

Handbook for EU Contestants

Petr Klán, Institute of Computer Science, Prague e-mail: pklan@cs.cas.cz, skype: petr.klan

Free download: <http://www.cs.cas.cz/pklan/soc/eucontesthandbook.pdf>

This handbook describes all steps of preparation for your EU Contest presentation. It gives the entire instructions how the participant of EU Contest is supposed to go ahead. It means from the moment of nomination of his project at the participating national contest up to the proper participation in EU Contest. Some genuine documents and experience of the several-year-activity in EU Contest are presented here. The handbook is written through the eyes of a student, whose work has been nominated for EU Contest. This student describes all the steps of preparation in his own project that he takes for EU Contest and he introduces various related examples.

1 On nomination of the project at national contest

The necessary assumption to be nominated for the EU Contest is *the first placing* at national contest. The latter is a science competition in participating European countries. It is associated with VIP person called the *national organizer*. National organizers represent the institution that is responsible for the organization of the national contest. A complete list of national organizers including contact information is on the web site

<http://ec.europa.eu/research/youngscientists/code/1-3-2.htm>

(1)

They are responsible for submitting the first placed projects selected by the respective national contest jury. However, additional aspects can be taken into account such as:

- Language skills of the contestant.
- Thematic relationship of his project with the general scientific categories.
- Time possibilities of the contestant in regard of the preparation that EU Contest requires.

A broader nomination according to well-established scientific categories such as mathematics, physics, informatics, chemistry, biology etc. has really proved, because it is good to have several alternates in reserve for the case that someone gives it up during the preparation.

It is usually true that the originality of the project, its performance and contribution have crucial impact in success at the contest competition. On the other side, practically all the EU Contest projects are original, well-made and bringing some contribution. They are sorted out through the screen of several hundreds up to thousands of projects, which participated in the national contests. It is possible to say, with certain exaggeration, that they are likely the same from the point of their evaluation. The situation is similar to searching for the singing „superstar”. Competitors, who take part in the final rounds, are able to sing almost for sure (they got short listed) and they will sing some hit. How to distinguish among them afterwards if a jury member wants to be objective and rational?

According to what is the project exactly evaluated? Jury members say that *the crucial point is how the EU Contestant is able to explain his work and which methodology he uses*. Largely it is a matter of placing. To some extent, it is a paradox, because speaking-well finalist with some average project shines in the eyes of jury more than genius, who is not able to express himself properly. Similarly, in the singing superstar mainly shine those, who communicate well and have an interesting performance than those who sing well “only”.

That’s why the verbal presentation of the project is so important. Jury members of the national contests confirm that after the meeting with the project documentation they had done some preliminary rate and afterwards verbal presentation they changed it in a deeper manner. That’s why for the EU Contest, the projects should be chosen, which are not only expertly good, but moreover, they fulfill additional criteria showed in Appendix 1: 7 rules for success projects.

2 I am nominated

My project is called “New Task for Human Intelligence Measuring”. It is attached to Appendix 4. I placed first at the national contest in the category of Mathematics. When presenting, I went by the 7 rules showed in Appendix 1 because:

1. *Project fits well in the scientific category.* Every jury member knows that human intelligence tests are spread very much. They are used by the companies, universities and individuals. Prestigious workplaces deal with the creating of these intelligence tests. Mathematicians, physicians or computer scientists try to define intelligence as some process. There is even a great field of artificial intelligence available.
2. *The title accurately says what the main point in this project is.* The project is absolutely and precisely defined. It combines something new with the known and exciting task.
3. *Project means the progress.* It is new. Nobody else has ever proposed such a test.
4. *Project is explained understandably.* When I use this task, I am able to test some stage of human intelligence. It is based on the table of numbers (matrix) and seeking symmetry in this table. Moreover, symmetry behaves like a natural phenomenon. It is possible to observe it both in animated and in unanimated nature. That’s why it is logical, that affects human intelligence as well. The faster the symmetry is found in a given task the higher the intelligence is.
5. *Project is consulted with a university expert.* He told me, which testing tasks exist already, how they relate to the intelligence rating, explained contemporary methodology of intelligence measuring and helped to formulate contribution of my project. He suggested certain improvement at the same time. After consultations with him I really gained good track of this scientific field.
6. *Project is connected to well-structured verbal presentation.* I said which testing tasks had existed so far, which idea I came up with, what justified my research and what was the goal of my project. Furthermore, I described which steps I took while suggesting the testing task and what the task consists of. I introduced some calculations. In the conclusion I compared the suggested testing task with another tasks. I also said and afterwards showed advantages and contributions of the new testing task. There was wide discussion with jury members. They

appreciated the original idea. I had to answer numerous questions regarding my procedure and results as well. I think I acted convincingly thanks to many experimental results which I could introduce.

7. *Project points to some passionate mathematician.* Over the mathematical problem or good mathematical book I am able to spend the night. When I talk to my friends, after a moment I put my talks to mathematics. When we sit in the sweetshop at some ice cream, first of all I talk about which problem I am dealing with. I fall asleep and wake in the morning with that problem in mind. The worst thing is when I date with a girl. I do not have a lot of other topics which I could talk about. Luckily the girls I know are familiar with that and sometimes I feel that talking on mathematics makes them happy. But I prefer talking to my granny most of all. She always cooks me something delicious and I keep on talking and talking and my granny listens to. She even does not ask much and it makes me so happy while talking.

Now the main task is to get ready properly for the EU Contest. My school consultant told me that I have had a good chance to succeed because I have obtained some original results. He will lead me expertly. I would like to cultivate a high competitive “flower” related to my project similar to the illustrative Fig. 1 and not to spoil the preparation. Every improvement is definitely worth doing. First of all I will find out some information available. I will have a look at associated WWW sites. The program will probably be stuffed.



Figure 1: To cultivate the high competitive “flower” requires certain attempts and special leading (source: J. Toman, 1980: How to perfect myself. Svoboda Prague)

3 The EU Contest

I found a lot of information about EU Contest on WWW sites. Only to be acquainted with this. I tried to pick the essential ones at least. I also found out that to some extent, the EU Contest evokes “the European Olympics”. I felt a little bit pressured whether my project would succeed in such competition.

The full title of EU Contest is *The European Union Contest for Young Scientists*. It is the most prestigious competition in the Europe. It is considered the greatest European scientific

celebration of scientists-teenagers. It is always held in the middle of September in some of the European countries with the participation of more than 80 projects from European and Associated countries, the European Schools, and some guest countries. The EU Contest was established in 1989. The first EU Contest was in Bruxelles (see Fig. 2).



Figure 2: The first EU Contest (source: <http://ec.europa.eu/research/youngscientists/code/2-3-1.htm>).

Each country can send up to three projects of the national contest without distinguishing between individual projects or team ones. The EU Contest has become a part of broader program of the EU called *Improving Human Potential* (IHP). Some detailed information on the EU contest is available on the website europa.eu.int/comm/research/youngscientists/. The work does not compete according to science categories. Participated countries do not need to send up the whole number of projects.

The logo of the EU Contest is shown in Fig. 3.



Figure 3: The logo of the Intel ISEF (source: europa.eu.int/comm/research/youngscientists/).

I am searching for some more information. For instance, was anybody there from our country? I found out an article published in the most-read newspaper in our country which is called “High school-students succeeded in science. Follow them”. It is introduced in Appendix 2. I imagined what exactly expects me and figured out that it is possible to succeed in such a great scientific party as well.

