Virtuology (VG)

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Abstract- Virtuology (VG) is a new science, which takes many of features coinciding with the rapid developments in the fields of sociology, economic, humanities, Philosophy of science, digital production technology, Information Technology (IT), means of Telecom, media, as well as the amazing discoveries in the audio and visual fields. One of the manifestations of Virtuology (VG) is the physical characteristic of the virtual environment. The main equation that Virtuology (VG) could be theorized according to it is: VG: U + D, which means: Virtuology: Upload + Download. However, this article discovers two basic branches of Virtuology (VG): Human Virtuology and Natural Virtuology.

Index Terms- Virtuology (VG), Virtualism, Thinking, Human, Nature, Internet, Technology

I. INTRODUCTION

To a previous article, I have indicated that Virtualism is a new style of thinking and acting that human kind began moving toward it. Reducing time and nearing place in virtual space produce new patterns of thinking and acting. It is a new vision of different styles of thinking and acting that human kind began moving toward it. Life is no longer as it was, because sense of time and place is no longer as it is. Reducing time and nearing place in virtual space produce new patterns of thinking and acting. We are facing a new way of reason, emotions and living that is what we call Virtualism. ¹

Here, in this new article, I am trying to put roles for a new science, which I name Virtuology (VG). Now, it takes many of features which coincide with the rapid developments in the fields of Religion, Theology, Philosophy, sociology, economic, humanities, Information Technology (IT), means of Telecom, media, digital production technology as well as the amazing discoveries in the audio and visual fields. All these and other dimensions constitute what we call Virtuology (VG); the new science that I try to put its first features in this article.

One of the manifestations of Virtuology (VG) is the physical characteristic of the virtual environment. They are pointed out as responsible for capability to communicate between people because they are able to involve users in such a way that the feeling of being in the world is frequently reported, and they

1 Rawaa Mahmoud Hussain, "Virtual, All Too Virtual: The Virtual Transaction and the End of Postmodernism," International Journal of Engineering and Computer Science (IJECS) 2, Issue 3 (March 2013), p. 746. From: http://ijecs.in/ijecsissue/wp-content/uploads/2013/03/746-758ijecs.pdf

create immersive environments that we are familiar with. The perception of the virtual, in presence, as if it were real, may be helpful in realizing how an easier to understand environment can improve collaboration. In this context, three dimensional (3D) virtual worlds are regarded as possessing strong capabilities to support collaboration between people. ²

For example, Wayfinding is the process of determining and following a path or route between an origin and destination. There is an underestimation of the conscious and unconscious Wayfinding search strategies in a virtual built environment without signage information. The assignment was to find the destination and then return to origin in a virtual maze-like building. Subjects perform three different assignments given different locations for the destination and the start; each assignment was repeated two times subsequently. ³

Virtual Observatory (VO) is also another form of Virtuology (VR). The Virtual Observatory (VO) is a distributed system—by design, there is no central node, either delivering data, running services, or even just a single link list-style director. Users and clients must have a means of discovering metadata of VO compliant resources, in order to still maintain the appearance of a single and integrated information system. ⁴

² Armando Cruza, Hugo Paredesb, Benjamim Fonsecab, Leonel Morgadoc, Paulo Martinsb, "Can Presence Improve Collaboration in 3D virtual Worlds?" Procedia Technology 13 (2014), p. 47, Doi: 10.1016/j.protcy.2014.02.008. Full text of the article is available from: http://ac.els-cdn.com/S2212017314000188/1-s2.0-S2212017314000188-main.pdf?_tid=179f14de-8572-11e4-bd59-

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³ Jan Dijkstraa, Bauke de Vriesa, Joran Jessurun, "Wayfinding Search Strategies and Matching Familiarity in the Built Environment through Virtual Navigation Environment through Virtual Navigation," The Conference in Pedestrian and Evacuation Dynamics 2014 (PED2014), Transportation Research Procedia 2 (2014). p. 141. Full text is available from: http://ac.els-cdn.com/S2352146514000544/1-s2.0-

S2352146514000544-main.pdf?_tid=5eee7c28-b0b3-11e4-8065-00000aab0f02&acdnat=1423524696_4daa9d18447f932284928f9a54878e82

⁴ M. Demleitner, G. Greene, P. Le Sidaner, R.L. Plante, "The Virtual Observatory Registry," Astronomy and Computing 7–8 (2014), p. 101. Full copy of the article is available from: http://ac.els-cdn.com/S2213133714000298/1-s2.0-

