

# Youth programming contests in the Balkans (Macedonia, Bulgaria and JBOI)



Mile Jovanov,

Mile Jovanov (Macedonia)  
Emil Kelevedjiev (Bulgaria),

# Competitions in Informatics

- We usually talk about **algorithmic programming** contests
  - Other types include: architecture, design, development, specification, assembly, testing scenarios, etc.
- Usually, separate competitions are organized for *high school/primary school* pupils
  - Age boundaries determine where one can compete
- A perfect opportunity for pupils to introduce to the *art of programming* and create a very solid background for becoming *engineers in informatics*

# International Olympiads in Informatics (IOI)

First Olympiad in  
1989



# Balkan Olympiads in Informatics (BOIs)

- The initiative for the establishment of the **Balkan Olympiad in Informatics (BOI)** came from the host country of the 1<sup>st</sup> BOI – Romania
- The Olympiad is *organized by* appropriate institutions and organizations of one of the following countries: *Albania, Bulgaria, Bosnia and Herzegovina, Cyprus, Greece, Macedonia, Moldova, Montenegro, Romania, Serbia, Slovenia and Turkey*
- *Since 1993*



# Balkan Olympiads in Informatics (BOIs)



# Overview

- **The situation in Bulgaria**
- The situation in Macedonia
  - their organizer, and the challenges we are facing
- Junior Balkan Olympiad in informatics



# The experience of Bulgaria

- National Informatics Olympiad began in 1985 with one age group
- More than one age group first appeared in the Winter Tournament in Informatics - since 1986 the contest is with two age groups: 6<sup>th</sup> -7<sup>th</sup> and 8<sup>th</sup>-11<sup>th</sup> grades.
- Since 1999 – three age groups: 5<sup>th</sup> -7<sup>th</sup>, 8<sup>th</sup> - 9<sup>th</sup> and 10<sup>th</sup> - 11<sup>th</sup> grades

- Since 2002 – four age group: 4<sup>th</sup> - 6<sup>th</sup> , 7<sup>th</sup> - 8<sup>th</sup> , 9<sup>th</sup> - 10<sup>th</sup> and 11<sup>th</sup> - 12<sup>th</sup> grades
- Since 2005 – five age groups: 4<sup>th</sup> - 5<sup>th</sup> , 6<sup>th</sup> - 7<sup>th</sup> , 8<sup>th</sup> - 9<sup>th</sup> , 10<sup>th</sup> - 11<sup>th</sup> grades and 12<sup>th</sup> grade.
- Five age groups were preserved, but with small changes in their scope:

E: 4<sup>th</sup> - 5<sup>th</sup>; D: 6<sup>th</sup> - 7<sup>th</sup>; C: 8<sup>th</sup>,

B: 9<sup>th</sup> - 10<sup>th</sup>; A: 11<sup>th</sup> - 12<sup>th</sup> grades.

The final round includes common themes for groups A and B, and C and D, respectively



- The competitions in informatics have been continually expanding and involving more and more younger students.
- A permanently open question, often asked by teachers and trainers, who are involved in the preparation of students from the youngest age group, is the question: how to choose suitable tasks? The goal is to cover such material that might be expected in real competitions.

# Look at the curricula

## *Group E, 4<sup>th</sup> - 5<sup>th</sup> grades*

- Programming: Environment for C/C++, Branch and loop operators, Integers and Characters.
- One-dimensional array.
- Standard input and output.
- Algorithms: Whole numbers arithmetic. Dates.
- Geometry: Straight line coordinates.

## *Group D, 6<sup>th</sup> - 7<sup>th</sup> grades*

- Programming: Extended study of the programming language. Introduction to pointers.
- Data structures: Arrays and Strings. Multi-dimensional arrays. Stacks and Queues.  
Methods for algorithms design: Simple exhaustive search.
- Recursion. Introduction to dynamic programming. Binary search in a sorted array.
- Arithmetic: Divisibility. Euclid's algorithm. Long integers. Number systems.
- Sequences: Searching, sorting, Merging, Polynomials.
- Combinatorics: Counting, Generating combinatorial configurations.
- Graphs: Representations, Grid of squares.
- Geometry: Coordinates in the plane. Rectangles with sides parallel to the axes.
- Games: Strategies, Parity, Symmetry.