My head was little spinning around from that information, I did not know where exactly to start. I am trying to write an e-mail to national organizer, which I found out in our country on the WWW site (1). I simply introduced, that I found some information about the EU Contest on the Web and do not know where to start. And I also asked what he would want from me and what will be ensured by him. The national organizer answered right away and sent me a procedure of the preparation. I got one step further again.

4 Preparation steps

The preparative steps for the EU Contest include:

1. *Administrative part* – sending and proper filling of needed documents. The national organizer will guide me through this. He knows the rules of the EU Contest and warns me about the parts of the project, which I have to have according to the rules.
2. *Scientific part* – writing abstract (scientific summary), scientific paper (straightforward project description), preparation for the whole presentation and so on. The abstract and the paper are sent beforehand as the typewritten presentation. The use of English language is taken for granted. The national organizer recommended me some *expert adviser*. It will be possible to consult with him through the preparation.

Honestly, it did not say too much to me, because I have not sensed what the abstract of the project was (probably some kind of annotation) and how to write it. Similarly, the same is with the scientific paper. So I will ask my expert adviser. English is also about to give me some difficulties. At least I know there is no need to care about the organization too much. I also hesitate, where to direct my work, either in “*Mathematical Sciences*” or in “*Computer Science*”.

Will I lecture on the project anywhere there? No, the national organizer answered to me. Each project has a single exhibition stand, where the contestant displays information about his project. During the days of the contest the jury members as “visitors” come separately up to the stands and the finalists introduce their project to them and they answer their questions at the same time. Everything has given rules in advance (including the size of the stands) and the precise time frame as well.

I really do not know how I am about to build the exhibition stand. I am thinking over, whether we have a domestic handyman. The national organizer suggests me the thing, which I intuitively feel like immensely useful. The national organizer organizes one-day Saturday meeting focused on both the preparation of administrative things and the preparation of scientific part. All the things connected with the preparation for the EU Contest are about to talk through together here. Moreover, the tight time schedule of the preparation is set in order not to have time lapses. The contestants will see what expects them and if they are strong enough to pack it up at all. They also get to know each other in advance and mutual exchange of experience is possible. The meeting will be held at a time, when there is still relatively enough time for the preparation. The contestants are asked to prepare their document proposals for the administrative part and also for the scientific part (abstract, paper) in advance. Then the national organizer will help them to prepare necessary forms for the assembly and the expert adviser the abstract and the paper so that to fit in the conventions and the rules of the EU Contest.

So it is time to take up working on the abstract of the project. I am little browsing the Internet and I am writing an e-mail to my expert adviser at the same time to let me know, how to write such things and how to realize the exhibition stand. The expert adviser responds to me immediately and he sends the instructions, how to write the abstract. He also writes that after preparing the abstract, he will talk through it with some related scientific expert whether the abstract is properly scientific and understandable written. He stimulates me and suggests that some specific journal or magazine could help with the preparation of the presentation in stand. They certainly have a graphic studio and they would help and I could publish my project there. Other possibility is to work as a “reporter” for them, to check out the EU Contest projects in my category and report, which new things I exactly saw there. I have to say that the latter possibility of being the reporter would fairly interest me and enjoy me. The expert adviser offers to help with the choice of the specific journal or magazine and he has offered to introduce me or I can try it on my own. I will see.

He also sends me one sample abstract (it is short, so I insert it at once in Fig. 4) and the rules, how to write scientific journal papers (paper is longer than the abstract, it typically contains 6 pages, maximum 10 pages for the EU Contest + 10 pages of Illustrations). The sample abstract is from finalist, who won the prize in an international scientific competition.

He asked me to prepare a first concept of the abstract and advises me to write it in the way I feel and that he will have a look at it and he will help me to move it further. Both abstract and scientific paper is very important document. The abstract is the first, which members of jury come across and the scientific paper will help to get all the results together, to compare them with what has already been done in the field and also to report them to the professional public. That's why it is important to pay attention to them and mainly of all to write them comprehensibly and understandably.

After all that I know at this moment, I would not mainly be the finalist who copies some real scientist. It could tempt me to present rather his ideas than my own ones. Some slight special “cultivating” support might be effective, which forwards me. But most of all I want to be me in the EU Contest.

While thinking about it, the journal which helps with the preparation of the presentation stand in exchange for writing about my project there, it really seems like a good idea. Even the school I visit could help me. I represent it exactly. I will try to come to my class teacher and ask her to make some arrangements. She could ask some known people for the participation who will support my project (e.g. the school director). I could present my work to the other classes to train its verbal presentation. The town mayor also could show an interest, I could also write into the local newspapers. I am sure that my parents will help according to their possibilities as well.

LANs without Network Cards

Nowadays, computer networks are becoming more and more important in communication and computing. Most computers presently available on the market can be provided with some specific networking equipment allowing connection to a computer network, namely in the form of an interfacing card. However, if schools and offices often have many computers as potential candidates for networking, they will need a fair amount of money to purchase interfacing cards for creating networks. Moreover, there may be some troubles when installing cards into older computers or in many notebooks.

In this work it is suggested to use instead of network cards the existing serial and parallel interfaces which are standards in all computers. A software for emulating functions of a network card is proposed, thereby building a fully functional computer network without the need for any additional hardware aside from the necessary cabling.

Since the goal is to interconnect more than two computers using the current serial and parallel interfaces, it is necessary to have two individual simulation programs, a hardware driver and a router. The hardware driver controls serial or parallel ports and emulates network cards. The router forwards packets among network computers via standard parallel and serial cables.

The benefit of this work is in a substantially reduced cost when introducing computer networks. Schools, offices and homes can take advantage of this work in order to connect computers into LANs and to share Internet services, application software, databases and printers.

Figure 4: The sample abstract (source: the author).

5 I am creating the abstract

I would never sense, how much work is connected with that. The abstract is exactly annotation of the project in several paragraphs. Even if it is a short thing, it takes much energy and time. Not to look like diy (do it yourself) abstract. Clearly, it must be created by me however written properly. When imagining, that a member of jury reads dozens more similar abstracts, it should attract. So look at what I have received from my expert adviser.

The abstract or a one page scientific summary sent to EU Contest (approximately 250 words, whereas each indefinite article or conjunction is considered a word) is a brief characteristics of the project. It contains some title, the name of the author and the body. For the title hold the recommendations mentioned above. The body of the abstract typically consists of 4 paragraphs arranged from not too long and simply readable sentences. The following table shows a frame content of these paragraphs.

1st paragraph	Present state, motivation for proposed project (Why?)
2nd paragraph	Description of solution, methods, experiments (How?)
3rd paragraph	Most important results (What?)
4th paragraph	Contribution, progress, novelty, the use of results (For what?)

It is possible to say it in a more specific way like this:

1. The opening sentences related to the studied problem, why it is important, definition of the goal of the project, the reasons for that goal.
2. Several sentences about the method proposed to reach the goal with details left out.
3. The summary of the achieved key results, not the details about the results, neither tables nor graphs are used.
4. The conclusions from the results, possible applications of the results, possible extension of results or their generalization, contribution of the project, benefits for society.

The expert adviser also draws my attention to the sample abstract on the Web address www.societyforscience.org/isef/student/abstract.asp. So I got down to work immediately. In the Appendix 3 I introduce, how I realized the abstract. It is for my project on the intelligence measuring. I tried to make it understandable, even if it looks mathematically. It is such a toy, but you might read it enthusiastically. For sure I myself also read it for hundred times.

