International School in Informatics "Junior" for IOI Training

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Abstract. In 2018 the IOI will celebrate its thirtieth anniversary. Over these three decades, not only the world secondary school Olympiads in informatics community have been formed, which covers more than 80 countries from all continents, but a formation of an united methodological space of the school Informatics started also. This space allows many countries today to develop school computer science education, using the experience of other countries, materials from the IOI conference journal, sites of computer science contests, and other Internet resources. This article describes a model for organizing an international training event for juniors – International School in Informatics "Junior" – ISIJ.

Keywords: young talented children, informatics curriculum, model of IOI training.

1. Introduction

At the same time, the preparation of students in the different IOI countries is still very different. In order to attract more young people all over the world to participate in programming contest, and especially in IOI, it is necessary to solve two important tasks: to start training as soon as possible and to allow countries (children together with their coaches) to exchange experience (Kiryukhin, V. Tsvetkova, M., 2014).

2. Development of the International Olympiad Environment for Olympic Training of Juniors

IOI started in 1989 in Bulgaria, Europe, with the support of UNESCO. IOI has already been held all over the world. It has been repeatedly held in Europe and Asia. IOI 2016

was held in Russia placed in the two continents. IOI was held in the countries of North and South America, in Africa, and Australia. There is now no country that does not know about IOI, as the most important Olympiad in Informatics for secondary school students from all over the world.

The complexity of IOI tasks increases continuously and this requires strengthening of the coaches' work and responsibility. In order to have smoothed entering of the youngest programmers in the topics of IOI Curriculum the Olympic training should start from an early age. Only in such way children with interests in programming will have time to gain the necessary experience and to become competitive in IOI. Unfortunately, not all children in the countries of the world, that are 12–15 years old, have a school Informatics courses at this age. Something more, not all teachers of these children can become coaches, because there are different curriculums of school Informatics in different countries. One possible way for having an efficient training in Informatics for juniors is to create an open teaching environment of Olympic school Informatics for junior age and to integrate as many as possible children of 12–15 years in it.

Due to the emphasis on the early training of juniors in Olympic Informatics, the process of searching for ways of methodological integration of IOI member countries for work with talented children aged 12–15 has begun. Since 2015, IOI team leaders have been discussing the formation of an international Olympiad environment for training juniors. At IOI 2016 the authors presented the Russian experience in preparation of juniors for olympiads in informatics and experience of Kazan Federal University (KFU) in creating in Russia of regional IT educational infrastructure as "digital bridge" from school to university (Tsvetkova M., 2016). After that in 2017 Bulgaria started a new programming contest – the European Junior Olympiad in Informatics (eJOI, 2017) – a possibility for more young programmers to take part in a serious international competition.

In support of these initiatives, Russia has offered to organize an international school in Informatics for juniors that are preparing for participation in international competitions in Informatics – International School in Informatics "Junior" (shortly ISIJ or the School). The mission of ISIJ is to create a space of Olympic startup in Informatics for all juniors of the world, to unite school teachers-innovators in Informatics in international coaching community, to stimulate exchanging of experience and creation of tasks for talented juniors. It is important that in ISIJ the coaches of the juniors will participate too. They will cooperate in the International Coaching Council, will exchange experience, will create tasks, and will receive methodical training for work with young talents. In such way ISIJ will be a training place for young IT specialists and coaches too.

The School is organized at the site of KFU, which hosted IOI 2016. The first session of the School was held in the summer holidays of 2018 for children from Europe and Asia, the second one is planned for the winter holidays for other interested countries.

We hope that ISIJ will become an attractive event for Olympic training in Informatics of juniors from different countries of the world and their coaches.

3. Organization Structure ISIJ

ISIJ is organized by KFU together with scientists from the national Olympic teams in Informatics of Russia and Bulgaria. The governing body of the School in Russia is the Organizing Committee, which is formed by the KFU administration and scientific consultants from the Russian Olympic team in Informatics.

The program and the financial support of the School are supervised by the Executive Directorate of the School in coordination with the Organizing Committee. The School Directorate is headed by an Executive Director who organizes the registration of participating countries, registration of teams, implementation of the School's program, and manages the School Fund. The Executive Director attracts a team of specialists in the Program Secretariat of the School. He organizes information mailing, collection of participation fees, and visa support for foreign teams.