# Forms of training

- **Local study groups** are active in a comparatively small number of towns, as programming is not included as an obligatory subject for students.
- **National competitions in informatics** and the practice of analyzing the tasks and their solutions after each competition.
- **National training camps** aims at intensive (one-week) preparation of the competitors selected according with the best their results throughout the year
- **Online competitions** acquire more and more importance



# Overview

- The situation in Bulgaria
- **The situation in Macedonia**
  - their organizer, and the challenges we are facing
- Junior Balkan Olympiad in informatics



# Competitions in Informatics in Macedonia

- The **Computer Society of Macedonia (CSM)** is the main organizer of competitions in informatics for both *high school* (HS) and *primary school* (PS) pupils
- Every year, contestants go through many levels of competition until the best are selected
  - *Regional Competition* (HS)
  - *National Competition* (HS)
  - *National Olympiad* (HS)
  - *Qualifications + National Competition* (PS)
- The selected pupils represent themselves and Macedonia at the BOI/JBOI and at the IOI



# Competitions in Informatics in Macedonia (2)

- Competitions in informatics have a long tradition in Macedonia
- So far:
  - **24** *Regional Competitions* (HS)
  - **27** *National Competitions* (HS)
  - **20** *National Olympiads* (HS)
  - **10** *National Competitions* (PS)

# Brief history: the beginnings...

- The first steps of informatics in high school education were made in middle **1980s**
- Few years later (in **1990**), the **1<sup>st</sup> National Competition** in Informatics for HS students was held in ***Prilep***
- In **1993**, CSM started to organize **Regional Competitions** in Informatics
- The **1<sup>st</sup> National Olympiad** in Informatics was held in **1997**
- In **2007**, the **1<sup>st</sup> National Competition** in Informatics for PS students was held in ***Veles***



# Brief history: HS competitions

- At first, all the contestants were given only one set of programming tasks
- Later, the contestants were divided into **2** groups (**A** and **B**), having a *different set of tasks* for each group
- Later, it was decided that it would be better to rename the **2** groups based on the *degree of difficulty*
  - The groups were named “**easier group**” and “**harder group**”

# Brief history: HS competitions 2008-2013

- The contestants, depending on the level of acquired knowledge in the programming area, at the start of each competitions cycle have to choose between:
  - **Beginners group**
    - First time contestants with no experience, usually in their first or second year of high school education
  - **Basic group**
    - First or second time contestants, that consider themselves not to have enough experience to participate in international competitions
  - **Advanced group**
    - Contestants that consider themselves to have enough experience to solve complex algorithmic problems and to participate in international competitions (BOI, IOI)

# Brief history: HS competitions since 2014

- All contestants have the same 5 tasks to solve
  - Given in an order of difficulty and scored appropriately

# Brief history: PS competitions

- Year **2007**
  - only skills in applications
- Year **2008**
  - skills in applications and
  - algorithmic skills
- Year **2011**
  - skills in applications
  - algorithmic skills – **beginners group**
  - algorithmic skills – **olympic group** (joined with HS comp)
- Year **2012**
  - skills in applications
  - algorithmic skills – **olympic group** (joined with HS comp)



# Challenges in the Organization of the Competitions

- Computer Society of Macedonia, is a non-government, non-profit organization.
  - the organization of the competitions **is based solely on sponsorships** from companies, educational institutions, and sporadically from donations based on application in some calls for projects
- Having in mind the low finances, CSM has to **find as cost-effective** as possible **way** for the following:

# ***Engaging pupils in the competitions***

- We have to spread the information among the pupils and keep them informed
  - We have concluded that the best way to do that is to **build and maintain a ‘community’ of competitors**, and let them collaborate throughout the whole year
  - we also use some more traditional methods, e.g. **contacting and informing the schools**, contacting the computer science teachers, but there are obstacles in that regard too

