

**UT
CB**



Technical University of Civil Engineering Bucharest
Department of Mathematics
and Computer Science

ABSTRACT BOOK

**The DigiSTEM International Conference: Innovating Education through
Digital Transformation (IEDT 2024)**

10 October 2024

Hybrid Meeting (on Microsoft Teams)

DigiSTEM (Promoting Digital Learning in STEM Subjects) Project
Technical University of Civil Engineering Bucharest (UTCB), Bucharest,
Romania

2024



Technical University of Civil Engineering Bucharest
 Department of Mathematics
 and Computer Science

**The DigiSTEM International Conference: Innovating Education
 through Digital Transformation (IEDT 2024)**

DigiSTEM (Promoting Digital Learning in STEM Subjects) Project

Department of Mathematics and Computer Science (DMI),
 Faculty of Civil, Industrial and Agricultural Buildings (FCCIA),
 Technical University of Civil Engineering Bucharest (UTCB),
 Address: 122-124 Lacul Tei Bvd., Sector 2, 020396 Bucharest, Romania & (MS TEAMS cod: **lwex929**)

10 October 2024
 Hybrid Meeting (on Microsoft Teams)

CONFERENCE ABSTRACT BOOK

Contents

DIGITALIZATION OF STEM EDUCATION – A CHALLENGE, THREAT OR WIN? 2

TIME TO ADAPT CIVIL ENGINEERING CURRICULUM IN POLIS UNIVERSITY: INNOVATIVE
 VISIONS FOR THE NEW CENTURY 3

CHALLENGES AND OPPORTUNITIES FOR ESL INTEGRATION INTO STEAM EDUCATION 4

INTEGRATION OF DIGITAL TOOLS IN BIOLOGY-CHEMISTRY STEAM ACTIVITIES 5

LEVERAGING DIGITAL TECHNOLOGIES FOR INTERACTIVE LEARNING IN PHYSICS EDUCATION
 WITHIN THE STEAM EDUCATION FRAMEWORK 6

GAMIFICATION OF STEAM LEARNING EXPERIENCES 7

ENHANCING STEAM EDUCATION THROUGH ROBOTICS: A PRACTICAL APPROACH TO MATH
 AND PHYSICS LEARNING 8

EXPLORING THE ROLE OF LEARNING ANALYTICS IN ENHANCING PERSONALIZED MATH AND
 SCIENCE EDUCATION: INSIGHTS FROM LITHUANIAN TEACHERS 9

THE INTERDISCIPLINARY CHARACTER OF MATHEMATICS IN DIGITAL APPLICATIONS 10

INNOVATION AND CULTURE IN THE DIGITAL WORLD 11

EVERYDAY APPLICATIONS OF MATRICES 12

BITWISE OPERATORS 13

IMAGES OF A VECTOR FIELD AND OF ITS FLOW 14

SPECTROPHOTOMETRIC DETERMINATIONS FROM THE PERSPECTIVE OF INTERDISCIPLINARITY
 15

DIGITALIZATION OF STEM EDUCATION – A CHALLENGE, THREAT OR WIN?

Daniela Velichová

Slovak University of Technology in Bratislava

Nám. slobody 17, 812 31 Bratislava, Slovakia

E-mail: daniela.velichova@stuba.sk

Abstract: Few ideas are presented on how to use the latest digital technologies and Artificial Intelligence in the teaching of STEM subjects with a considerable focus on digital pedagogy as a fundamental element of such educational actions. The evident lack of acknowledgement of digital pedagogy does not mean that it is absent, as pedagogy is inherently a natural part of any educational scenario. Any use of technology in education is a complex process that is determined, conditioned, and modified by a range of pedagogic actors and influences. In order to innovate and improve educational process, new challenges introduced by massive digitalization of our society must be profoundly discussed and understood. Digital technologies are the key vehicle for recasting higher education as an individualized activity. Some of the most prevalent forms of digital technology in higher education seem to be based on the individual students taking responsibility for decision-making with regards to their education, as well as dealing with the consequences of these decisions. Such shifts in emphasis is in contrast with the traditional values and desires of education as a public good rather than private interest, and learning as a social rather than solipsistic undertaking. Many important questions might be raised in this context, and the uneasy task of scholars is to find answers and introduce proper solutions. Regardless of the pedagogic intent of university educators, the hardware equipment options and software they use shapes what can and cannot be done in the classroom, lecture theatre or on-line.

