive geometry, projective geometry and perspective, theory of polyhedra, applied geometry and graphics, modeling of objects and processes, application of geometry in science, architecture and engineering, geometry of space structures, paper folding geometry and origami, geometric aspects of art and design, computer animation and games, engineering computer graphics, computer aided design and drafting, computational geometry, geometric and solid modeling, product modeling, image synthesis, computer-generated imagery, scientific and technical visualization, graphics education and teaching methodology, education of descriptive geometry and graphics, education technology research, multimedia educational software development, virtual and augmented reality, educational software development tool, history of geometry, geometry in historical contexts, geometric aspects of historic-cultural monuments, life and work of famous geometricians.

The papers published in this Special Issue have been chosen as the most prominent, and scientifically most significant and interesting. Let us disclose briefly the essential subject matter of all selected works.

The first paper, *Immersive Virtual Reality course at the Digital Production studies*, by Predrag Šidanin, Marko Lazić and Ratko Obradović, presents the structure of the Immersive Virtual Reality course, which provides the students of technical orientation a connection to the state of the art visualization aspect of digital production. This paper is a valuable contribution to the contemporary courses on virtual reality studies.

The second paper, *Reverse Fishbone Perspective*, by Dirk Huylebrouck, discloses algorithmically the constructive methods by which the Panofsky's so-called 'fishbone perspective' can be constructed. Moreover, it explains and illustrates the geometrical essence of Byzantine reverse perspective, the analogy between the vertical and horizontal fishbone method, and their combination.

In the third paper, *Jean François Nicéron: Perspective and Artificial Magic*, author Agostino De Rosa exposes the perspectival and artistic work of a French mathematician, Minim friar and painter of anamorphic art Minim Father Jean François Nicéron (1613-1646).

The fourth paper *Augmented and Virtual Reality application in traditional architectural project presentation*, by Petar Pejić, Sonja Kراسić, Milica Veljković, Srđan Sakan and Taško Rizov, presents the development of modern, portable systems for presentation of architectural project on a case study of house. The authors use methods of virtual and augmented reality to upgrade the traditional printed catalogue of the project.

In the fifth paper, *Development of the Transmission Tower Virtual 3d Model for Structural Analysis in ANSYS*, Emil Veg, Mladen Regodić, Aleksandra Joksimović and Nenad Gubeljak analyze dynamic behavior of the structure, exposed to a known load and emphasize that truly correlated 3D model, with verified geometric, static and dynamic properties offers the opportunity to predict the structure behavior under loads that can hardly be applied on a living structure.

In the sixth paper, *Geometric Analysis of Turbulent Macrostructure in Jets Laid on Flat Surfaces for Turbulence Intensity Calculation*, O. Gumen, V. Dovhaliuk, V. Mileikovskiy, O. Lebedieva and V. Dziubenko, determine the turbulence intensity of wall jets on flat surfaces such as room walls or ceiling without any experimental values and claim that results are coincident with known experimental data and may be used in flow calculation in rooms.

The seventh paper, *Remarks on Perspective Simplicies*, by G. Weiss and H. Ebisui, exposes the generalization of Desargues' theorem to perspective simplices in a projective n-space and their linear images in a subspace. Proofs disclosed in this work are interesting and significant contribution to the theory of projective geometry.

The eighth paper, *Paper strips driven design – Application on doubly curved surfaces*, by Aleksandar A. Čučaković, Biljana S. Jović and Miloš R. Tripković, analyzes and rationalizes doubly curved surface of a given shape by multiple strips of paper glued onto a surface. Results are addressing possibilities of achieving an overall smooth surface and developing a model for

the generation of curvature continuous surfaces composed of paper strip surfaces, as well as generating alternative solutions that are in the domain of contemporary product design.

The ninth paper, *Polyhedral Forms Obtained by Combining Lateral Sheet of CP II-10 and Truncated Dodecahedron*, by Marija Đ. Obradović, Milena Stavrić, and Albert Wiltsche, analyzes a possibility of obtaining polyhedral shapes formed by combining polyhedral surfaces based on the segment surface of elongated concave pyramids of the second sort (CeP II-10, type A and type B). Moreover, a couple of new shape suggestions are given in this paper: compound polyhedra, obtained by intersection of paired composite concave polyhedra originated in the described manner.