# ***Motivating teachers and school authorities***

- The most important thing
  - motivate the teachers to inform and mentor the pupils
- With years of our experience, we have found that the
  - computer science teachers, mainly, **do not want to spend extra time** for tutoring gifted pupils
  - the greatest reason for this is that they are **not familiar enough with the curriculum** of the programming competitions

# ***Motivating teachers and school authorities***

- The best solution consists of two things:
  - **Provide online materials, training and q/a support** for the pupils, in every stage of their training for the competitions, and
  - **Inform the teachers for this convenience** and put **additional pressure directly through the pupils**
- The school authorities can also be an obstacle for the participation of the pupils
  - mostly with ridiculous reason in mind like not spending money for the trip of the pupils to the contest venue
  - On this issue, we can only hope on the pressure of the pupils and the teachers on them



# ***Keeping the participants informed, and 'in condition'***

- **Publically present the information** for the next steps in the competitions (dates, rules, procedures, results, etc.) in order to directly inform the pupils
  - the most reliable way to spread information (opposite to informing through the teachers )
- The greatest challenge of all is to **motivate pupils to constantly prepare** (work on solving problems) for the competitions, with public sets of tasks that can be solved at any time

# Better conditions for fulfilling our goals

- we had a dramatic improvement in the area of **internet penetration** in Macedonia, and nowadays we have similar conditions for internet access as most EU countries
- The government project “Computer for every pupil” allowed easy **access to internet content from every classroom**

# MENDO (<http://mendo.mk>)



## Mendo Online Judge

Систем за натпревари по информатика 2012

Тренинг Натпревари Понош

Дома Линкови Пријави Грешка Помош

► Дома ► Добродојдовте во Mendo Judge

### Најава

Корисник

Лозинка

☐ Запомни ме

Забравена лозинка?

### Навигација

- Регистрација
- Тренинг
- Натпревари
- Форуми
- Вики
- Помош
- Пријави Грешка

### За нас

Овој сајт (проект) е пуштен во употреба како дел од напорите за популаризирање на натпреварите по информатика во Македонија. Иако целта на

## Добродојдовте во Mendo OJ 2012

### Државен натпревар 2012

Поканети натпреварувачи на Државниот натпревар

На веб-сајтот на Здружението на информатичарите на Македонија се објавени конечните резултати од регионалниот натпревар ([\[ЛИНК\]](#), [\[ЗА ПЕЧАТЕЊЕ\]](#)), како и листата на поканети учесници на Државниот натпревар по информатика 2012 ([\[ЛИНК\]](#), [\[ЗА ПЕЧАТЕЊЕ\]](#)). Сите ученици за да може да учествуваат на Државниот натпревар мора да бидат пријавени од нивните ментори (или од некој професор од училиштето во кое што учат) на адресата [natprevar AT cs.org.mk](mailto:natprevar@cs.org.mk) најдоцна до 19.04 до 15 часот (повеќе детали [ТУКА](#)).

### Регионален натпревар 2012

Регионалниот натпревар ќе се одржи на 08.04.2012 (недела). За сите учесници натпреварот започнува во 12:00 и трае до 15:00 часот – значи вкупно 3 часа. Натпреварот ќе се одвива електронски - преку овој веб-сајт. Повеќе информации за регионалниот натпревар можете да најдете на веб-сајтот на ЗИМ - директен линк [ТУКА](#) (задолжително прочитајте!). ВАЖНО: Доколку се случи прекин на интернет врската до [mendo.mk](http://mendo.mk) во текот на натпреварот, информации како продолжува натпреварот ќе може да добиете на [Facebook страната на ЗИМ](#). Не мора да сте Facebook корисник за да ги следите објавените соопштенија.

### Натпревари по информатика 2012

Информации за 23-тиот циклус натпревари

#### Статистика

На овој систем има вкупно 1778 регистрирани корисници; 25 од нив биле активни во последните 5 минути.