References

- [1] Castañeda, L., Selwyn, N.: More than tools? Making sense of the ongoing digitizations of higher education. *International Journal of Educational Technology in Higher Education*, 15, 22, (2018). <https://doi.org/10.1186/s41239-018-0109-y>
- [2] Richter, O. Z., Juarros, V. M., Bond, M., Gouverneur, F.: Systematic review of research on artificial intelligence applications in higher education: where are the educators? *International Journal of Educational Technology in Higher Education* 16 (2019). <https://doi.org/10.1186/s41239-019-0171-0>.
- [3] Pedró, F.: Application of Artificial Intelligence to higher education: possibilities, evidence and challenges, *Open Journal of IUL University*, Vol. 1 n. 1 (2020), 61-76.
- [4] Velichová, D.: Future of Mathematics in the Digital Age, in *The 21th SEFI Special Interest Group in Mathematics - SIG in Mathematics Seminar Proceedings*, Tampere 2023, Finland, ISBN 978-2-87352-025-0, pp. 133-141.
- [5] Zeide, E.: Artificial Intelligence in Higher Education: Applications, Promise and Perils, and Ethical Questions. *EDUCAUSE Review* (Summer 2019), 31–39.

TIME TO ADAPT CIVIL ENGINEERING CURRICULUM IN POLIS UNIVERSITY: INNOVATIVE VISIONS FOR THE NEW CENTURY

Ilda Rusi

POLIS University, Tirana, Albania

Rruga Bylis 12, Autostrada Tiranë-Durrës, Km 5, Kashar, SH2, Tiranë 1051

E-mail: ilda_rusi@universitetipolis.edu.al

Abstract: Education must aim at cultivating within students the skills of searching knowledge through self-learning so that they can learn continually at any time and any place throughout lives. As education is a continuing process, it should also provide the engineering students with life-long education, particularly to keep them aware of the latest developments and scientific and technological advances in today's fast-changing world.

The teaching process is one of the essential and most important functions of the school and as such it is subject to a close monitoring and continuous improvement, paying attention to the teaching quality, knowledge assessment and especially to the applied teaching methods. Polis University, Tirana in the process of learning reform and education aims at attaining Knowledge, Critical thinking and Integrity. The acquisition of practical and applicative skills is highly relevant in the disciplines offered at POLIS such as architecture, design, civil engineering, etc.

As an attempt to modernize the civil engineering program and learning process, it was of a very great importance to improve the teaching standards and, most importantly, the competency of the lecturers. The role of the lecturer is considered as a facilitator/moderator in this learning process, therefore the interaction among the lecturer and the class through methodologies that engage the students are strongly encouraged.

New teaching methodologies are introduced through a number of Erasmus CBHE projects such as CONSUS / DRIVE / VTECH / CONNECT IT and shared internally in institution. The results show a high level of appreciation by the students with the skills obtained throughout the course.

References

- [1] Chau, K.W: *Incorporation of sustainability concepts into a civil engineering curriculum*, Journal of professional issues in engineering education and practice, 2007, 133. Jg., Nr. 3, S. 188-191.
- [2] Fei, W., et al: *The Critical Role of the Construction Industry in Achieving the Sustainable Development Goals (SDGs): Delivering Projects for the Common Good*, Sustainability, 2021, 13. Jg., Nr. 16, S. 9112.
- [3] Fry, H., Kettridge, S., Marshall, S: *A handbook for teaching and learning in higher education: Enhancing academic practice*, 4th edition. Routledge, 2015.
- [4] Lichtenstein, K, Spyridis, P., Orłowsky, J: *Interdisciplinary approaches in engineering practice and education toward building efficiency and longevity*, In: IALCCE 2020, The Seventh International Symposium on Life-Cycle Civil Engineering, Shanghai, 2020.
- [5] Valdes-Vasques, R., Klotz, L: *Incorporating the social dimension of sustainability into civil engineering education*, Journal of Professional Issues in Engineering Education & Practice, 2011, 137. Jg., Nr. 4, S. 189-197.
- [6] Vemury, C. M., Heidrich, O., Thorpe, N., Crosbie, T: *A holistic approach to delivering sustainable design education in civil engineering*, International Journal of Sustainability in Higher Education. 201.

