

Platform for analysing and encouraging student activity on contest and e-learning systems

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New approach for comparison of countries' achievements in the science Olympiads

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Overview

- Macedonian situation
- ‘Hero’ idea
- Comparison idea

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 1st 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)



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:
 - **26** *Regional Competitions* (HS)
 - **29** *National Competitions* (HS)
 - **22** *National Olympiads* (HS)
 - **12** *National Competitions* (PS)

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

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

Заборавена 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 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

Chat ONLINE AI

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

Microsoft

seavus

SEMOS
education

IO 

netcetea

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	~400/179*	98	25
2016	~400/205*	102	21
...

Other 'resources'

Product	Type	Features
Udemy	Online learning platform	Video tutorials, discussions, quizzes, file sharing
Stack Overflow	QA site	Questions/answers, learning by viewing best answers on common questions
CMS	System for running programming contests	Grading solutions, answering questions, administering contests (self-hosted)
Codeforces	Site with contests & tutorials	Contests, practicing in virtual competitions, learning from tutorials and posts
MENDO	Site with contests & courses	Site with forum, wiki, national contests and courses for C++ and algorithms

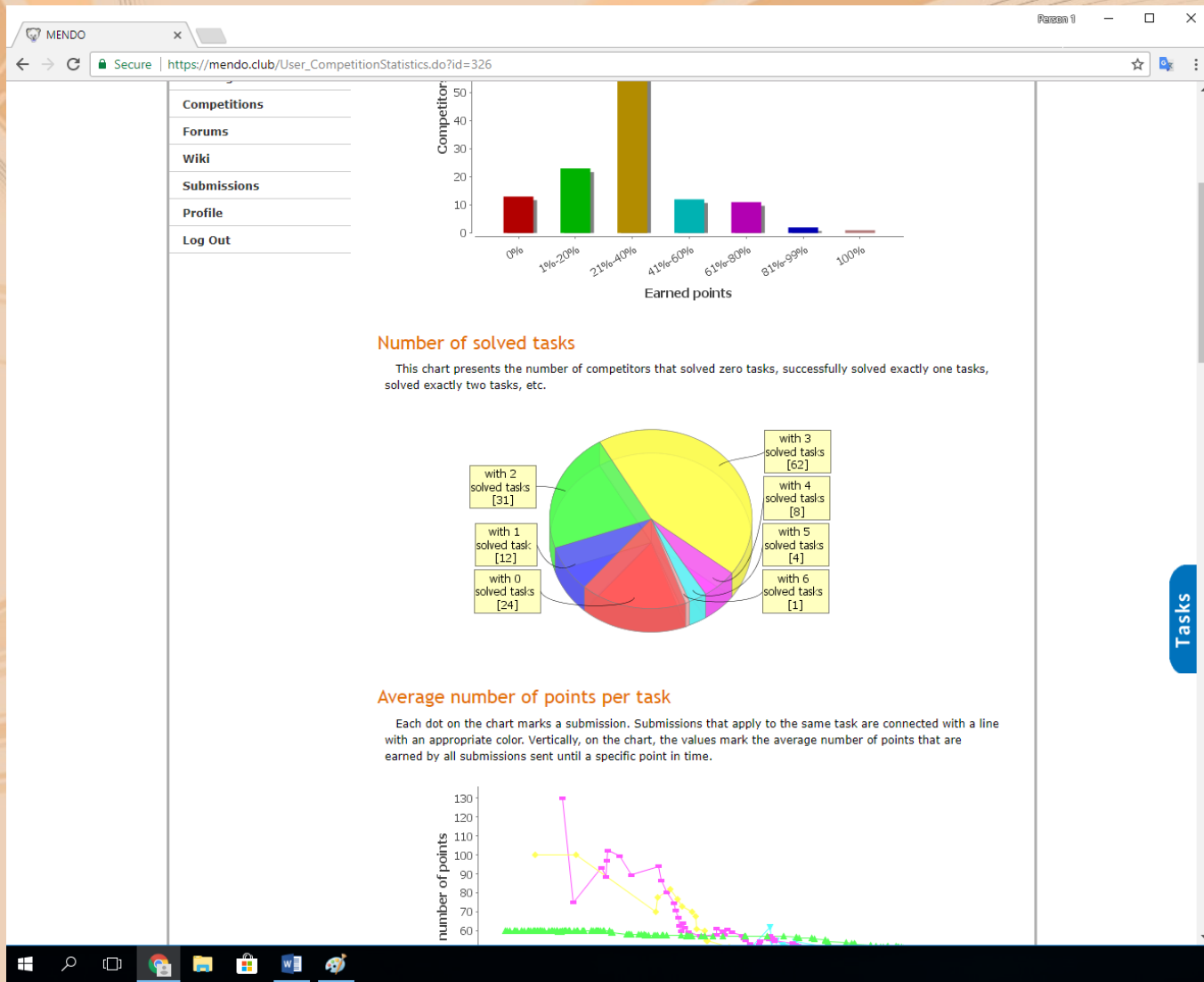
Main issue

How to track the work and the progress of our contestants?