Системот ги поддржува сите 4 јазици кои се користат на IOI и ACM (Pascal, C, C++ и Java).

#### Поддржувачи



#### Дали знаете?

Македонија освои четири бронзени медали на БОИ 2011, и два бронзени



# MENDO as a Training System

- The MENDO's training system *can be used 24/7*
- Every time a user logs
  - he can view all the tasks that are available for training, and he can submit a solution
- After a solution has been submitted, the submission is added to a queue and judged as early as possible
- After a submission has been judged, the results of every test case are shown to the user in a form of detailed feedback
  - There is no limit to the number of submissions a user can make during a time period



# MENDO as a Training System (2)

- Special section consisting of organized materials that present an online step by step introduction to algorithmic problem solving and programming (with C++ as the programming language)
  - number of lessons, combined with executable sample codes and proposed tasks connected to the information presented in the lesson in question
  - Every user has a personal view of the lessons, showing her current progress



# MENDO

System for competitions in informatics 2013

English

Македонски



Home

Training

Competitions

Help

» 89324 tested submissions | 3304 users «

» Home » Training

Chat OFFLINE AI

Login

Username:

mile

Country:

Macedonia

Activity:

1 solved tasks

Navigation

Training

Competitions

Forums

Wiki

Submissions

(M) Tasks

(M) Contests

Log Out

## Learn programming...

[ Learn C++ ] [ Beginners ] [ National ] [ International ]

### The C++ programming language

	Name	Source	Activity
1.	Вовед. Структурирано програмирање		lecture
2.	Бинарен броен систем		lecture
3.	Типови на програмски јазици		lecture
4.	Креирање на вашата прва програма		lecture
5.	Анализа на првата програма		lecture
6.	Здраво	вовед '12	task
7.	Податочни типови. Променливи		lecture
8.	Читање и печатење на податоци		lecture
9.	Оператори - прв дел		lecture
10.	Квадрат и куб	оператори	task
11.	Математика	оператори	task
12.	Средна цифра	оператори	task
13.	Оператори - втор дел		lecture
14.	Условно извршување (if-else, switch)		lecture

# Interest in the competitions

Year	Regional Competition	National Competition	National Olympiad
2010	55	45	23
2011	118	68	19
2012	209	95	21
2013	290	118	19
2014	341	101	21
2015	179*	98	25
2016	205*	102	21

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- **Junior Balkan Olympiad in informatics**