CHALLENGES AND OPPORTUNITIES FOR ESL INTEGRATION INTO STEAM EDUCATION

Jevgenija Jerochina-Labanauskiene

STEAM Center, Klaipeda University

H. Manto 84, LT-92294, Klaipeda, Lithuania

E-mail: jevgenija.jerochina-labanauskiene@ku.lt

Abstract:

Introduction Although students' motivation to develop critical thinking, collaboration, and creativity are considered as the benefits of integrated STEAM education, teachers tend to face obstacles preventing them from the successful implementation of it. The aim of this research is to reveal teachers' experience in integrating English as a second language (ESL) into STEAM education.

Methods The online survey of ESL teachers from Lithuanian schools (n=153) has been accomplished in February and March, 2024.

Results The survey accomplished has shown that the most of the respondents are experienced in integrated teaching with two thirds of the latter still lacking experience in integrating ESL into STEAM education. The exercises banks and online learning platforms are seen as the most useful teaching materials of integrated education by the researched. The evaluation of their own readiness for integrated STEAM and ESL education is either good or satisfactory with the lack of necessary materials and clear guidelines/recommendations for integrated education being considered as the greatest obstacles preventing teachers from more active engagement into integrated teaching.

Conclusions To conclude with, clear guidelines and recommendations as well as appropriate learning materials could add to ESL teachers' readiness to engage in integrated education covering both ESL and STEAM subjects.

References

- [1] Martins, I., Baptista, M. (2024). Teacher Professional Development in Integrated STEAM Education: A Study on Its Contribution to the Development of the PCK of Physics Teachers. *Education Sciences* 14(2), 164. DOI: [10.3390/educsci14020164](https://doi.org/10.3390/educsci14020164)
- [2] Silva-Hormazabal, M., Alsina, A. (2023). Exploring the Impact of Integrated STEAM Education in Early Childhood and Primary Education Teachers. *Education Sciences* 13(8), 842. DOI: [10.3390/educsci13080842](https://doi.org/10.3390/educsci13080842)
- [3] Harkki, T., Vartiainen, H., Seitamaa-Hakkarainen, P., Hakkarainen, K. (2021). Co-teaching in non-linear projects: A contextualised model of co-teaching to support educational change. *Teaching and Teacher Education*, 97(7). DOI: [10.1016/j.tate.2020.103188](https://doi.org/10.1016/j.tate.2020.103188)
- [4] Bertrand, M. G., Namukasa, I., K. (2020). STEAM education: student learning and transferable skills. *Journal of Research in Innovative Teaching and Learning* 13(1). DOI: [10.1108/JRIT-01-2020-0003](https://doi.org/10.1108/JRIT-01-2020-0003)

INTEGRATION OF DIGITAL TOOLS IN BIOLOGY- CHEMISTRY STEAM ACTIVITIES

Assoc. prof. Rita Jankauskiene

KU STEAM Center,

Klaipeda, Lithuania

E-mail: rita.jankauskiene@ku.lt

Martyna Pareigyte

KU STEAM Center,

Klaipeda, Lithuania

E-mail: martyna.pareigyte@ku.lt

Abstract: In the digital age, the integration of technology has become a ubiquitous aspect of modern society. These advancements have significantly enhanced the field of education, allowing students to receive a better learning experience [1]. By integrating digital tools in STEAM activities, educators can provide a more interactive and captivating learning experience, encouraging the students to apply scientific principles in real contexts. This approach not only improves the knowledge of the subject, but also encourages critical thinking, problem solving and creativity [2]. Yang D. and Baldwin S. J. (2020) provides four technology-use strategies to support student learning in an integrated STEM learning environment: a) providing authentic learning contexts, b) offering web-based inquiry environments, c) expanding learning through immersive and interactive technology, and d) transforming students from consumers to creators.

The study objective is to show the possibilities and practical implications of digital tools, such as microscope images transferring to a TV screen, computer or mobile phone, virtual reality T-shirts and etc., for learning in integrated biology-chemistry STEAM learning activities.

Key words: digital tools, STEAM biology-chemistry activities.