Data and statistics

- For web applications, it's common to use a premade solution like Google Analytics to both collect data, visualize it, and provide various other insights.
- Developers insert a small piece of code on a website, and the data instantly becomes available and visible on a dashboard.
 - User and session counters, bounce rates, real-time reports, traffic sources, referrals, demographics, locations...
- Usually, other sources of data include server logs, the application's database (relational or non-relational), hosting providers' dashboards and APIs and more.
- Various free and commercial software solutions exist to parse this information, compare it side-by-side, and then visualize and group critical data.

Screen with contest statistics on MENDO



The Hero app

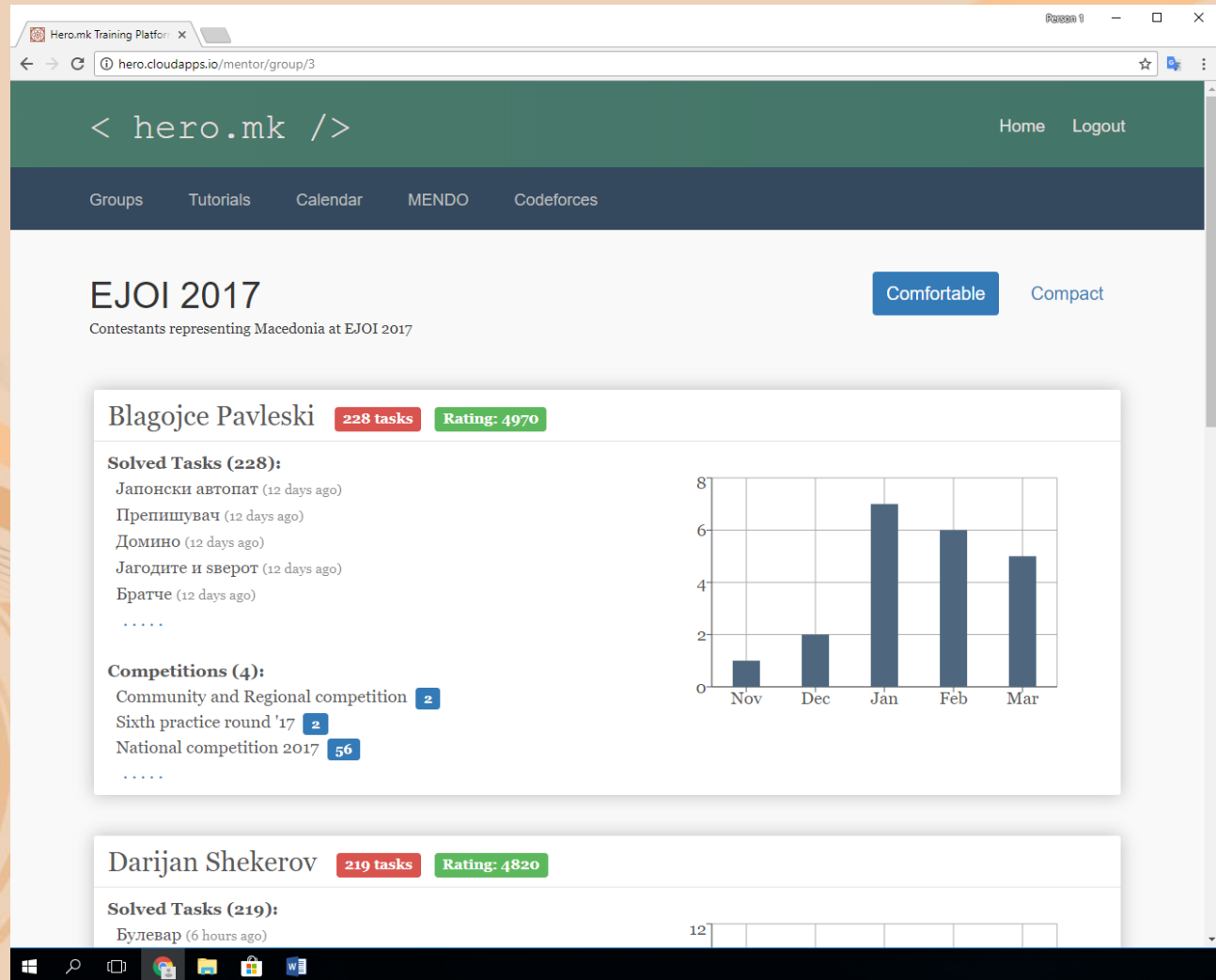
The Hero app is a software application that tracks, stores and visualizes that data, and which is currently used by several organizers and contestants in Macedonia.

Why do we need this?

- Organizers need to track contestants after the national cycle (in order to help them perform better at international competitions),
- Organizers should make sure a student that did a bad result at one competition isn't eliminated if his results at many other online systems are good, and
- Contestants want to learn more about the practice plans of students that performed better than them.

