

Foreword

IOI, the International Olympiad in Informatics, second year in a row organized by Singapore from June 19th to 28th, 2021, is held online again due to the worldwide spread of COVID-19. A traditional one-day scientific conference is replaced by only virtual presentations of the articles on June 21st.

The 15th volume consists of ten research articles, and two reports.

Giorgio Audrito, William Di Luigi, Luigi Laura, Edoardo Morassutto, and Dario Ostuni share the experience gained and tools produced during a year of online Olympiads in Italy, hoping that other countries can benefit from these tools and suggestions for their own Olympiads. The authors provide a list of online resources after the reference list, including GitHub urls of the developed tools.

In his article “Self-Generated Figures in Sequence Processing”, David Ginat deals with self-generated figures in algorithmic problem solving. Such figures elicit associations of hidden patterns, whose recognition yields elegant and efficient algorithmic solutions. IOI students have demonstrated constructive utilization of self-generated figures in solving challenging sequence processing tasks. The author believes that this problem-solving heuristic should be elaborated, exemplified, and studied in the teaching of algorithmics, at all levels, including the Olympiad level.

Jamaladdin Hasanov, Habil Gadirli, and Aydin Bagiyev provide statistical analyses based on the last on-site IOI and share insights on each of them. The sources of the article and results of the work can be found in a public GitHub repository (<https://github.com/ADA-SITE-JML/ioi-grant>)

Martin Mare presents “Security of Grading Systems” and discusses various attacks on grading system security. Several recommendations are summarized in the conclusion part.

In their article, “You Should Know and Not Only Use Sorting Algorithms: Some Beautiful Problems”, Laszlo Nikhazy, Aron Noszaly, and Bence Deak present some beautiful tasks where the key to the solution lies in knowing a particular sorting algorithm. In some cases, the sorting algorithms are applied as a surprisingly nice idea, for example, in an interactive task or a geometry question.

The article of Pavel S. Pankov, Taalaibek M. Imanaliev, and Azret A. Kenzhaliev deals with methods of generating various Olympiad tasks by using evident images of virtual automatic makers. Such tasks are well-understood, have short formulations and are difficult for solving even with initial data of small volume. The authors hope that these tasks would enlarge the scope of tasks involved in the IOI and give ideas for young people to implement in hardware.

The article of Zsuzsa Pluhar presents the newest extending activity idea, a challenge game of the Hungarian Bebras initiative. The goal of extension is to create unplugged computational thinking activities based on the Hungarian Bebras competition.

Vesna Dimitrievska Ristovska, Emil Stankov, and Petar Sekuloski present a comparative analysis of the conduction of traditional courses, as opposed to the conditions with distance education. The analysis is done from the aspect of the approach to teaching as well as from the aspect of exam conduction and achieved exam results. Presented scenarios for conducting online exams may also be used for conducting online contests in informatics.

Marina S. Tsvetkova and Vladimir M. Kiryukhin discuss the concept of algorithmic thinking in the context of the history of the formation of school informatics, in the competencies of new digital literacy and in the system of developmental education.

Tom Verhoeff presents an excellent article, “Look Ma, Backtracking without Recursion”, and demonstrates how backtracking can be discovered naturally without using a recursive function nor using a loop with an explicit stack.

In the second part of the volume, a national report from Cuba is presented by Francisco Hernandez Gonzalez, José Daniel Rodriguez Morales, and Dovie Antonio Ripoll Mendez. The Cuban Olympiad in Informatics has different stages ranging from the school level to the national contest. In recent years, the competition has been renewed with the use of an instance of the Don Mills Online Judge, an open-source online judge.

Finally, Antti Laaksonen overviews two recently published competitive programming books: “Algorithmic Thinking” by Daniel Zingaro, and “Competitive Programming in Python” by Christoph Dürr and Jill-Jênn Vie.

Many thanks to all of those who have assisted with the volume, authors and reviewers, as well as the Editorial Board of this journal. A lot of work to be done in the process after submitting the first version of papers until the final version ready for printing. We would like to thank the host of this year’s IOI in Singapore for organising the IOI conference online.

Editors