Now I would get down to working on the paper or a straightforward description of the project. I am stimulated the expert adviser complimented my abstract. I gather some information how to write a scientific paper. The basic structure of such a paper, in the way that the expert adviser sent it to me, I introduce in the following chapter. But now I am “illuminated” how to write such a paper.

6 I am writing scientific paper

It is worse situation with the paper than with the abstract. Although it contains the abstract as well, which is shorter than that above, the paper is much longer. However, it will probably be better because of the possibility to introduce more results here, to put some figures in and in general to describe my results in detail. I would like to introduce some mathematical relationships there as well, to see how it is professionally performed.

The paper is a standard form of scientific communication. It has its usual scheme. In English terminology this scheme is called IMRAD - Introduction, Materials and Methods, Results and Discussion. The following table introduces more about individual parts of the paper. At present the best computer format to prepare such a paper is in the PDF (Portable Data File) for Acrobat Reader. But I am sure it does not surprise anybody who deals a little bit with the computers.

Notice what else might occur in a paper: mathematical relations, formulas, references, schemes/tables, flowcharts, paintings/drawings, figures, diagrams/graphs, photos.

Title	Up to 10 words
Author (authors)	Name, address, e-mail

Abstract	Brief characteristics, 50-100 words
Keywords	Characteristic words, word phrases (10 maximum)
Introduction	Introduction to the problem Present state Citation of references Brief description of solution Why – innovation, contribution, justification
Material and methods	Definition of the problem Material, methods and experiments used Solution, results Examples, applications
Conclusion	Discussion Summary of results Comparison with the present state Contribution, innovation
References	List of references
Appendix	Instants complicated for reading Software listings Description of the software Proofs of theorems Detailed schemes

I am determined to try my own paper. I went to the library and borrowed some issues of a scientific journal that the expert adviser recommended me. To have a look, how the paper really looks like. I was also browsing „Web of Science“ and „Current Contents“ on the ISI Web of knowledge, (<http://portal.isiknowledge.com>) and searched for the related papers, to make sure that my results are really original and my project has a justification. I went through the searched results, red through several papers in the journal and felt being ready for getting down to write. How the paper resulted in, you kind reader are able to read in the Appendix 4. I even do not know how many times I was rewritten it. In the evening I liked it and in the morning I fell out of liking. The expert adviser had the range of constructive suggestions.

7 I am on the preparation meeting

Winter culminates in our country and I am going to the preparative one-day meeting promised by the national organizer. I carry the abstract and paper proposal with me. I talked through it with my school consultant moreover my relatives helped me with English. In the warm lecture hall of academic institution, where the meeting is held, the national organizer and the expert adviser welcome me. First time I am meeting them personally. So far I have merely known them through the electronic mail and internet phone. The video is playing from the last year of EU Contest. We browse a photo-gallery of several presentations right from the EU Contest (see the Appendix 5). For the image, how the presentation stands look like and also for seeing of their amazing diversity.

We are obtaining basics about EU Contest. How the journey, program, presentations look like. Various trips and social events are also part of this contest. That's why I enclose a record from one EU Contest party taken place in Dublin that I received at the meeting. There is detailed description of the program day by day. I recommend reading it. There are even things, which in fact I would not expect. For example, the possibility to exchange pins during the whole contest party. It is a good way how to get acquainted with other people through the pins. You say "Have you a pin" and the conversation can get under way, with the girls as well. That sounds good. I would like to find abroad a similar researcher as I am. For example we could do something together or to visit one another during the holidays.

The Appendix 6 introduces the record mentioned above. The first part of meeting is over with that. I would like to look a little bit about the countryside of the town in which the EU Contest will take place and get to know with local science as well.

The expert adviser takes a seat on one end of the lecture hall, the national organizer on the other one. We join them individually. With the national organizer we are talking through organizational matters. We are mainly filling in various forms of application and we are arranging until when the application needs to be sent. We will meet a few days before the date of sending and we will do everything through Internet. I do not have to care about any payments. Then I join the expert adviser and we are talking through the abstract. The expert adviser says his opinion, we agree with the some corrections. Similarly, it is with the paper. It is important to keep given structure. Jury members are used to the latter and something else makes them problems and it may decrease the project rating.

When we sequentially change with other contestants, furthermore, we talk about the plan for another preparation. We focus on perfecting the abstracts. We also start thinking about the presentations. There is enough inspiration from the EU Contest photos. In the afternoon we finish and I have my mind full of plans. I wonder how I catch up with all that, school, EU Contest. But the contest is a great opportunity. It is worth to put some time and effort into it. Moreover, we received basic information, how to make presentations. They are involved in the following part. Basically, the posters are printed in order to stick in the exhibition stands. The journal could provide printing according to the pattern, which I would prepare. It is also good, if there is something practical, I will try to make some model of matrix for my project. I consider writing specific software of some medially-oriented task for visitors of my project. There are so many plans, the question is who is about to do it.

8 I am creating exhibition stand

First I summarize what I have learned about the presentation from my expert adviser and from the Internet. In spite of diversity and imaginativeness of the exhibition stands it is possible to observe their certain structuring. It can be possible to encounter with the opinion, that what is scientific is also complicated. It cannot be like this with the presentation and the presentation is about to persuade, that science can be done and presented in the understandable way. It is about to look, that among the numerous stands it should attract attention of jury members and other visitors.

Each project has its own exhibition stand in the EU Contest. It consists of the table of given height (75cm maximum) as a base including electricity. Some model, computer etc. can be

put upon it. Each stand has the back board and both side boards of given sizes. That's why three-armed self-supporting folding constructions are still very popular, which are put together during the transport. While presenting, they are spread and put up. The maximum sizes of the exhibition stand are not allowed to exceed 103cm to the depth, 203cm to the width and 175cm to the height.

Particularly the title of the project, facts, figures, describing statistics, statements of the authorities, illustrative stories, definitions, humor, laws and so on are placed into the exhibition stands. All in upper cases for a good legibility, briefly, with emphasis on the main features of verbal presentation, balanced at sight (eye-attracting) and reasonably colored (color supports meaning).

Especially the logical arrangement of the exhibition stand, graphs and photos support the verbal presentation. They gain in conclusiveness. The following table brings the tips for such an optimal organization:

Board	Contents
Left side	Problem, goals
Back	The title above, research below, results
Right side	Contribution, conclusions
Base	Computer, real model, one-page abstract (for handing out, it is provided by bz organizers), detailed documentation, published papers etc.

In the part titled

Problem, the problem, which the project is solving, is specified clearly and understandably.

Goals, the goals of the project are formulated.

Research, the method, experiment or procedure are presented, which were used to achieve the goals. In this part it is appropriate to introduce carefully the main performed steps and also the data examples acquired from the measuring devices.

Results, there is data evaluation acquired from the research for example that data is put into the graphs. New results are formulated.

Contribution, contribution and practical meaning of results or new observations for the science and society are claimed.

Conclusions, achieved results are compared to the declared goals and possible new horizons and future goals are suggested.