References

- [1] Levin, I. and Tsybulsky, D. (eds): Digital Tools and Solutions for Inquiry-Based STEM Learning. Hershey, PA: IGI Global, 2017. <https://doi.org/10.4018/978-1-5225-2525-7>.
- [2] Peykova, D. and Garov, K.: Digital tools for STEM education. *Anniversary International Scientific Conference REMIA'2021*, 2021, 21-28.
- [3] Yang D. and Baldwin S. J. Technology to Support Student Learning in an Integrated STEM Learning Environment, *International Journal of Technology in Education and Science*, 2020, 4 (1), 1–11, <https://doi.org/10.46328/ijtes.v4i1.22>.

LEVERAGING DIGITAL TECHNOLOGIES FOR INTERACTIVE LEARNING IN PHYSICS EDUCATION WITHIN THE STEAM EDUCATION FRAMEWORK

Vilius Skarbalius

*Klaipeda University, STEAM center
H. Manto str. 84, Klaipeda, Lithuania
E-mail: vilius.skarbalius@ku.lt*

Tomas Daukšas

*Klaipeda University, STEAM center
H. Manto str. 84, Klaipeda, Lithuania
E-mail: tomas.dauksas@ku.lt*

Abstract:

Introduction: While engaging in STEAM education activities, learners get to use or interact with physics phenomenon that might not be intuitive and easy to visualize [1, 2, 3]. The integration of digital technologies into Klaipeda University STEAM center education, particularly in physics and engineering, has transformed traditional teaching methods, promoting more interactive and engaging learning experiences. The aim of this presentation is to explore how digital tools (computer simulations and technological equipment) enhance students' engagement, understanding, creativity, and problem-solving in physics education.

Methods: Literature review, case study and focus group with teachers.

Results: Good practices and the benefits of digital tools can be outlined, explaining how these features enhance the conceptual understanding and problem-solving skills among learners. By utilizing dynamic visualizations and real-time feedback, multiple groups of students and teachers alike have mentioned that these tools helped them in bridging the gap between theoretical knowledge and practical application, allowing to explore complex physics concepts in a more intuitive way. The use of such technologies fostered collaborative learning environments, supported differentiated instruction, and enabled personalized learning pathways ultimately improving learners' outcomes in the broader STEAM context.

Conclusions: The integration of digital technologies in STEAM education significantly enhances the quality of learning experiences. The selection of various digital tools, sensors deepens learners' conceptual understanding and helps connect theoretical knowledge with practical application.

References

- [1] Dominguez A, De la Garza J, Quezada-Espinoza M, Zavala G. Integration of Physics and Mathematics in STEM Education: Use of Modeling. *Education Sciences*. 2024; 14(1):20. <https://doi.org/10.3390/educsci14010020>
- [2] Cheryl J. Craig, Paige Evans, Rakesh Verma, Donna Stokes & Jing Li (2019) A tribute to 'unsung teachers': teachers' influences on students enrolling in STEM programs with the intent of entering STEM careers, *European Journal of Teacher Education*, 42:3, 335-358, DOI: [10.1080/02619768.2018.1523390](https://doi.org/10.1080/02619768.2018.1523390)
- [3] Debbie Siegel & Michael Giamellaro (2022) Non-STEM Teachers Finding Their Place in STEM, *Journal of Science Teacher Education*, 33:6, 579-597, DOI: [10.1080/1046560X.2021.1968992](https://doi.org/10.1080/1046560X.2021.1968992)

GAMIFICATION OF STEAM LEARNING EXPERIENCES

Evaldas Zacharevičius

Klaipeda University, Methodical STEAM Open Access Center

84 Herkus Mantas Str. LT-92294 Klaipeda, Lithuania

E-mail: evaldas.zacharevicius@ku.lt

Olga Berežnova

Klaipeda University, Methodical STEAM Open Access Center

84 Herkus Mantas Str. LT-92294 Klaipeda, Lithuania

E-mail: olga.bereznova@ku.lt

Abstract: Gamification and simulation are two powerful strategies to enhance STEAM learning and motivate students. They can help learners develop problem-solving, critical thinking, and collaboration skills, as well as foster creativity and engagement.