Information about the time schedule of the School and the participation fees is specified in the letter of the Organizing Committee to the coaches of the teams of the registered participating counties. The participation fees includes only the accommodation and the meals for participants (breakfast, lunch, dinner and buffets), as well as some cultural program.

In the residence of participants there is a medical staff and supporting teachers from IT lyceum (KFU, 2018). A security measures for participants are provided. The residence of the School is in a children's educational institution and has comfortable conditions for living and conducting classes. All rooms are equipped with computers and Internet.
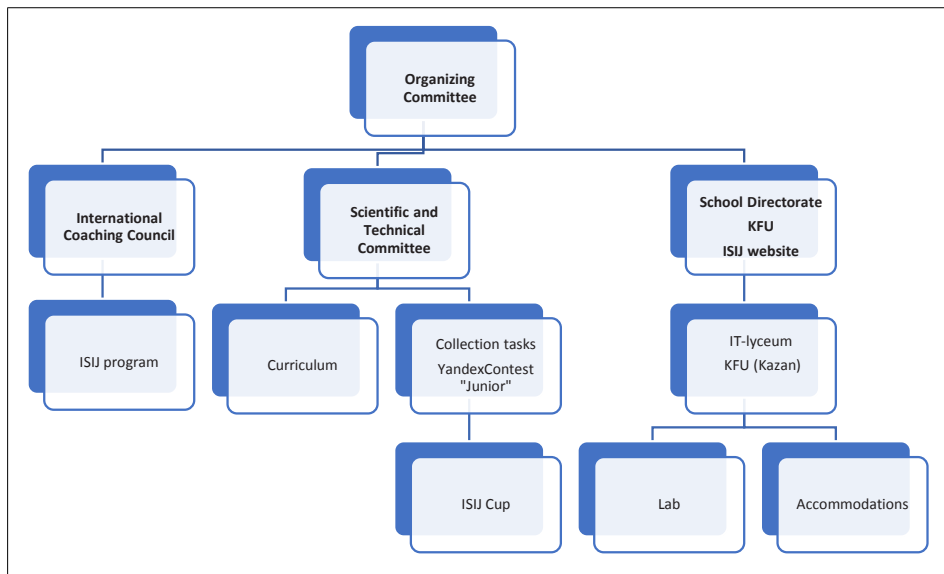

Fig. 1. Organization structure ISIJ.

4. Participants of ISIJ

The School is held as an international educational start-up for the national teams of participating in IOI countries: Summer school – for the countries of Europe and Asia, Winter school – for other interested countries.

The team of a country consists of 2 to 6 participants and one coach – the Head of the team. Age of participants: at least 12 years of age and not older than 15 years at the end of the previous year. Children from Russia that will participate in the School will be contestants from the national Olympiad, and will be invited by the administration of the School.

5. Scientific and Technical Committee – STC ISIJ

Scientific and technical support of the School's activities is provided by the Scientific and Technical Committee (STC). School's Organizing Committee is composed in coordination with the School STC.

Technical support of the School is carried out by the sponsor of the School – the Russian IT company Yandex – on the basis of a cloud system for competitions organizing and grading (Yandex Contest "Junior"), specially made for the School and opened for filling with tasks by the Coaching Council and STC of the School.

The composition of the Russian group of member of STC is approved by the Organizing Committee of the School. Applications for membership of coaches from the different countries in the international part of the STC are made by the countries. STC of the School is headed by two leaders – one from Russian members and the second one – from the international STC members. Together, both leaders organize the work of the Coaching Council to fill the collection of tasks.

Preparation of the training tournaments and the ISIJ Cup tournament is carried out by the STC of the School using tasks from the national Olympiads of Bulgaria, Russia and other participating countries. STC start preparation of tournaments tasks in the Yandex Contest system (remotely) one year before the start of the next School. The participating countries can form in the Contest system their own sections of tasks useful for their teams during the School and for remote tournaments in the period between two School's sessions.

Tasks from the tournaments of the current year, prepared by the Coaching Council of the School are available for participants registered for the next School as remote homework.

6. The International Couching Council

Coaches of the participating countries compose the International Coaching Council (ICC) of the School: one coach from each participating country.

The representative of each country in ICC provides every year one ready for use task for the collection of tasks of the School. The task archive has to contain: statement of

the task – in Russian or English, program-solution and checker (if necessary) written in C++ programming language, and test cases. Description of the alternative possible solutions is welcome.