S2213133714000298-main.pdf?_tid=48744eee-8563-11e4-8a8c-00000aab0f27&acdnat=1418762399_27e95237f582dd65f81571 35ee72231a

SCADA systems also might explain one of the ways of Virtuology (VG). SCADA systems often include devices that are directly connected through intranet or a LAN. It improves on XML through simplicity, as it has a smaller grammar. A simpler syntax determines better performance, i.e. easier and faster parsing, without any constraints on the range of data structures that can be represented. On the other hand, JSON is not extensible and human readability is impoverished. As the number of such devices grows, scalability becomes a primary concern. The most common format used for sending data is XML (Extensible Markup Language), which is both human-readable and machine-readable. It provides a simple and standard structure for exchanged data, so that it can be easily processed. The main advantage of this format is its ubiquity, as it is supported by browsers, development environments for web applications, and many APIs. Another commonly used format is JSON (JavaScript Object Notation). ⁵

Virtuology (VG) has interfered with a digital revolution in paleontology. This has included improvements in tomographic techniques, and in both computer technology and its availability, and, which have made it possible to image a series of 2D sections or slices through a fossil and to use these to make a 3D reconstruction of the specimen. As a consequence of applying these techniques, paleontological studies are often at the forefront of anatomical research. New protocols allow more objective reconstructions of fossil organisms, including soft tissues, from incomplete remains. The resulting digital reconstructions can be used in functional analyses, rigorously testing longstanding hypotheses regarding the Paleobiology of extinct organisms. In fact, some fossil species are now better characterized in terms of their anatomy and development. Computer-aided visualization and analysis of fossils has revolutionized the study of extinct organisms. Novel techniques allow fossils to be characterized in three dimensions and in unprecedented detail. This has enabled paleontologists to gain important insights into their anatomy, development, and These approaches are transforming understanding of long-studied fossil groups, and of the narratives of organismal and ecological evolution that have been built upon

For further readings on the Virtual Observatory (VR) see: S. Erarda, B. Cecconi, P. Le Sidaner, J. Berthier, F. Henry, C. Chauvin, N. André, V. Génot, C. Jacquey, M. Gangloff, N. Bourrel, B. Schmitt, M.T. Capria, G. Chanteur, "Planetary Science Virtual Observatory Architecture," Astronomy and Computing 7–8 (2014), p.71. doi:10.1016/j.ascom.2014.07.005. Full text of the article is available from: http://ac.els-cdn.com/S221313371400033X/1-s2.0-S221313371400033X-main.pdf?_tid=a2aa2d8a-8913-11e4-b30e-

00000aacb35e&acdnat=1419167995_8e229845732346005d4866 7150b9b6d1

5 Traian Turc, Adrian Gligor, "Emerging Markets Queries in Finance and Business SCADA Virtual Instruments Management," Procedia Economics and Finance 15 (2014), p. 1259. Full text of the article is available from: http://ac.els-cdn.com/S2212567114005863/1-s2.0-S2212567114005863-main.pdf? tid=69b8bb6c-8914-11e4-ae21-

00000aab0f26&acdnat=1419168329_69e34bfc89503798677c38 a98046f09f them. Paleontology has a reputation as a dry and dusty discipline, stymied by privileged access to fossil specimens that are interpreted with an eye of faith and used to evidence just-so stories of adaptive evolution. However, in recent years the discipline has been revolutionized by the emergence of powerful methods for the digital visualization and analysis of fossil material. ⁶

II. THE EQUATION OF VIRTUOLOGY: (VG: U + D)

The main equation that Virtuology (VG) could be theorized is: VG: U + D, which means: Virtuology: Upload + Download. This equation, as I believe, is summarized the entire new science, i.e. Virtuology (VG).