Gamification is the use of game design elements and principles in non-game contexts, such as education, to increase motivation, participation, and enjoyment. Gamification can include elements such as points, badges, leaderboards, levels, rewards, feedback, challenges, and narratives. Gamification can also involve applying game mechanics, such as rules, goals, competition, cooperation, and interactivity, to create a more immersive and fun learning experience.

Simulation is the imitation of a real-world process, system, or phenomenon, using a model that can be manipulated and observed. Simulation can be used to explore complex scenarios, test hypotheses, practice skills, and experiment with different outcomes. Simulation can also provide feedback, guidance, and reflection, to enhance learning and understanding. Simulation can be implemented using various technologies, such as virtual reality, augmented reality, computer software, or physical models.

Gamification can be used in STEAM learning to create a more engaging and rewarding learning environment, where students can apply their knowledge and skills in meaningful and relevant ways. It can also help students develop a growth mindset, where they see challenges as opportunities to learn and improve.

In our presentation we want to share our experience of using Gamification principles in STEAM activities at Klaipeda University Methodical STEAM Open Access Center.

References

ENHANCING STEAM EDUCATION THROUGH ROBOTICS: A PRACTICAL APPROACH TO MATH AND PHYSICS LEARNING

Gediminas Gricius

*Klaipėda University, STEAM center
Herkus Mantas str. 84, LT-92294 Klaipėda, Lithuania
E-mail: gediminas.gricius@ku.lt*

Abstract: Students often struggle to fully understand complex mathematical and physical concepts when these are presented only in theory, as it can be difficult to connect abstract ideas to practical applications. Robotics provides a practical solution by integrating hands-on activities into STEAM learning, allowing students to engage with mathematics and physics through real-world applications. This approach enhances their understanding and fosters critical thinking and problem-solving skills. [1,2] The study employed a combination of literature review, practical teaching sessions, and case study analysis to explore the impact of robotics on math and physics learning.

The study was conducted at the Klaipėda University STEAM Center, involving students aged 10-14. In the mathematics component, students worked with various fields containing geometric shapes. They were tasked with calculating unknown angles and side lengths from given data and then programming a robot to navigate the shape. This practical task helped students better understand and apply geometric formulas. In the physics component, students used an ultrasonic sensor to measure distances. By calculating the time for sound to return and comparing it with manual measurements, students deepened their understanding of sound propagation and sensor technology.

The study showed that integrating robotics into math and physics education enhances engagement and comprehension. The hands-on approach made abstract concepts more tangible, and students found the tasks both enjoyable and educational. Real-world applications of robotics made the learning experience more relevant, highlighting the importance of STEM subjects.

References

- [1] Ouyang, F., Xu, W. The effects of educational robotics in STEM education: a multilevel meta-analysis. *IJ STEM Ed* 11, 7 (2024)
- [2] Arís N, Orcos L. Educational Robotics in the Stage of Secondary Education: Empirical Study on Motivation and STEM Skills. *Education Sciences*. (2019)

EXPLORING THE ROLE OF LEARNING ANALYTICS IN ENHANCING PERSONALIZED MATH AND SCIENCE EDUCATION: INSIGHTS FROM LITHUANIAN TEACHERS

Gražina Šmitienė^a, Julija Melnikova^b, Aleksandra Batuchina^c, Gita Šakyatė-Statnickė^d

^aKlaipėda University, Dept. of Pedagogy, Faculty of Social Sciences and Humanities – Klaipėda (Lithuania)

^bKlaipėda University, Dept. of Pedagogy, Faculty of Social Sciences and Humanities – Klaipėda (Lithuania)

^cKlaipėda University, Dept. of Pedagogy, Faculty of Social Sciences and Humanities – Klaipėda (Lithuania)

^dKlaipėdos valstybinė kolegija, Higher Education Institution, Dept. of Business Administration – Klaipėda (Lithuania)