- Currently, the application tracks activity on the following systems:

- mendo.mk
- topcoder.com
- codeforces.com



- Hero can only be accessed by authorized users (students, teachers or organizers). New users can be added by administrators through the application. Because authorization is needed, all profiles and combined data is private and only visible from inside the application.

Second issue:

Are we any good at international competitions??

Achieving a good result at an International Olympiad

In our experience shows that several factors are important:

- good education(al system),*
- gift,*
- tradition,*
- competitive environment,*
- continuous work and*
- strong training.*

Country	Levels in the competition cycle	Number of 1 st level p.	Training of contestants	Financing
Serbia	Municipal, Regional, National, Serbian Olympiad in Informatics (SIO).	Over 1200 senior and around 750 junior contestants	Online tournaments (via the online judge system Petlja), preparations organized by some schools, training camp for the selected teams (JBOI/EJOI and BOI/IOI)	Before 2016, no financial support whatsoever for training camps, only travel costs for international Olympiads covered by Ministry of Education. Starting from 2016, a budget of 10 000 euros is allocated by the Ministry of Trade, Tourism and Telecommunications of Republic of Serbia.
Montenegro	School level competition, State competition.	Between 15 and 20	Training camp for the best contestants in the State competition	School competitions are organized and financed by schools; state competitions and training camp organized by the Examination Center of Montenegro, which also covers the travel costs for international Olympiads.
Slovenia	School level competition, State competition, Playoff competition for IOI/BOI team selection.	120 (plus 100 junior contestants)	Preparations (2 lecture cycles) for the best contestants in the State competition	Budget: 7 000 euros
Romania	Municipal Olympiad in Informatics (OMI), Country Olympiad in Informatics (OJI), National Olympiad in Informatics (ONI), Selection Contest for Junior and Senior National Training Team, First and Second training camp.	Around 4000 students	Two training camps (7 days each), online contests organized by Romanian websites such as infoarena.ro	All the activities are directed and financed by the Ministry of Education of Romania.

Country	Levels in the competition cycle	Number of 1 st level participants	Training of contestants	Financing
Bulgaria	Municipal, Regional, National Olympiad in Informatics, 4-5 additional competitions for the national (IOI/BOI/JBOI/EJOI) team selection.	More than 1000 students	Preparations for the selected teams for IOI/BOI – 2 camps (a 3-days and a 7-days camp)	Budget: 80 000 euros. There is a national project for financing by the Ministry of Education, but sometimes schools, sponsors or even parents participate financially. There are also other sources of financing as well, e.g. the “America for Bulgaria” foundation.
Turkey	First National Paper-Based Exam, Programming Contest, Team Selection Contest (IOI/BOI).	Approximately 1300 students	Summer School (2 weeks), Winter School (2 weeks), IOI camp (2 weeks)	Financing provided by the government agency TUBITAK. Budget: 40 000 US dollars.
Macedonia	School Qualification Competition, Regional and National Competition, National Olympiad, and (potentially) Selection Contests for International Competitions	Approximately 450 students	Sporadic summer schools (around 1 week)	Financing provided by sponsors of Computer Society of Macedonia. Budget: 8 000 euros.

Taylor, P.: Comparisons of the IMO and IOI. In: Olympiads in Informatics, Vol. 6. (2012).

“There are two possible ways of providing a premiership for countries. One would be ***to use every point won by the student*** (as IMO does), while the other, which I have seen done by Australian colleagues from other science Olympiads, is ***to use a medal count based on something like 3, 2 and 1 points for Gold, Silver and Bronze***”

Our approach: take into account the population of the countries in question

If you consider country A with population of ***a*** and country B with population of ***b***, then one should expect that out of the first ***n*** students in the ranking of the students from both countries, approx. **$N_a = (a * n) / (a + b)$** should be from country A and approx. **$C_b = (b * n) / (a + b)$** from country B, and this should stand for every ***n***, when the countries are equally strong.

For example, if A is a country with population of 2 000 000, and B is a country with population of 7 000 000, then for **$n=2$, $C_a=0.44$** and **$C_b=1.55$** , which means that from the first 2 students either both should be from country B or in rare occasions one from each country.

For **$n=4$, $C_a=0.88$** and **$C_b=3.11$** , which means that from the first 4 students either one should be from country A and 3 from country B or in very rare occasions all of them should be from country B.

For **$n=6$, $C_a=1.33$** and **$C_b=4.66$** , which means that from the first 6 students either one or rarely 2 should be from country A and 5 or rarely 4 from country B.

From the above example, and if we consider that at IOI every country participates with 4 contestants, for the particular 2 countries (A and B), if the country A has 1 student ranked in the first 4 or 5 students from the joined ranking list, then one may consider that these 2 countries have achieved similar results.

Every situation in which a student from country A is ranked higher than fourth place in the joined ranking gives “advantage” to the country A.

We believe that this approach is much more fair and precise, when used to compare 2 countries.

Although it cannot be efficiently used when the population of the countries is dramatically different (i.e. the ratio B/A or A/B is greater than 5) for a specific year, it becomes usable when comparing the countries over the period of more than one (consecutive) years, by putting the contestants from all years in a joined ranking list.