In Fig. 5 there is an example of such well performed exhibition stand. The stand was constantly in the center of attention of visitors, moreover, the finalist made it more special with the occasional playing the displayed exhibits. Acoustics of Tibetan bowls was the topic of this project. From Fig. 5 and possibly also from the photo-gallery of the Appendix 5 we can get the basic view, how such the exhibition stand is. In the EU Contest they stand one next to the other in the longer lines according to the participating countries. In the contest there are ideally two days reserved to build the stands. In fact, one day and half, because of the approval process to have exhibition stand without defects, being safe, having no exceed sizes etc. needs to be caught up. That's why the good preparation from home is recommended beforehand, to only complete or glue it together there. It is also important do not have the construction heavy and spacious, it will be carried by plane and there could be some trouble.



Figure 5: The example of the exhibition stand (source: public CD from EU Contest in Moscow).

Before I get down to work on the exhibition stand posters, I will outline schematically, how the presentation could look. In Fig. 6 there is the final proposal after 1-week of thinking about. I will build like this and I will attend the fair with that. After the consultation with the selected journal there is no problem for them to produce the suitable posters in their graphic studio. I will put the model of symmetric matrix on the table (see Fig. 6). I will construct some wooden frame. I will bore holes from the side and pull through the wires. I will pull bored ping-pong balls from both sides on them, which I will mark with the numbers. They will be scraping, so that it will not be hard to change them.

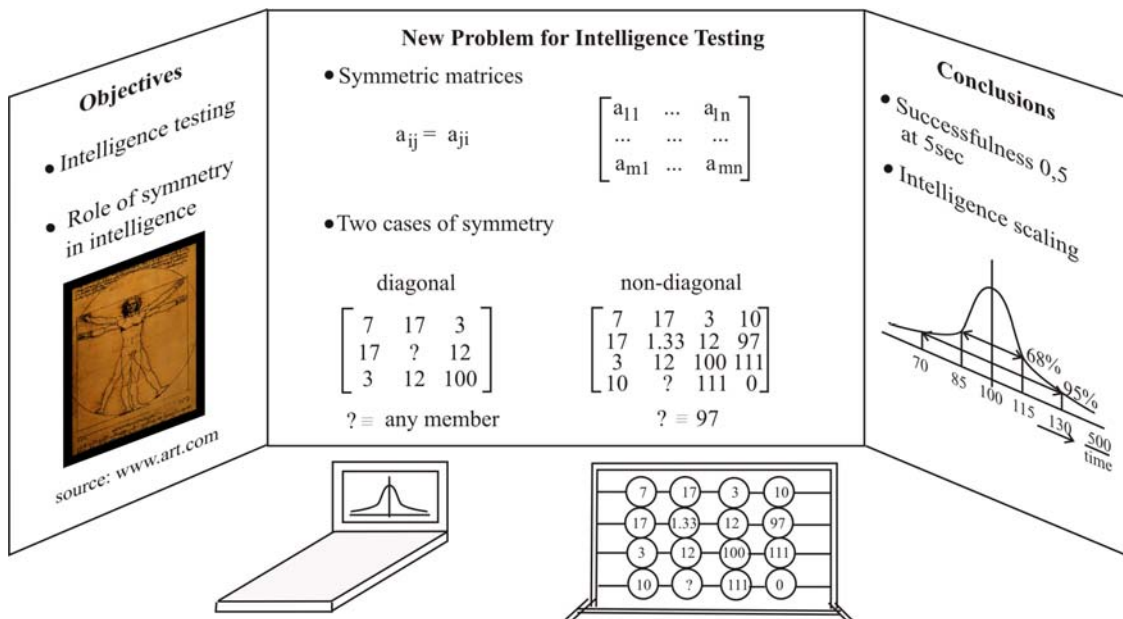


Figure 6: Exhibition stand of the project (source: the author)

9 How to discuss the project with jury members

The contest will be coming soon. My posters are ready according to the Fig. 6. I was talking it through continuously with the expert adviser, school consultant of my project and the others. I can see the competitive days near at hand, when I face my stand and the jury members are approaching. „What to say to them“, and how to organize the verbal presentation has already been mentioned in the Appendix 1. The discussion of the project in face of a jury member belongs to the part of the presentation, which apparently tells most about success. That's why it is useful to focus on “How to say it” as well. When preparing the verbal presentation it is basically good to take procedure mentioned in the Appendix 7 into consideration.

I introduce the real story mentioned by the expert adviser about that the verbal presentation really matters most. Recall that there are excellent projects nominated for the EU Contest. On the other side it can be seen that the verbal presentation of the high quality and the art of a good communication with members of jury can conclude to a “surprise”.

There were two individual projects denoted simply by *A* and *B*. The project *A* demonstrably had higher scientific value than the project *B*. It certainly influenced the placing at the national contest, where the project *A* placed first and the project *B* placed second. Though, it was on the contrary in the international competition. While the project *B* received one of the grand awards in this high competition (also the fourth place is huge success in this competition), the work *A* did not win any prize. Why the juries has evaluated differently? In the EU Contest the purpose of the entire project is evaluated complex. It means its scientific value, the real usage, the need or justification to solve this problem, the attempt to finalize the solving up to the application. And it was clearly seen, that while the author of the project *A* concentrated on the scientific value of his project (though high) only, the author of the project *B* also highlighted the other aspects of his project while presenting. And it probably basically signified the placing. If then the author of the project *A* received grades for example (in analogy with figure skating) for scientific value, the applicability, the need and finalizing 10,2,2,2 and the author of the project *B* 5,5,5,5, the simple arithmetic mean is still 4 in the former and in the latter 5. In other words, the project *B* was rated better.

10 On a chance to win?

Following evaluation of all competing projects the jury selects outstanding projects to receive prizes. Prizes take form of non-monetary or monetary awards. The latter can include:

- Up to 3 first prizes worth 5.000 EUR each;
- Up to 3 second prizes worth 3.000 EUR each;
- Up to 3 third prizes worth 1.500 EUR each.

It is quite interesting. My notebook is too old From approximately 80 projects, the probability of obtaining some prize is about 0.11.

The Appendix 8 summarizes some reflections and observations about, why the finalists won or not some prizes. Let them be some inspiration to succeed in the international contests. Good luck for that. And here I close my saying. That is to say, I am leaving for the EU Contest. I tried to introduce here all the aspects of my preparation. I really tried to prepare as best I could. Most of the steps I had to search hard somewhere or to consult. That's why I

wrote this handbook, to make it easier for my followers. So stick up for me, I will also keep my fingers crossed for you.

Acknowledgements

The author gratefully acknowledge the support of Institute of Computer Science and National Children and Youth Institute of Ministry of Education, Youth and Sports of the Czech Republic and in particular Ing. Miroslava Fatkova. The author was also inspired by the Rules of the EU Contest on http://ec.europa.eu/research/youngscientists/pdf/ysc_guidelines_en.pdf.

Appendix 1: 7 rules for success projects

1. *They fit well in the scientific category.* Jury members mostly are specialists representing one scientific category. An inter-category project might cause the decrease of evaluation, because contribution in other category does not have to be fairly clear them. It also is fine to fits well in the context of the known method or theory. The jury members are familiar with the known results or methods and it is a good way to take use of them both in the work and in the verbal presentation. For example, the project is somehow to extend results known in the literature. The jury member exactly gets the direction, which way the project takes. That is the assumption leading to ability to explain the project.

2. *Their title is cogent.* To say simply the title is brief, precise and pregnant. The title should be a view-tower of the entire work such as in Fig. 1: interesting, attracting attention, luring to view. The jury member should glance over the project easily from the title. As for the way of choosing the title, we comment on some titles of the international projects (Intel ISEF) - absolute winners in the category of Mathematics (see Grand Awards Winners on <http://www.societyforscience.org/isef/results/index.asp>).