Abstract: Learning analytics is associated with wide opportunities for the organization of individualized, differentiated, and personalized learning. Moreover, the individualization and personalization of natural science and mathematics education are considered one of the priorities of Lithuanian education, in order to foster a culture of innovation in schools. The importance of integrated education is recognized for the sustainable improvement of the student's competencies: problems in solving the issues of integrated organization of natural sciences and mathematics in lessons, searching for the most appropriate didactic solutions, and so on. The usefulness of learning analytics is quite ambiguous: the search for tools of learning analytics, the system of its use, and definitions of benefits for the learner – these are the questions that raise researchers' attention. The current article is based on a qualitative study that particularly sought to disclose the possibility of using learning analytics in science and math lessons. Focus group participants were teachers from general education schools in Lithuania. The aim of the focus group was to extract the accumulated experience of teachers in working with digital platforms and in applying learning analytics based on artificial intelligence. The results of the study revealed that teachers have no doubts about the benefits of digital platforms integrating learning analytics based on artificial intelligence, in identifying student (class) learning gaps, and learning characteristics, making data-based decisions regarding differentiation and individualization of learning. Research participants saw the importance of data generated by learning analytics in planning and organizing integrated math and science education lessons.

Key words: learning analytics, science education, mathematics lessons.

References

THE INTERDISCIPLINARY CHARACTER OF MATHEMATICS IN DIGITAL APPLICATIONS

Alina Paraschiv¹, Aurora Ciachir², Anghelescu Alice³

¹The School Inspectorate of the Bucharest Municipality, Bucharest, Romania

²"Leonardo da Vinci" Secondary School, Bucharest, Romania

³Technical University of Civil Engineering of Bucharest, Bucharest, Romania

Abstract: This article aims to present the importance of an interdisciplinary approach in digital applications in pre-university education. With the alignment of the national curriculum with the recommendations of the European Union, the teachers used multiple Open Educational Resources, sometimes created by themselves, sometimes taken from specialized platforms, to present the topics as attractively as possible and for their acquisition by the students to be completed efficiently, but also pleasant. Along with R.E.D.s, subjects in pre-university education also benefit from well-made digital textbooks, where the applications are full of attractive exercises that stimulate your logic and mathematical thinking, regardless of the subject covered.

References

INNOVATION AND CULTURE IN THE DIGITAL WORLD

Terinte-Olteanu Giorgiana

„Saint Sava” National College, Bucharest

Str. General H. M. Berthelot, No 23, District 1, Bucharest, Romania

giorgianaterinte@gmail.com

Abstract: *Introduction and aims:* Education in the age of technology is as much a challenge as it is a multiverse of strategies and methods to bring knowledge and create cultural background to and for the students. Digital programs and platforms have proven to be incremental to the teaching/learning process. One more salient point to be discussed is the need of digital literacy among teachers. *Approach:* This paper describes a systematic review of methods and approaches used to convey information using digital technology as well as the challenges encountered. A series of researches have brought to light the psychological implications of such technologies *Key findings:* The ever-growing need of social media and the newly developed apps are extremely enticing when compared to obsolete textbook and old teaching methods limited by fixed time frames and grading systems that no longer satisfy the need of the students. At the same time the psychological profile of preteens, teens and young adults has changed making it difficult for professionals in the educational system to find the best paths to communicate, to open doors towards the cultural background and knowledge they need to convey within the institutionalized system of education. *Implications:* The use of innovatory digital programs and platforms have proven to be incremental to the development of the school system and students' motivation to stay in school. However excessive and inappropriate use of digital media proves to be inefficient if not harmful to the system of education. There is need of digital pedagogy among the teachers of the 21st century in order to achieve the learning objectives. *Conclusion:* It has been proven that the new generations use technology as their second knowledge, while middle-aged adults are mere illiterates when it comes to the use of the upcoming changes of the digital world. This is the context in which change has had to take place to adjust the perspective of the teacher and of the teaching methods using digital technology as an ally in conveying meaning to teaching, learning and evaluation strategies at hand.

References

EVERYDAY APPLICATIONS OF MATRICES

Sofia Nae, Stanescu Loredana Andreea, Nicolaie Iarina Alexia, Vasilescu Mara
Alexandra

„Sfântul Sava” National College, Bucharest, Romania
Str. General H. M. Berthelot, No 23, District 1, Bucharest, Romania
loredana.a.stanescu@gmail.com