For example, it is used with MSCOW.⁷ It is implemented also in Large-scale Distributed Systems and Energy Efficiency. ⁸ Another study has M computers upload or download N contents. During the simulation process, each user selects a certain content to upload or download with a given probability. In addition, the type attribute of user behavior indicates a user may be likely to follow his own habit and has an obvious inclination to upload/download a specific kind of contents. If a user is found to prefer to upload/download pirated content according to the historical statistics, it is of higher probability for him to continue to upload/download piracy contents in the future. ⁹

Virtual reality, Michael Heim indicates, is not a state of consciousness or a simulated drug trip. It is an emerging field of applied science. ¹⁰ Virtual form will displace the material form and radical changes for the users of the old material from and the new virtual form. ¹¹

⁶ John A. Cunningham, Imran A. Rahman, Stephan Lautenschlager, Emily J. Rayfield, Philip C.J. Donoghue, "A Virtual World of Paleontology," Review Article, in: Trends in Ecology & Evolution 29, Issue 6, (June 2014), p. 347. Full text is available from: http://ac.els-cdn.com/S0169534714000871/1-s2.0-S0169534714000871-main.pdf?_tid=42758964-8918-11e4-8379-

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⁷ Rod Stephens, Beginning Software Engineering (Indiana: John & Wiley Sons Inc., 2015), p. 82.

⁸ Jean-Marc Pierson, Large-scale Distributed Systems and Energy Efficiency: A Holistic View (New Jersey: John & Wiley Sons Inc., 2015), p. 278.

⁹ Longbing Cao, Hiroshi Motoda, Jaideep Srivastava, Ee-peng Lim, Irwin King, Philip S. Yu, Wolfgang Nejdl, Guandong Xu, Gang Li, Ya Zhang, "Behavior and Social Computing," in: International Workshop on Behavior and Social Informatics, BSI 2013, Gold Coast, Australia, April 14-17, and International Workshop on Behavior and Social Informatics and Computing, BSIC 2013, Beijing, China, August 3-9, 2013, Revised Selected Papers (Heidelberg: Springer, 2013), p. 52.

¹⁰ Michael Heim, Virtual Realism (New York: Oxford University Press, 1998), p. 4.

¹¹ Christine Heine, Virtual Ethnography (London: SAGE, 2003), p. 3.

Jack Herrington tries to create a Media Upload/ Download Center. He indicates that sometimes the customers will want to trade more than just text. The legality of just things aside, this hack will work through building a simple media upload/ download center. The user starts at *index. php*, where he uploads file through *upload php*. The *upload. php* script forwards him to the *dir. php* page, which then shows the file that are available as downloads. Clicking on any of the files will download them through the *download. php* script. ¹²

Sunit Kumar Sen indicates that domain refers to a continuous memory are, which can either be data area or program area. Data can be downloaded in the domain for future use or uploaded from the domain with the help of FMS services.

III. HUMAN VIRTUOLOGY

Virtuology is a way to provide realism to crowd simulated motion, as a response to a need to understand and model how humans move and behave during local interactions with their neighborhood in real conditions. Building an observation database is however a difficult task. Observation data is then required to define a 'gold standard' for comparisons. Data can be extracted from situations (i.e., observing a crowd in a street) using mobile phone information video techniques or, but outdoor recordings generally suffer from uncertainties on people states and motivations, lack of precision, and involve uncontrolled factors. To solve these problems, data can be extracted from laboratory experiments using optoelectronic devices. Crowd simulators have a wide range of application, from entertainment in video games and movies, to architecture in building analysis and emergency evacuation studies. Crowd simulators have been designed through two different approaches. On one hand, the macroscopic approach considers the crowd as a whole, behaving such as a fluid. On the other hand, the microscopic approach considers that global crowd motion emerges from local interactions between agents. Realism is defined as a match between simulated data and real data. 14

Human Virtuology, it is possible to say, has witnessed three waves:

Wave one: virtual freelancers: Untethered work on a large scale began in the early 1980s, when a "freelance nation" of virtual workers using nascent e-mail networks emerged. As companies contracted with virtual freelancers for discrete tasks that weren't reliant on real-time collaboration, both sides gained flexibility. The new connectivity enabled marginalized talent—stay-at-home parents, retirees, students, caregivers—to enter the labor market. Services typically provided in this way included graphic design, report writing, translation, and transcription. It also allowed an individual who might otherwise have worked inside a company, or at a specialized vendor serving a company, to set up a one-person shop instead. ¹⁵

Wave Two: virtual corporate colleagues. Office-based infrastructure is less relevant, replaced by smarter personal technology and cloud computing. Top talent increasingly values—and demands—work-life balance. With virtual work serving the interests of both employees and employers, the number of highly skilled and untethered people has risen exponentially. IBM, an early convert, has reached the point where more than 45% of its 400,000 contractors and employees work remotely. ¹⁶