Figure 1: Title should be a view-tower of the entire work (*Terežka* view-tower, the Czech Republic, source: the author)

“*C-Transformation Introduction of a New Geometric Transformation*” The word “new” is the key word here, which promises, that the work solves or brings something new. The words

such as “new”, “novel” and “improved” are universally suited for the use in the titles, if they really characterize the project. It means that this project brings some new method, sight, algorithm etc. It is concerned with the innovative or innovatory work. It is significant to present the project in this manner as well. New is always the object of enhanced interest not only from the side of the jury members.

“Determinantal Sequences” This title is ideal in the sense that defines exactly certain methodology. Each jury member will know immediately, where to put the project in. Now it is already very easy for the finalist to show and for the jury member to judge, whether the project is “only” exploration of known facts or brings something new. This kind of projects belongs to those, which are both presented and judged most easily, because there is no need of any deeper introduction.

“Rainbow Ramsey Theory: Rainbow Arithmetic Progressions and Anti-Ramsey Results” This is the classical case of so called stuffed title. The project titled like this would almost certainly place, even if the finalist hesitated elsewhere. On one side it is not concerned in certain part of theory as in the previous case, but directly with the entire theory. Progress is straight mentioned here and together with “anti” results. It is basically combination of previous two types of titles in one. Progress can be understood as a synonym introducing something new and possible results hold straight for the entire theory. But not just the results, also “anti” results, which is again taken for meaningful positive, when the finalist proves, that something in given theory does not hold true.

“Continued Fractions of Quadratic Laurent Series” It is referred to the title delivering combination of two specific topics (Continued Fractions and Quadratic Laurent Series). It is related to another possibility, how to announce creation of something new. The point is that a combination of current things can promise something new. It is again related to easily “readable” type of the title, because the jury members generally know something about combination of current theories or topics or methods or they imagine what it is to expect from such combination. Instantly, a new horizon for discussion is about to open here.

3. *They contribute or they mean progress for given category or society.* It is good to describe contribution or progress right in the title of the project (see mentioned titles above). Every possible contribution is good to find and also highlight or present. The project then gains certain credit in the eyes of the jury. It gets importance, why it was actually carried out and that it is not „work for work“.

4. *They are explained comprehensibly.* Both good comprehensibility of verbal presentation and good English are great positive. At the beginning of the verbal presentation the finalist introduces his project to the jury member about 3-5 minutes. It is literally tragedy, when he feels touched that the jury member possibly does not understand eventually the presentation is not intelligible to the jury member. In any case, it is therefore good to be prepared for the feeling of success or failure about the meeting with the jury member and not to give “fatal” importance to it, because in a while another jury member comes and it is necessary to present for 100 percents (see Fig. 2)



Figure2: The finalists are explaining project to the jury members (source: www.eucontest.hu).

5. *They were consulted by an academic or industrial expert.* He has necessary view of theory and practice and is able to coordinate the project well and to introduce it to the current category. He draws attention to assets and weak points of proposed solution and he can help with preparation for the fair. After that the finalist generally makes better in the related methodology.

6. *They have well-structured verbal presentation.* Jury members are used to established schemas and patterns. Any deflection means a possible loss in their evaluation or possible misunderstanding. It follows that the finalists are often rather helpless, if they come into the conventional environment of the scientific results presentation. Even if they get some base by the participation in the affiliated fair, it is good to cultivate them further, because the jury members consider cultivated presentation of the results as the base and every lapse from the established pattern can entail lower evaluation.

7. *They do not calculate with success beforehand.* The jury generally recognize very rapidly, whether the project has been done with enthusiasm for work or with calculation for success. The finalist excited for his work is in this case highly welcome.

The 7 points mentioned above form 7 aspects to improve the participation in the EU Contest. In doing so they are attached to each other. It is like the moving nativity scene shown in Fig 3. Single element pieces are firmly synchronized here through one another. If one of them misses, the pieces will move, but everybody sees that there is something wrong with it. In the fair the jury also reveals easily offences against conventions and established rules. That's why it is always better for the finalist to shine with his or her originality, but of course on behalf of the established rules.



Figure 3: Improvement of the participation in the fair is a set of connected elements (Nativity scene, Museum of Karlstejn, the Czech Republic, source: Iso Wyrsh, with permission)

Let's illustrate the use of the rules mentioned above by using an example of the possibly winning project. An author has finished the project titled "*The new electromechanical model of Watt's regulator*". In Fig. 4 there is a photo of the model. The author has applied 7 rules mentioned above for his project.

1. *Project fits well in the engineering category.* Each jury member knows that real models intended for lab-experiments are part of the well introduced engineering category. I felt good when presenting, since I said that the goal of the project had been construct a new model and mentioned lab-models which are currently used in labs.

2. *The title accurately says what the project is dealt with.* The project is defined well by the title. It is obvious at first view, what the topic of the project is and where to put it.

3. *Project gives progress.* It is new and nobody else has ever proposed such a model.

4. *Project is explained understandably.* Watt's regulator was used for locomotive steam engines. It was attached to the rotating wheels. Its task was to keep the speed of the locomotive constant as good as possible. It worked in the way that when the locomotive speed went up, axle base of the governor arms increased by centrifugal force. The piston-rod attached to the governor arms turned down steam supply and the locomotive slowed down. On the contrary, lower speed meant lower centrifugal force. Axle base was decreased and the piston-rod was moving in the opposite direction. It opened steam supply. There was more steam in the machine and the steam locomotive accelerated. So let's acknowledge that it is understandable.

5. *Project is consulted with the university expert.* He told me which models have already existed, explained the methodology of mechanical models and helped to formulate contribution of my project. He also suggested tiny corrections. After having consultations with him I really got the good view to this scientific category.

6. *Project has well-structured verbal presentation.* I introduced, which models have existed so far, which idea is leading and what the goal of the work is. Furthermore, I described, which parts the model is consisted of and which development steps were used. Some calculations are introduced. In the conclusion, I compared the model with the other models. I clearly explained and showed advantages and qualities of the model.

7. *I am a passionate designer.* I also invested some money in the model. I was making them by snacks sale which were prepared by my mum. But do not say it to her she would certainly be upset, because she prepared the snacks so thoroughly early in the morning. And my friends loved them (even such, that I had some waiting list and I could raise the price as well).



Figure 4: The electromechanical model of Watt's regulator (source: the author).

Appendix 2: High school students succeeded in science. Follow them.

One first, one second and two fourth positions were occupied by our students in the international fairs.

The view that a successful scientist has at least three academic degrees and spends all days in the lab is not quite accurate. Even young high school students might succeed in the world's scientific category. Having a good idea is enough and not to keep it to oneself.

High school students probably do not believe, that the school theme which give them some pleasure and in which they take more interest, can bring them up to the community of the Nobel Prize laureates. However, some of our students have succeeded by this way. This year six students from secondary schools participated in international fairs Intel ISEF and EU Contest. At the end of the entire five-day-competitive party four of our secondary school students were awarded in two cases by the fourth and in one case by the first place and in one case by the second place during monumental grand award ceremonies with participation of scientists and the Nobel Prize laureates. If we consider that in scientific categories there may compete about eighty up to one hundred of projects, it is a matter of real success.