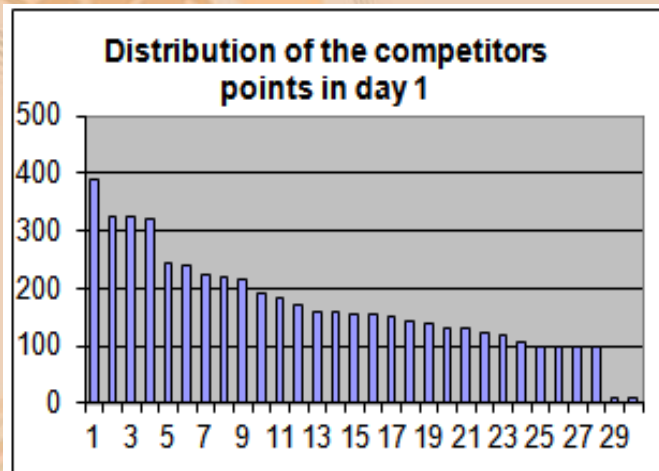
# JBOI

year	Issue	Location	Cont.	Participating countries
<b>2007</b>	<b>1</b> <sup>тата</sup> JBOI	<i>Belgrade, Serbia</i>	22+4+1	BIH, BUL, GRE, MKD, ROM, SRB
<b>2008</b>	<b>2</b> <sup>тата</sup> JBOI	<i>Shumen, Bulgaria</i>	24+7+8	BIH, BUL, GRE, MKD, ROM, SRB + POL, KAZ
<b>2009</b>	<b>3</b> <sup>тата</sup> JBOI	<i>Shumen, Bulgaria*</i>	23	<b>BIH*</b> , BUL, GRE, MKD, ROM, SRB
<b>2010</b>	<b>4</b> <sup>тата</sup> JBOI	<i>Shumen, Bulgaria*</i>	23	BIH, BUL, GRE, MKD, ROM, SRB
<b>2011</b>	<b>5</b> <sup>тата</sup> JBOI	<i>Bistritsa, Romania</i>	28+4+4	BIH, BUL, GRE, MKD, <b>MOL</b> , ROM, SRB + HRV
<b>2012</b>	<b>6</b> <sup>тата</sup> JBOI	<i>Ohrid, Macedonia</i>	24+2+4	BIH, BUL, GRE, MKD, ROM, SRB + HRV
<b>2013</b>	<b>7</b> <sup>тата</sup> JBOI	<i>Shumen, Bulgaria*</i>	20	BUL, GRE, MKD, ROM, SRB
<b>2014</b>	<b>8</b> <sup>тата</sup> JBOI	<i>Belgrade, Serbia</i>	27+4+5	BIH, BUL, GRE, MKD, MOL, ROM, SRB + TJK
<b>2015</b>	<b>9</b> <sup>тата</sup> JBOI	<i>Ohrid, Macedonia</i>	28+3+8	BIH, BUL, <b>CYP</b> , GRE, MKD, MOL*, ROM, SRB + POL, SLO

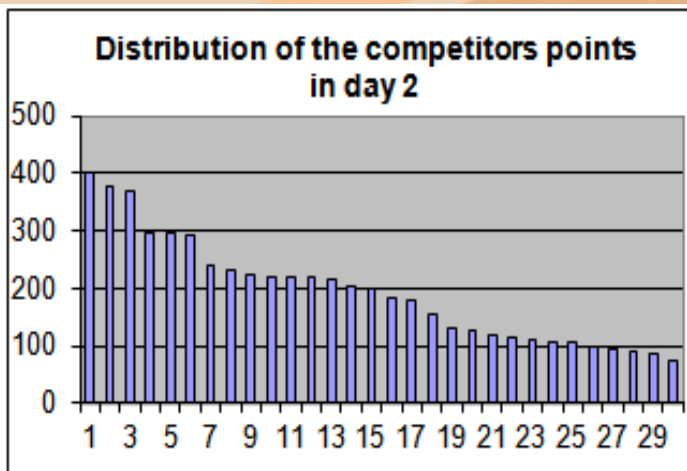
# JBOI organized by CSM



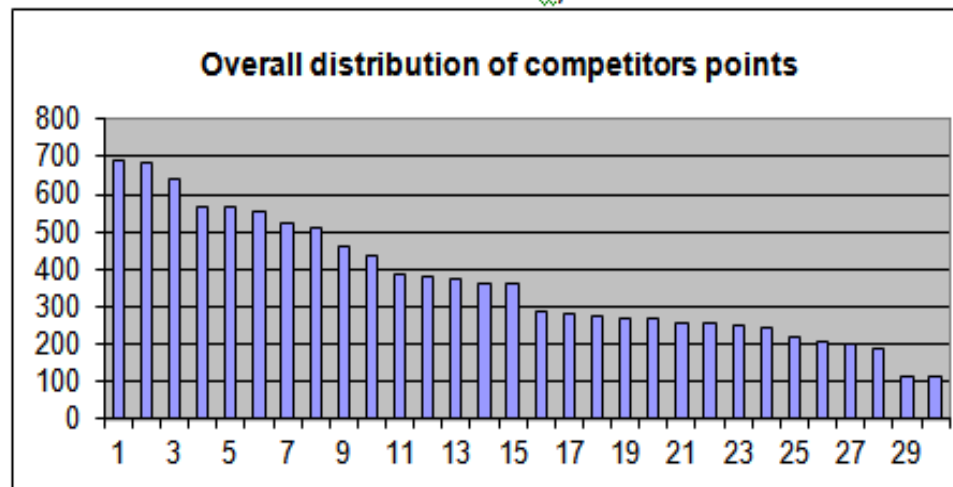
# Example results: JBOI 2012



a)



b)



c)

a) MIN = 10,  
MAX = 390,  
AVG = 166  
(out of 400 p.)  
-

b) MIN = 75,  
MAX = 400,  
AVG = 191,5  
(out of 400 p.)  
-

c) Overall  
distribution  
MIN = 115,  
MAX = 693,  
AVG = 357,6  
(out of 800 p.)