Wave Three: virtual coworkers. Workers shared these concerns: Their work lives often lacked a sense of community and the richness of collaboration. Many experienced far too little unstructured social contact. Somewhat paradoxically, then, a new wave of complex, global virtualized work has surged, as many workers physically reunite and ret ether to specific spaces. Indeed, at IBM a sardonic comment started circulating among employees: The Company's initials stood for "I'm by myself." A major focus of the third wave's new technology is to give workers the feeling of being in a shared environment. But virtual platforms can go only so far. As we'll see, organizations and workers are also investing in a return to the colocation of colleagues in the real world. ¹⁷

A probabilistic approach is proposed for statistical pattern recognition. The classifier is achieved by supervised learning. The classification uses Bayes decision rule. The underlying multi-variate probability distribution is estimated, by the exploitation of the conditional independencies between the variables (features). This is achieved by fitting to the training data a t-cherry junction tree. A problem that occurs is that databases often contain redundant data, which mean a great number of features that may lead to over fitting of the model.

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¹² Jack Herrington, PHP Hacks: Tips & Tools For Creating Dynamic Websites (California: O'Reilly Media, 2006), p. 415. Compare with: Andrea Corradini, Ugo Montanari, "Recent Trends in Algebraic Development Techniques," in: 19th International Workshop, WADT 2008, Pisa, Italy, June 13-16, 2008, Revised Selected Papers (Heidelberg: Springer, 2008), p. 27; Nabil Abdennadher, Dana Petcu (eds.), Advances in Grid and Pervasive Computing: 4th International Conference, GPC 2009, Geneva, Switzerland, May 4-8, 2009, Proceedings (Heidelberg: Springer, 2009).

¹³ Sunit Kumar Sen, Fieldbus and Networking in Process Automation (Florida: Tylor & Francis Group, 2015), p. 128.
14 Anne-Hélène Olivier, Julien Bruneau, Gabriel Cirio, Julien Pettre', "A Virtual Reality platform to study crowd behaviors," The Conference on Pedestrian and Evacuation Dynamics 2014 (PED2014), Transportation Research Procedia 2 (2014), pp. 114 – 115. Full text is available from: http://ac.els-cdn.com/S2352146514000519/1-s2.0-S2352146514000519-main.pdf?_tid=09973fbc-9fec-11e4-97ed-

¹⁵ Tammy Johns and Lynda Gratton, "The Third Wave of Virtual Work," in: Harvard Business Review, (The January–February 2013) Issue, available from: https://hbr.org/2013/01/the-third-wave-of-virtual-work/

¹⁶ Ibid., from: https://hbr.org/2013/01/the-third-wave-of-virtual-work/

¹⁷ Ibid., from: https://hbr.org/2013/01/the-third-wave-of-virtual-work/

This may cause poor generalization (the performance of the model on a new test data). ¹⁸

Virtual Reality (VR) is a powerful and complementary tool to acquire useful data on human motion and behaviors in crowds. It allows exposing participants to virtual crowds: only one participant is required to observe individual behavior in crowded situations, stimuli can be accurately controlled and repeated over several participants, information can be manipulated to inspect the role of some specific factors, etc. experimental design and achievement are eased in many ways, and individual data can be accurately measured. Such properties have made VR a common tool to perform experiments in socio-psychology, spatial-cognition, motion control, etc. VR is then a relevant tool to study how we navigate in crowds. ¹⁹

Another example in people with psychiatric disorders, particularly those suffering from schizophrenia and related illnesses, pronounced difficulties in social interactions are a key manifestation. These difficulties can be partly explained by impairments in social cognition, defined as the ability to understand oneself and others in the social world, which includes abilities such as emotion recognition, theory of mind (ToM), attributional style, and social perception and knowledge. In the RC2S program, the patient's goal is to assist a character named Tom in various social situations. The underlying idea for the patient is to acquire cognitive strategies for analyzing social context and emotional information in order to understand other characters' mental states and to help Tom manage his social interactions. In this paper, we begin by presenting some data regarding the social cognitive impairments found in schizophrenia and related disorders, and we describe how these deficits are targeted by social cognitive remediation. The RC2S program is represented and discussed the advantages of computer-based simulation to improve social cognition and social functioning in people with psychiatric disorders. The impact of several kinds of interventions on social cognition has been studied recently. The best outcomes in the area of social cognition in schizophrenia are those obtained by way of cognitive remediation programs. Considering that the social cognitive deficits experienced by patients with schizophrenia are very diverse, and that the main objective of social cognitive remediation programs is to improve patients' functioning in their daily social life, RC2S was developed as an individualized and flexible program that allows patients to practice social interaction in a realistic environment through the use of virtual reality techniques. 20