The ICC chooses some of its members to represent ICC in the international group of STC by public vote. The term of representation in the international group of STC is limited to 5 years.

The Coaching Council of the School participates actively in the work with juniors – giving consultations after tours, organizing workshops, providing translation of the tasks to the national languages, holding thematic meetings for selection and refinement of tasks for the task collection of the School.

7. ISIJ Program

The School is held for 11 days in the summer and for 7 days in the winter. The School's program includes at least five training tournament and one competitive tournament – the ISIJ Cup. STC and the Coaching Council decide on the educational content of the tasks on the basis of the Curriculum of EJOI (eJOI, 2017) and then select set of appropriate tasks (according to Curriculum), on the basis of which the STC prepares tournaments. STC and Coaching Council prepare a set of lessons to be proposed to participants and organize pedagogical workshops and consultations for groups of coaches.

The School's languages are Russian and English. The organizers provide participants with technical devices for simultaneous translation for small groups with a common language. The texts of the tasks are provided to all participants in Russian or English in electronic form with the possibility of printing. The coaches could provide the participants with a translation of the tasks into the native language of the students.

The program includes two excursions. The program provides sports, leisure activities, chess classes, meeting with people from IT companies, scientific and practical workshops.

The Organizing Committee approves the terms of the School taking into account the proposals of the ICC, conducts meetings with the participants, and manages the provision of a base for the School in the campus of KFU.

8. ISIJ – Cup

On the last day of the school a ISIJ-Cup is held. The Cup is held in one round of 3 tasks for 4 hours.

Following the results of the Cup three places for rewarding are defined: gold, silver and bronze medalists of the Cup. In case of equal number of points, all participants with these points are awarded the medal.

From the Russian group of participants no more than 6 participants (chosen by their performance rating from tournaments of the School) are allowed to compete in the Cup

are, i.e. the Russian team is has no more members than the teams of the other participating in the School countries.

The Coaching Council determines the scores necessary for awarded the Diplomas of the Cup finalists. The number of the Diplomas is no more than 1/2 of the number of the Cup participants.

9. ISIJ Website

On the School's website (ISIJ, 2018) all teaching materials of the School are published and they are accessible for the registered participants of the School only.

The site of the School contains information about the composition and contacts of the Organizing Committee, the STC, the Directorate, and the Coaching Council, a list of participating countries, the program of the School, the schedule of the Coaching Council, School news, etc.

The archive of tasks of the School is placed in a special section on the Website of the school in order to be used by registered participants and couches through the Yandex-Contest system for the remote access throughout the year. Registration of all participants on the school website is mandatory.

The site contains the logo of the School for the use by countries in the design of t-shirts and other objects attributes of the School.

On the website of the School there is a history page in the form of a virtual whiteboard achievements of school participants: the best participants of the year, medalists and finalists of the school Cup, etc.

10. Certificates of Participation

All participants of the International School receive a certificate of participation.

All school coaches receive a certificate of teaching internship in the amount of 72 hours under the program "Methods of development of early talent in informatics". (Tsvetkova M., 2010).

Ten best participants of ISIJ on the sum of all training rounds receive the diploma with honors and information on them is placed on a virtual distinction Board on the website of school.

11. Conclusion

The organizers of the ISIJ hope to form an international school for juniors, including all countries participating in IOI as well as to provide juniors from these countries remote participation in the training tournaments of the School.

The total experience of the IOI coaches in the implementation of the ISIJ (as the start of the Olympic "lift") will form the best methods of developing the talent of the juniors and methods of teaching informatics in schools in the world. The ISIJ will be an open Olympiad educational space for juniors in informatics.

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V.M. Kiryukhin is professor of the Russian Academy of Natural Sciences and assistant professor of National Research Nuclear University "MEPhI". He is the Chairman of the federal methodical commission in Informatics, which is responsible in Russia for carrying out the national Olympiad in Informatics. He is author of many papers and books on development of the Olympiad in Informatics in Russia and preparations for the Olympiads in Informatics. He is the exclusive representative who took part at all IOI from 1989 as a member of the IC of IOI (1989–1992, 1999–2002, 2013–2016) and as a Leader of the Russian team (1989, 1993–1998, 2003–2012). He received the IOI Distinguished Service Award at 2003 and 2008 as one of the founders of the IOI and for his long term distinguished service to the IOI from 1989 to 2008, as well as the medal "20 Years International Olympiad in Informatics" at 2009.