How exactly to attain to such a placing? First of all it requires having an idea. For example, to think of how much Geography has changed since the days of the ancient maps, which way to improve mathematic graphs or why and how to fight against fungous diseases of plants. Then you have to send up your project to national contest, to be nominated in this contest and you can set out for Intel ISEF or EU Contest.

The special thing about the contests is, that instead of writing some extensive work you are about to prepare a presentation, which you vindicate orally afterwards. The presentation is possible to liken to some exhibition stand. Then the jury members and other visitors walk around and finalists introduce their results to them. They both show the results displayed on the presentation boards and they explain, what every result means. If we take into account, that you have to present your project in a foreign language to the jury, it is recommended to have both special knowledge about the project and some language skills. English with its vocabulary related to a given scientific category comes in handy, the finalists who are not able to make themselves understood in English can ask for an interpreter.

Young scientists have to spend two main days of the contests standing at their exhibition stands which are arranged in the endless lines in huge exhibition halls. On the first day the exhibition hall is open for the finalists, who are at their presentation stands and the jury members who walk around them individually. Each of the jury members is interested in what the work consists of and he asks questions. When presenting the work, an emphasis is mainly put on clear and understandable formulation of goals, used scientific methods, the results and contribution of the project for the society. It is considered that every work is visited by five up to six jury members in average. The second day the students' projects in the exhibition hall are accessible to public. The neighboring schools and parents with their children particularly come to meet the finalists' projects and finalists answer their questions. The goal of the public day is to find out whether the finalists are able to explain the principle of the project understandably and briefly and its contribution to outsiders.

Appendix 3: What abstract I created

New Task for Human Intelligence Measuring

My name

My school address

Intelligence measuring is a part of many tenders for attractive leading functions in the major world companies. Intelligence is perceived here as a set of dispositions to learn and solve problems. It is measured by the specialized tests which are taken by applicants. However, they do not contain the questions focused on symmetry observations that are the one of the essential feature of nature. These observations have possibility of predicting much about human intelligence. That's why this project analyses the task of symmetry in human intelligence and on its base it proposes new method for intelligence measuring.

The proposed method works with symmetric matrices. It makes use of basic feature of symmetric matrices that is the matrix symmetry according to its diagonal. The task of the tested applicant is to distinguish symmetry and its usage to complete the missing matrix elements. In doing so, two cases are distinguished. The missing element lies either on the main matrix diagonal or beyond it.

The achieved results show, that intelligence measuring by using the proposed method is basically more precise than by using the known methods up to now. It is also shown that time necessary for testing can be reduced up to half. In doing so, symmetric matrices are programmed well on the computers. In such way the testing tasks can be graphically very schematic.

If the proposed method was tested by the firms, specialized in intelligence measuring, they could test more applicants during the same time. It would bring them greater flexibility when testing and it would save financial costs. Moreover, it was done with essentially more precise results. The applicants will meet requirements of world companies better.

Appendix 4: What paper I created

New Task for Human Intelligence Measuring

My name

My school address

Abstract: *Intelligence is perceived as a set of dispositions to learn and solve problems. We can deduce about intelligence from the degree of acquired education and from success in the occupation. If we need more precise evaluation, we use sets of specific testing tasks. This paper is concerned with developing the original testing task. It originates from symmetry observing, that is one of the fundamental feature of nature. The paper analyses the proposed symmetry task in details and also the possibilities of its solving and evaluating.*

Key words: intelligence measuring, testing task and symmetry.

1. Introduction

Human intelligence measuring is a part of many tenders for attractive leading functions in the major world companies. In literature [1] there is a typical test introduced, which is used for intelligence measuring. It is a collection of several testing tasks. They are evaluated by points. All achieved points are scored to the tested applicant. When evaluating, the following proportion holds: “the more the number of achieved points and the less time necessary for working out, the higher the intelligence level is”. If we look at the test in [1] in more details, we can see, that just one testing question regarding symmetry is involved. It introduces four symmetrically written numerals and the tested person is about to continue in this sequence.

Symmetry has fascinated human mind since the beginning of time. It is often very hard to recognize it. Latter useful ability relates to intelligence. We say about an object that it is symmetrical, if it is possible to do something with it and it remains the same, as it was before. The objects are often symmetrical in nature. Perhaps most symmetrical object, which we are able to imagine, is a ball and nature is full of them. They are stars, planets and water drops. Crystals show a great amount of various kinds of symmetry. Animals and the realm of plants show a certain degree of symmetry. Mathematical formulas of physical laws are symmetrical

related to certain transformations since they do not change when making these transformations (e.g. Lorentz's transformation, specified in [2]).

In regard of such important natural principle in its diverse forms, there is not sufficient how it is used in the intelligence measuring. That's why in the following there is another testing question introduced, which is based on this important feature in completely another form than in the [1].

2. Used theoretical tools

In the following we are going to work with matrices. The current marking of matrices will be used. It means that we will mark matrices in upper case A , B and others. Their elements will be denoted in lower case, a_{ij} will be an element of matrix A . Recall the basic definitions. Matrix of the type (m, n) will be understood the arranged table of the numbers of m lines and n columns

$$A = \begin{bmatrix} a_{11} & \dots & a_{1n} \\ \dots & \dots & \dots \\ a_{m1} & \dots & a_{mn} \end{bmatrix}.$$

Symmetrical is such matrix, for which the equality $a_{ij} = a_{ji}$ holds for each element. Clearly, $a_{ii} = a_{ii}$ holds for all the elements of the diagonal.

3. The formulation of new testing task

The proposed testing task makes use of the basic feature of symmetrical matrices, which is symmetry according to diagonal of matrix. Purpose of this testing task is to recognize symmetry of matrix and to complete the missing element. In doing so, two cases might occur. The missing element lies either on the main diagonal or beyond it.

1. If it lies on the main diagonal, it results in any number which is possible to introduce in the testing task. It has no effect on matrix symmetry. An example may be given by

the following matrix $A = \begin{bmatrix} 7 & 17 & 3 \\ 17 & ? & 12 \\ 3 & 12 & 100 \end{bmatrix}$. In the position of the missing element we can

complete arbitrarily, for example $16 A = \begin{bmatrix} 7 & 17 & 3 \\ 17 & 16 & 12 \\ 3 & 12 & 100 \end{bmatrix}$ or $1.33 A = \begin{bmatrix} 7 & 17 & 3 \\ 17 & 1.33 & 12 \\ 3 & 12 & 100 \end{bmatrix}$

and so on, without disturbing feature of matrix symmetry.

2. If the missing element lies out of the main diagonal, then the right completion is unique. For example, if an element b_{ij} is missing, whereas $i \neq j$, unambiguously the right answer is to introduce the known element b_{ji} in the position of the missing

element, if the tested person is able to recognize the symmetry of matrix. Suppose for

example matrix $B = \begin{bmatrix} 7 & 17 & 3 & 10 \\ 17 & 1.33 & 12 & 97 \\ 3 & 12 & 100 & 111 \\ 10 & ? & 111 & 0 \end{bmatrix}$. Number 97 ($=b_{24}$) is the right solution.

The way of the test evaluation is identical as in [1], it means for the right answer in both cases (in the first case the right answer is any number) 10 points, 0 points for the wrong answer.

4. Conclusion

The original testing task was proposed for the collection of questions aimed at human intelligence measuring. Experimental results including this testing task show the competence of such a task insertion, because success factor ranges close to value of 0.5. 768 randomly chosen people were tested. It shows the average intelligence, which is in accordance with [1].