In Humanities, Virtuology played an important role in education. In presence, there are many investigations to knowledge, academics' use, and adoption of emerging

technologies in an open distance learning (ODL) environment in some depth. The Virtual Teaching Dispositions Scale (VTDS) was used to assess the professional teaching dispositions associated with effective online instruction. One of the aims was to identify associations between pedagogical presence, virtual/technological presence, expert/cognitive presence and social presence among academic staff members at an ODL institution, making suggestions for improving online teaching in this environment. ²¹

IV. NATURAL VIRTUOLOGY

Emerging of internet and broadband connection enabling large amount of information to be transferred from one point to another have caused many services to be transferred to virtual environment causing face to face communication is being replaced by screen to screen communication. Consequently, individuals encounter more and more visuals than ever before, which develops and forms the visual culture through new ICT tools. Evolving nature of visual culture in virtual environment is a result of new information communication technology devices serving us as intermediaries between traditional services that we are used to get through face to face communication and their virtual applications in cyberspace. ²²

Virtuology (VG) has important applications recently. For example, "It has been recently proposed to study coherent deeply virtual Compton scattering (DVCS) off ³He nuclei to access neutron generalized parton distributions (GPDs). In particular, it has been shown that, in Impulse Approximation (IA) and at low momentum transfer, the sum of the quark helicity conserving GPDs of 3 He, H and E, is dominated by the neutron contribution. This peculiar result makes the ³He target very promising to access the neutron information. We present here the IA calculation of the spin dependent GPD H of 3 He. Also for this quantity the neutron contribution is found to be the dominant one, at low momentum transfer. The known forward limit of the IA calculation of H, yielding the polarized parton distributions of ³He, is correctly recovered. The extraction of the neutron information could be anyway non trivial, so that a procedure, able to take into account the nuclear effects encoded in the IA analysis, is proposed. These calculations, essential for the evaluation of the coherent DVCS cross section asymmetries, which depend on the GPDs H,E and H, represent a crucial step for planning possible experiments at Jefferson Lab." ²³

¹⁸ Tamás Szántai and Edith Kovács, "Application of T-Cherry Junction Trees in Pattern Recognition," Brain. Broad Research in Artificial Intelligence and Neuroscience 1 (July 2010), p. 41. Full text: http://brain.edusoft.ro/index.php/brain/article/view/103 19 Ibid., p. 115.

²⁰ Elodie Peyroux, Nicolas Franck, "RC2S: A Cognitive Remediation Program To Improve Social Cognition In Schizophrenia and Related Disorders," in: Frontiers, http://journal.frontiersin.org/article/10.3389/fnhum.2014.00400/f ull

²¹ Nico Martins and Leona M. Ungerer, "Virtual Teaching Dispositions at a South African Open Distance, ICEEPSY 2014, Procedia - Social and Behavioral Sciences 171 (2015), p. 929. 22 Cengiz Erdal, "Visual Culture in the New Communication Environment: E-Government as a Case Study," The Turkish Online Journal of Design, Art and Communication - TOJDAC (October 2012) 2, Issue 4, p. 47. DOI: 10.7456/10204100/008. Full text: http://www.tojdac.org/tojdac/VOLUME2-ISSUE4_files/tojdac_v02i408.pdf

²³ Matteo Rinaldia and Sergio Scopettab, "Coherent deeply virtual Compton scattering off 3He and neutron generalized parton distributions," in: MENU 2013 – 13th International Conference Meson-Nucleon Physics and the Structure of the

Another example, Loet Leydesdorff points out that configurational information is generated when three or more sources of variance interact. Different stabilizations can be considered as second-order variation, and globalization as a second-order selection. The positive manifestations and the negative selections operate upon one another by adding and reducing uncertainty, respectively. Reduction of uncertainty in a configuration can be measured in bits of information. The variables can also be considered as dimensions of the probabilistic entropy in the system(s) under study. The variations not only disturb each other relationally, but by selecting upon each other, they are also positioned in a configuration. A configuration can be stabilized and/or globalized. The configurational information then provides us with a measure of synergy within a complex system. For example, the knowledge base of an economy can be considered as such a synergy in the otherwise virtual (that is, fourth) dimension of a regime.