Abstract: “Without mathematics, there’s nothing you can do. Everything around you is mathematics. Everything around you is numbers.“. Indian writer Shakuntala Devi provides the context for our research detailing Everyday Applications of Matrices, a topic of extreme importance. From a general perspective, being used to design the neighborhoods we live in, to more of a specific one, by being a necessary tool in domains such as Computer Graphics, projecting 3D scenes onto a 2D screen, Machine Learning, where matrices are fundamental to the algorithms and Genetics, present in techniques as Principal Component Analysis (PCA), matrices are all around us. Thus, learning to work efficiently with them is an important step towards innovation. Apart from technical domains, matrices can be observed in recreational activities, for instance the beloved game of chess, in which the moves are described by the row number and column letter. Our research paper is detailing the significance of matrices in various fields, so as to spark interest in a larger crowd regarding bidimensional arrays. Our study will also provide a simple guide towards working with matrices and their operations, such as: addition, subtraction, multiplication, transposition and inversion. It is time we acknowledged how broad the utilizations of matrices are. Only by being acquainted with the implications of matrices in our world, will we be able to use them to good advantage, in order to lead a better life. In conclusion, keeping in mind the quote that inspired our topic of documentation, the issue presented is one of utmost relevance.

References

BITWISE OPERATORS

Nae Sofia, Cumpănășoiu Denisa-Gabriela, Tulea Ioan Casian
„Sfântul Sava” National College, Bucharest, Romania
Str. General H. M. Berthelot, No 23, District 1, Bucharest, Romania
denisa.gabriela09@icloud.com

Abstract: A bit represents the smallest unit of storage, as it can only be 0 or 1. With only 8 bits a byte is formed, which is known as the smallest unit of directly addressable storage. Therefore, every bitwise operator will be applied to, at a minimum, an entire byte at a time. This paper aims to explore bitwise operators, highlighting their essential role in programming. By examining their applications, we will emphasize on how these operators enhance efficiency and simplicity in coding, making them valuable tools for developers seeking to optimize their programs. We use bit operations in data compression, where we convert data from one representation to another to reduce space, and in Exclusive-Or encryption, which encrypts data for security. To encode, decode, or compress files, we need to extract data at the bit level. Bitwise operations run faster and align closely with the system, often optimizing programs. In c++, bitwise operations enable manipulation of individual bits with integer types directly. These operations occur at binary level. Below is an overview of the primary bitwise operators: “NOT” (operation that performs logical negation on each bit), “AND”(binary operation that takes two equal-length binary representations), “OR”(binary operation that takes two bit patterns of equal length) ,“XOR” (performs a logical exclusive OR on each pair of corresponding bits), “Left shift” (shifts all bits to the left by a specified number of positions, filling the vacated bits with 0’s) and “Right shift”. Bitwise operators excel in various applications. They manipulate flags by setting, clearing, and toggling individual bits, giving you greater control over data. They optimize performance by executing faster than arithmetic operations. Additionally, they enable efficient data compression by packing multiple values into a single integer, saving memory, and they support cryptographic functions.

References

IMAGES OF A VECTOR FIELD AND OF ITS FLOW

Stefania Constantinescu, Anghelescu Alice

Technical University of Civil Engineering of Bucharest, Bucharest, Romania

B-ul Lacul Tei, Nr. 122-124, Sector 2, Bucharest, Romania

stefania.constantinescu@utcb.ro

Abstract: In this paper, we explore the concepts of vectorial fields and flow through the use of Python programming. By integrating technology into the teaching process, we aim to demonstrate how these tools can facilitate a deeper and more intuitive understanding of complex mathematical topics, particularly within the realms of differential equations and geometry. Through practical examples and visual simulations, the paper highlights how Python can be effectively used to break down abstract ideas, making them more accessible to students. This approach not only enhances conceptual learning but also provides a dynamic and interactive environment for students to engage with advanced mathematical theories. The inclusion of technology in education thus serves as a bridge between theoretical knowledge and practical application, improving comprehension and fostering a more engaging learning experience.

References

SPECTROPHOTOMETRIC DETERMINATIONS FROM THE PERSPECTIVE OF INTERDISCIPLINARITY

Gîtlan Tudor, Costache Tudor, Shajaani Iuliana

„Sfântul Sava” National College, Bucharest, Romania

Str. General H. M. Berthelot, No 23, District 1, Bucharest, Romania

Abstract: Digital technologies are changing people's lives, from the way they communicate to the way they live and work. Digitization has the potential to provide solutions to many of the challenges facing teachers and students.

References