# The people



International

Olympiads Countries Tasks



Rumen Hristov

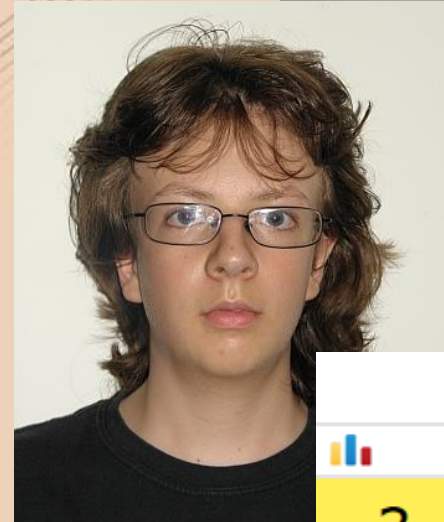
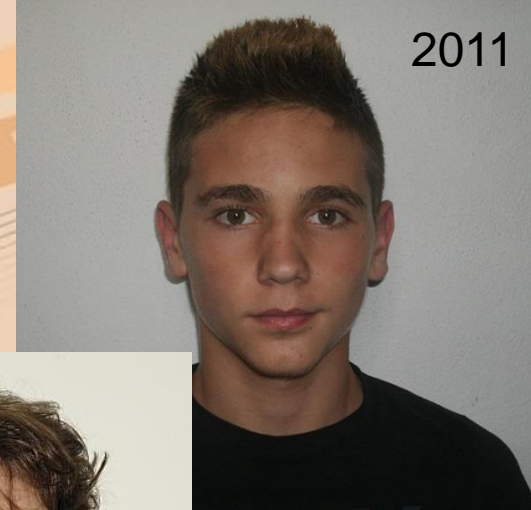


3

2

0

2007



Hristo Venev



3

1

0



2014

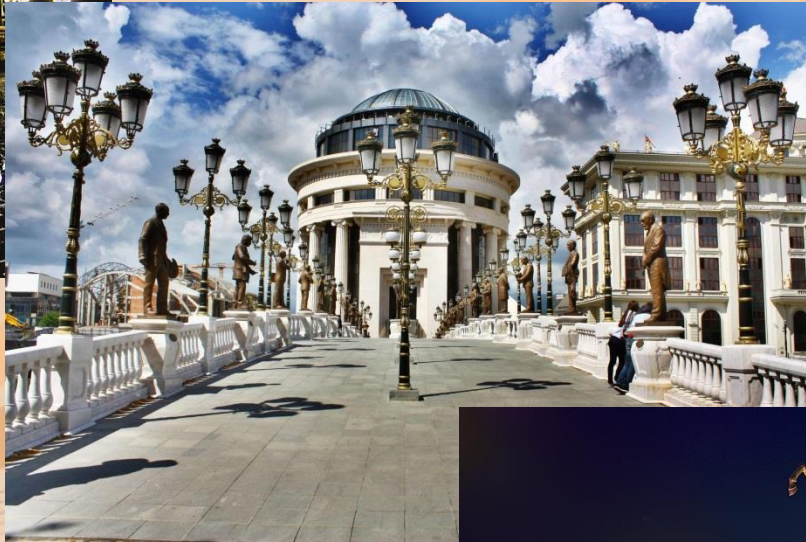


# JBOI 2016



## **Skopje, Macedonia** **September, 17-22**

students up to 15,5 years  
unofficial up to 16 years



Contact me if you are interested in participating at  
[mile.jovanov@gmail.com](mailto:mile.jovanov@gmail.com)