Virtuology (VG) is also implemented in Molecule Cloud. "A method is presented here allowing visual representation of the most common structural features of chemical databases in a form of a cloud diagram. The frequency of molecules containing particular substructure is indicated by the size of respective structural image. The method is useful to quickly perceive the most prominent structural features present in the data set. This approach was inspired by popular word cloud diagrams that are used to visualize textual information in a compact form. Therefore we call this approach "Molecule Cloud". The method also supports visualization of additional information, for example biological activity of molecules containing this scaffold or the protein target class typical for particular scaffolds, by color coding. Detailed description of the algorithm is provided, allowing easy implementation of the method by any cheminformatics toolkit. The layout algorithm is available as open source Java code." ²⁵

One basic method of incorporating wood grain patterns into designs is to use natural wood, but this method is costly depending on the type of wood used. Moreover, abundant use of wood is environmentally inappropriate in modern times. In order to effectively use beautiful wood grains, the method of printing wood grain patterns on sheets and pasting them on products is mainly used, because this method offers numerous advantages such as low cost, simplicity, and reduced wear with age. However, the wood grain pattern data that is printed is often acquired by trial and error; preparing the actual wood, calculating the cutting plane of the wood to obtain the required wood grain pattern, and converting this wood grain pattern into the digital data. For this reason, the design of wood grain patterns can be

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very costly and time consuming. Wood grain patterns are widely used as the design of manufactured products because they create a warm and calming impression. In addition, there is also a limit to the wood grain patterns that can be designed from photographs of real wood grain patterns. For this reason, the use of computer graphics to describe wood grain patterns is useful for rationalizing and diversifying the design of wood grain patterns itself. For this reason, various approaches for generating wood grain patterns have been studied for a long time.

Another example is that parameters describing boundary conditions and dynamics of temperature changes during casting cooling in foundry molds and the successive performance, especially as regards the massive cast elements. Identification of these parameters can be interpolated to laboratory conditions and to the validation of virtual models subject to computer simulation. The use in simulation of genetic algorithms combined with the results of measurements under real conditions enables more precise determination of the performance parameters, including critical states of stresses present in a structure. Considering the specific nature of casting operation, non-standard methods of examination of the isotherms of temperature fields on the casting surface were described to determine local overheating resulting from the technological process, chemical composition, properties of the currently applied insulation materials, casting defects and/or design. This should allow further optimization of the massive castings design, considering the specific nature of a manufacturing process (alloy composition included), combined with performance parameters. Measures described are expected to contribute to the reduced casting weight and longer time of operation. ²⁷

V. CONCLUSION

A new science has emerged in this article; namely Virtuology (VG), with a new equation: VG: U + D, which means: Virtuology: Upload + Download. Virtuology (VG) is considered a new wave of Virtualism. Previously, Virtualism has been defined as a new style of thinking and acting. Virtuology (VG) is the science that describing reducing time and nearing place in virtual space and producing new patterns of thinking and acting in scientific ways.

VI. FUTURE WORK

This article suggests Virtuology (VG) to be considered as a new science interfered in different field, like: science, technology and humanities. It believes that it is time for this science to be

²⁴ Loet Leydesdorff, "Configurational Information as Potentially Negative Entropy: The Triple Helix Model," Entropy 2008, 10(4), pp. 391-410; doi: 10.3390/e10040391. Full text from: http://www.mdpi.com/1099-4300/10/4/391

²⁵ Peter Ertl, Bernhard Rohde, "The Molecule Cloud - Compact Visualization of Large Collections of Molecules," *Journal of Cheminformatics* 2012, **4**:12. doi: 10.1186/1758-2946-4-12. The electronic version of this article is the complete one and can be found online at: http://www.jcheminf.com/content/4/1/12

²⁶ Ryo Akiyama, Takuya Mori, Hideki Aoyama and Tetsuo Oya, "Digital Design Method of Wood Grain Pattern Based on Kansei," in: International Journal of CAD/CAM (2013), 13, No. 2, p. 13. Full text is available from: http://www.ijcc.org/ojs/index.php/ijcc/article/viewFile/243/149 27 A. Pytel, S. Pysz, "Identification of Temperature Changes Dynamics in Selected Castings as a Contribution to Performance Life Improvement," Archives of Foundry Engineering 10 (3/2010), p. 179.

taken place in universities, academic institutions and research centers as a field that summarizes the age that we live in.

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