References:

1. J. Stepanek (1991): *Systemic and operation analysis*. Additional lecture notes. Edition centre CVUT Prague.
2. R.P. Feynman, R.B. Leighton, M. Sands (1985): *The Feynman lectures on Physics 2*. Alfa Bratislava 1985. Translated from the English original "The Feynman Lectures on Physics" published by Addison-Wesley Publishing Company in 1966.

Appendix 5: Presentation of the photo-gallery

Source: EU Contest public CD photos documents

Figure 1 – EU Contest opening ceremony

Figure 2 – Talk with jury member

Figure 3 – Talk with jury member

Figure 4 – Contest hall view



1



2



3



4

Appendix 6: The report from EU Contest 2004

Contest was held in Dublin on the days of 25.-29th September in 2004 with participation of 74 projects from 35 countries (the EU countries, countries associated with the EU and guest countries USA, Japan, China). The Czech Republic took part in contest representing three projects:

Jiri Tutsch: *Novel system for selective kation detection: application of substituted cobalticboranes as lipophylic additive in liquid membrane ion-selective electrode.*

Jan Nesor: *The new disposes to the usage of the computer technology by the exploration of the wood ants*

Martin Rezac: *Control system of the biomass combusting process*

The Czech team was made up of 4 members: three finalists and escort (Petr Klan from Informatics institute of Science Academy of the Czech Republic), who has created this report. Furthermore, there is some description of events in the way how they followed/happened on the individual days.

Saturday 25th September

The departure was at 10:10 a.m. by direct flight to Dublin. The checking-in and the journey passed without trouble. At the airport in Dublin we were expected by so-called student-helper, similarly as in the previous years, who took us together with several other delegations to the bus available to us. Roughly after 1 hour we got to the place of accommodation in Dublin (Montrose hotel). There was a poster on the windscreen of this bus announcing EU Contest venue, which seemed to be like some good promotion. Afterwards at the hotel there was a presentation of finalists going on. After putting up it was possible to start building up projects from 3:30 p.m. in nearby university centre (University College Dublin, UCD). We gathered all the stuff needed into the contest hall (display boxes were already prepared) and installed projects. From 5:30 to 6:30 p.m. the students were cruising by Viking Splash Tour vehicles.

At 7:00 p.m. we went back to the centre of Dublin by buses, up to the Town Hall where the city mayor welcomed us. He said that Dublin was a place full of dynamic young people, the finalists fitted in here and they could stay here as well. Afterwards there was cultural performance (several drummers with dance group in exotic masks) and brief refreshment. At 10:00 p.m. the buses took us back to the hotel.

Sunday 26th September

Every morning breakfast is served at the hotel in the way of self-catering. Both the „classical“ one (eggs, bacon) and the „healthier“ (cereals, yoghurt). The great thing is that they can have both white and brown cereal pastry. After breakfast we leave for the exhibition hall at 8.30 a.m. about 10 minute-walk faraway from the hotel. We finish building up the projects. Exhibition stands for each project consist of horizontal table board which is empty from one side and surrounded by vertical display boards from three sides. Everything has its known size beforehand. Our contestants have their presentations fairly well prepared outland. Presentations are mostly made up of printed colorful little posters and photos which are stuck on the walls of boxes. Some illustrations on laptops that finalists have with them are another useful helper of presentation. Project building finishes at 12:00 p.m. During this phase a minor problem just occurs. Czech electrical sockets are missing. Problem is successfully sorted out by organizers. So at 12:00 p.m. we have exhibition stands installed and prepared for tomorrow, when early in the morning the visits of the jury would start. Some quick lunch follows right in the contest hall. It is good to mention one thing. It was possible to rent WiFi modem for reasonable deposit which covered our exhibition stands and surroundings through the signal. On laptops with WiFi (it is now standard equipment from the practical point of view) the quick Internet was in operation. Soon after lunch there was official opening of contest, where the deputy of the EU had some brief speech and also one finalist of the past years who said how the EU Contest has had positive influence on her professional career. From 2:00 to 5:00 p.m. the finalists are present at their projects, they are viewed by the jury-members from time to time. It is also a day accessible to public, a lot of visitors come there (especially families with kids) and they ask the finalists. It is concerned some very good preparation for presentation in front of the jury members. Small gifts, a stand with Lego and so on are prepared for kids. It makes contest more attractive. It seems also good that stage is a part of the display hall, where the supporting actions are taking place. At 5:00 the students head to historical Trinity College, where dinner with scientific quiz expected them. At 6:30 p.m. suites are taken to the country-style restaurant to dinner from the hotel by buses (about 1 hour-drive), where appearance of local folklore band follows. The return is at 10:30 p.m. back to the hotel. It is possible to choose one of the three meals for dinner, but because nobody distinguished any food under the Irish name, we rather order randomly.

Monday 27th September

We got up at 7 a.m., at 9 a.m. members of the jury started going round individual exhibitions. The jury remained the same as last year. At 12:30 p.m. the quick lunch was served and at 1:30 p.m. the visits of the jury members continued. Both in the morning and in the afternoon the contest hall was full of students of local schools in identical uniforms. They were always accompanied by their teacher. Several delegates got the feeling that it distracted contestants from their presentation in front of the jury members, although most of us (including me) had more positive opinion because contestants were making communication, some explanations and so on. There were some opinions, arguments coming to our minds and it is always good. In the morning we also felt nice surprise when our ambassador in Ireland Mr. Havlas came to see our presentations. I think that it was a good step

taken by organizers, there were far more ambassadors present including American one. Students were evidently delighted by Mr. Ambassador's interest. He promised to increase support of young scientists. See attached illustrative photo showing Mr. Ambassador with a finalist J. Tutch at his presentation.



Figure 1: Our contestant with ambassador (source: the author).

Then at 7 p.m. there was a lecture in so-called Café Scientifique and discussion on global warming. However, there was a problem with a space, the room was not so spacious and sitting was very problematic. It seems that it was the main problem of organizers in this year EU Contest. Spaces of some actions were very small, we were sitting on the floor and there were no chairs. The lecture on global warming was not apparently suitable because students said that almost everyone has given them talks on this topic and so they did not take much interest in it. Nevertheless there was some petition created signed by participants and which was sent out to the prime minister of the UK T. Blair. Because the contest hall was nearby the university campus, we could walk back to the hotel, which was done by most of the participants. Nevertheless, we were picked up by buses, which looked funny, when we were advised to drive less and we were picked up by double-decker and there were just six of us on board. Moreover, what we could walk within 10 minutes, the bus took 25 minutes because it made its way through various rounds-about and overpasses.

Tuesday 28th September

We got up at 7 a.m., from 8:30 a.m. up to 12:30 p.m. the last visits of the jury members continued. At 10 a.m. there was a meeting of national organizers. The quick sandwich lunch followed again and after that there was some inspection of selected university institutions around the contest hall (Conway Institute) on the program. They presented here some research aimed at biology and genetics including some very expensive devices for spectrum measurement. At 4:30 p.m. we were taken by buses to a factory of the firm Intel which was about one hour and half far away. Some excursion followed when we were looking through the glass at workers wearing special clothing and machines making digital microchips. After excursion right in the factory there followed a lecture presenting briefly the Intel Company and also some discussion with Nobel Prize winners which was short because they just answered three questions. But the finalists took some advantage to take a photo of those men. Then some scientific quiz followed when the finalists were divided into teams of four people

and they answered the questions taken from various fields. The winners were given high quality palmtops. Then the late supper followed, that time there was both a lot of food and a space which the organizers were often coped with. At 10:30 p.m. we got back to the hotel.