The tenth paper, *3D Analysis of Geometrical Factors and Their Influence on Air Flow around Satellite Dish*, by Zorana Jeli, Misa Stojicevic, Ivana Cvetkovic, Alina Duta, Dragos-Laurentiu Popa, analyzes the geometrical characteristics of satellite dishes and their influence on its functionality and safety. The set of 3D models of satellite dishes are created, and the simulation of the air flow over the satellite antenna is accomplished by the using of Solid Works software program.

In the eleventh paper, *On the Computation of Foldings*, author H. Stachel exposes two examples of a surface folding. In the first example, cylinders with curved creases are given. In this case the involved curves can be exactly described. In the second example, even the ruling of the involved developable surface is unknown and the obtained model is only an approximation.

The twelfth paper, *Virtual and Rapid Prototyping Methods Applied in Civil Engineering. Snow, Wind and Earthquake Simulations Made On A Five Levels Building*, by A. D. Popa, A. M. Mogosanu, D. L. Popa, A. Duta and A. Teodorescu, presents a virtual model of a five storey building, as well as the simulation of multiple loads effects (of snow, earthquake and wind) on the model. The results are shown in the figures and diagrams. Moreover, the paper presents the rapid prototyping method applied on the scaled building using Prusa Mendel I3 3D printer.

In the thirteenth paper, *Automatic Configuration of Cityscapes*, the author Naomi Ando depicts Japanese cityscapes in the Tokyo metropolitan district by the using of algorithmic computer graphic configurations. He performs a numerical analysis of the three-dimensional configuration to grasp the characteristics of its form. The author attempts to generate cityscapes automatically and reproduces the appearance of a cityscapes using this approach.

The fourteenth paper, *Concept design of a sports coupe with ergonomic analysis and photorealistic rendering*, by Slavko Ristevski, Risto Tashevski and Tashko Rizov, presents the design process of a vehicle in the sports coupe body style for the secure transportation of two passengers, with the addition of possibly two more, as well as to provide space for baggage. The process of creation of the 3D model of the vehicle is consisted of several steps: sketching, concept

analysis, concept selection, concept processing, creation of a 3D model, and model rendering.

The fifteenth paper, *Modeling of Focal-Directorial Surfaces for Application in Architecture*, by Ljiljana S. Petruševski, Maja M. Petrović, Mirjana S. Devetaković and Jelena S. Ivanović, discloses the modeling of focal-directorial surfaces, starting with their definition, as a locus of points whose sum of the distances to the focus and/or directrix is constant and predefined. A heuristic algorithm for modeling surfaces and their isocurves is presented, achieved through the use of the Grasshopper visual programming editor in the RhinoCeros environment.

The sixteenth paper, *Inverse perspective in Cézanne's art*, by Ivana J. Marcikić, Marijana V. Paunović, presents the inverse perspective and analyses its effects on space representation in the paintings of Paul Cézanne. Considering many artwork examples of this famous French Post-Impressionist painter, the authors emphasize that inverse perspective is an important projection model, due to the fact that it represents an object with the minimum of hidden parts, compared to representation in any other system of projection. Moreover, authors claim that inverse perspective, which implies a multi-ocular view with many binocular pairs of points, is close to natural vision.

And the last, seventeenth paper, *Equilibrium Analysis of Frictionless Triangular Arches: Geometrical Formulation*, by Dimitrije Nikolić and Radovan Štulić, discloses in detail the explicit equation that defines the precise position and orientation of the joints in a triangular arch of general shape. For two commonly used shapes, namely flat arch or plate-banded and triangular arch with its intrados and extrados both perpendicular to springing, the closed-form expression of thrust line is obtained and presented.

## ACKNOWLEDGMENTS

The Guest Editors would like to express gratitude to the papers' authors for their contribution and to reviewers for their useful and timely remarks on the papers submitted to this Special Issue. The Guest Editors would also like to give a sincere thanks to Prof. Boško Rašuo, the Editor of the Journal, for this kind opportunity, his valuable suggestions, important instructions and his great support along the development of this Special Issue.

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December 2016