Wednesday 29th September

We got up at 7:30 a.m. At 9 a.m. there were lectures of young scientists of local university on scientific work they are working on in the contest hall. Afterwards the finalists were preparing for the ceremonial result announcement at the hotel. It was running from 12:30 p.m. at the castle of Dublin in a nice historical aula with the participation of Irish ministry of education. The winners then were received by the president of Ireland. Moreover, from official personalities the ceremony was participated by Mr. Mitsos, commissioner in charge of science. All of them were giving short speeches including the president of Jury Dr. U. Merbold. Then announcement of individual awards followed. There was no so-called alumni jury (three-member jury made up from the last winners). First of all there was announcement of special awards (there were very few of them) and in the end the finale of major prizes followed. There were always three awards for those who came in the first, second or third place. We received no award. After the ceremony ending there followed the lunch in the form of snack bar in nearby Trinity College and then returns back to the hotel. Participants changed their clothes fast and they were making their way to the display center to pull down and pack individual expositions. In the evening at 6 p.m. there was the final gala dinner with folklore band performance accompanied by giving thanks to individual organizers, student helpers and others. Afterwards free amusement and a little bit of dancing followed. The final dinner ended at 22:30 p.m. and at the same time it was the last point of the contest. Because the dinner was served at the hotel about 30-minute-drive faraway, the buses took us back to our hotel.

Thursday 30th September

It was time to leave. We took our flight at 12:30 p.m., organizers booked us a bus for 10 a.m. and we were leaving for the airport of Dublin. We reached Prague at 4 p.m. The flight was without troubles. Even with all our pieces of luggage.

Appendix 7: How to deal with the verbal presentation

1. *To select the right conception of presentation.* So called SPAM model (Situation, Purpose, Audience and Method) is used here which is related to success. The finalists are concerned to talk with regard to the situation (scientific contest), to the purpose (justification of the project, especially introducing of his or her own results and contribution), to the audience (the member of the jury, the expert directly from the field or related field) and to the method of presentation (understandable, simple, convincing and not too long – 5 minutes maximum).
2. *To choose the most important points.* Generally, it holds that thoughts and ideas come up if our mind is clear, so that we can exactly talk on the topic. The main points of the oral presentation is reasonable to write down in the form of the key words or phrases chronologically, how the presentation will move forward and to place them in the presentation stand.
3. *To talk about the content of the verbal presentation with an expert.* He has experience and knows the present state. It will refresh the presentation which is being prepared

and on the presented problems we can get another point of view. It can influence credibility of the presentation positively.

4. *To consider, that the jury member is scientist who is otherwise perceptive, but he is to be skeptical according to the job specification.* That is why it is important to focus on logical procedure of the oral presentation and step by step to convince the skeptical jury member about benefit of our project.
5. *To take the content of the presentation stand as supporting material.* A right oral presentation is not a copy of the stand posters. However, it is useful to add some photos, graphs, tables/schemes, computer show, real model, humor etc. to the oral presentation.

Appendix 8: Considerations and observations why projects do not win awards

The cause of not winning some of the awards could be:

1. Insufficient attention from the finalist's side to the documents preparation before the fair could be serious handicap during the fair.
2. Inconvenient choice of the scientific category. The project looking like "Mathematics" by its content was rather to be directed to the "Computer Science". Contribution to the mathematics was not apparent, but contribution in the category of "Computer Science" was clearly and unambiguously visible and easy presentable. I am afraid that the jury mathematicians were not able to appreciate it properly.
3. Non-tactic oral communication with the jury members. Generally the students have no specific training of verbal communication with the jury members. That is why it rather depends on natural talent and communication skills. The jury members need to hear simply to achieved results and contribution.
4. The project seems to be a too specialized science (the finalist also publishes at the international conference), but the jury members cannot see clearly such things as practical contribution, the finalist's contribution to the whole project or the demonstration of some experiment.
5. The central idea of the project will remain lightless, the experiment results are unconvincing and excitement and dilettantism result from the project rather than some respectable attempt.
6. One of the jury members discovers a tiny mistake in the work. Although it does not mean that the results in a whole are going down, it influences evaluation. It is interesting, that nobody has discovered that mistake before at the affiliated fair.

Each "tiny thing" is visible in such project competition:

1. The project was very attractive through the media. It was even shown in a short film about the contest, which was screened at the end. The finalist linked special abilities to verbal speech very well. Because the experimental research which lacked some deeper theoretical analysis was concerned, I mean that just this could take effect on the jury members of the physics unfavorably from the point of possible awarding among about the 70 projects.
2. The project put effort rather on graphic design and figurative description. Appropriate "mathematics" remained a little bit in the background of the presentation and attempting. I mean the jury members-mathematicians would rather see there that

mathematics is in the first position here. It would probably be better in this case to place the project for example in the category of “Engineering”.

3. The work solved the problem which was tightly bounded and socially interesting. However, the deeper insight into the problem, knowledge and more professional interest were missing. The finalist simply did not live for the problem, he did not have the problem in mind for full time, he did not wake up with the problem in mind and in the evening he did not fall asleep attached to that problem. Moreover, during the presentation he reacted kindly, but a little bit uncertainly.
4. The project solved the problem which had a clear goal, method, conclusion and also practical application. Such kinds of projects are often placed in the medal positions (it is enough to study through the index of awards). The finalist was also well prepared from the technical point of view. However, the presentation poster was a stumbling block here. Although “the new method” was the center of gravity of the project, there was just a range of photos on the presentation. There was no word about a method. Moreover, the author of all photos (source of figures introduced in the presentation is a must) was a father. So the jury members had the right to ask where the own work of the finalist exactly was. Even if having very good oral presentation the jury members had to ask: who is exactly the author of the project, the finalist or his father.
5. Through “the annual school” it is visible, what high-quality verbal presentation and the ability of good communication with the jury members really involve in this fair. After all that it was also confirmed by public shoptalk with several jury members. Verbal presentation is very hard to realize with full interpreting, because the interpreter generally does not know technical expressions. While the posters serve well to attract attention of passers-by (of course the jury members as well), verbal presentation and excitement are absolutely the key ones for the thing.
6. The project was awarded in the international contests of similar type, however in the EU Contest did not win grand award. What could the jury members of the EU Contest discourage from this project? Maybe paradoxically the obtaining of another award (the gain of another award does not have to lead to necessarily to the winning the award here), maybe performing from the position of “the star” (verbal presentation was not from the position of the enthusiastic scientist), maybe exaggerated ambitions (I have another prize, I will automatically get it here as well).
7. The project was good (as all the works in the contest), however it solved the local problem too much. The project did not get out of this “shell” towards wider signification or contribution.

Two real observations:

1. Over the years of participation in EU Contest I have experienced several winners. Surprisingly he was the finalists who were extremely communicative and enthusiastic for the thing and it was their great interest to search for some bookshop related to science and to buy literature associated with their project from their spending-money.
2. Some similar device contested was the result of our project. However, it was not focused so widely as our project as possible to measure physical magnitudes, but it measured the speed of sound. It means it had some particular focus. It was constructed for the specific purpose. It won the second grand award. It seems that the project with the clear determinate purpose might be evaluated more positively than the general project.