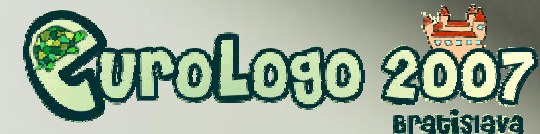


PALMA junior – programming competition in Imagine

Ján Guniš
Ľubomír Šnajder
Valentína Gunišová
Zuzana Szabóová
Andrea Hricová

Pavol Jozef Šafárik University in Košice, SLOVAKIA





Programming competitions

- n programming competitions in Slovakia
 - n National Olympiad in Informatics, ZENIT, KSP, PALMA
 - programming languages C/C++ and Pascal
 - n Cologobežka & ImagineCup, 20 commands
 - programming environment Comenius Logo, Imagine
 - n Internet Problem Solving Contest – online competition
- n LOGO programming competitions in Europe
 - n National Logo competition-Olympiad in Lithuania (Slapkauskiene, 2005)
 - n “miniLOGIA” (Jochemczyk, Oledzka, 2005)
 - n “Beaver” (Dagiene, 2005)



Background of the competition

- n PALMA junior was established in 2005
- n Programming, ALgorithms, MAtematics
- n attractive for pupils aged 10 to 15
- n online form of competition
- n access to authorial solutions and study materials for everyone
- n focus on team working, supporting their creativity, aesthetics, exactness and effectiveness of solutions



Description of the competition

- n programming environment Imagine based on programming language LOGO
- n assigned for pupils aged 10 to 15 working in pairs
- n one year of the competition => four bouts
- n each online school bout => six problems
 - n pupils of 10-11 age in category PROFIK solve 1st - 4th problem
 - n pupils of 12-15 age in category EXPERT solve 3rd - 6th problem
- n attendance final bout for the best teams
 - n competitive section (3 problems)
 - n funny form of some activities for the competitors (logical and algorithmical problems)



E-learning support

- n competition website <http://di.ics.upjs.sk/palmaj/>
 - n study materials, news, registration form, links
 - n assignments of problems and their authorial solutions
 - n cumulative evaluation of contestants' solutions with a list of typical mistakes
 - n gallery of final pictures (results of programs)
 - n ranking of competitors
- n authorized area in LMS MOODLE
 - n assignments of problems, chat, discussion forum
 - n competitors solutions passing in limited time (3 hours)
 - n assessment of competitors' solutions with comments



Objectives

n to encourage youngsters to solve interesting algorithmical problems

algorithms concerning drawing planar objects with given properties (turtle as a processor of algorithms), sorting and searching objects (numbers), traversing through 2D array (e.g. labyrinth), creation and evaluation of own formulas

n to improve their programming skills

loops, conditions, own procedures, operations, variables, procedures and operations of turtle graphics and Cartesian co-ordinate system, visual components, events, using several turtles, lists, recursion etc.

n to improve their mathematical thinking

basic knowledge and skills in the areas of relative orientation in turtle geometry, orientation in Cartesian co-ordinate system, properties of planar objects, calculation of angles, sequences of numbers, arithmetical functions, Pythagorean theorem, calculating position in 2D array, factoring numbers, unit conversion, fractions, percentage etc.

n to develop their aesthetics feeling, creativity, EU citizenship etc.



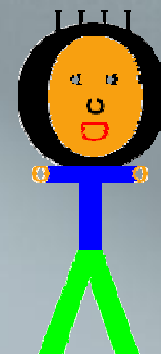
Selection of problems

- n to cover all four described dimensions
- n problems oriented to drawing objects and/or calculations with aesthetics experience, using knowledge in various areas (biology, geography, history and sports)
- n problems enabling development of algorithmic thinking of the competitors (effectiveness of solutions)
- n assignments of the problems use story style in order to lead the pupils to identify the problem hidden in short story
 - n understanding of assignment – presumption of successful problem solving



Kingdom of letters

- n The competitors should have to create arbitrary figure by using only letters and other characters.
 - n traditional “drawing” assignment
 - n on one hand space for fantasy and creativity, on the other hand ability to experienced competitor to use his knowledge (implementation of parameters)
 - n properties of text, position and orientation of turtle (turtle co-ordinates and heading), correct computation or approximation of turtle position





Treasure Island

- n The competitors should have to create an algorithm processor – pirate Kubo – to find the way through the forest.
 - n prepared game environment (pirate map)
 - n good orientation in two-dimensional array
 - n effective evaluation of conditions and computing exact position of pirate





Pyramid

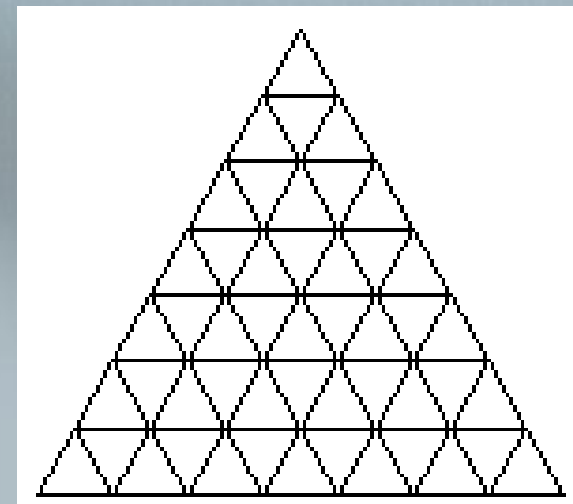
n The competitors should have to create procedure for drawing the pyramid. Input of procedure was number of pyramid floors.

n more complex version of assignment about typical drawing a chess-board

n superior and inferior cycles

or

n recursive version of algorithm?





A drone bee and its (n x grand) parents

n The competitors should have to compute how many (n x grand) parents drone bee has got.

n completing the terms of sequence

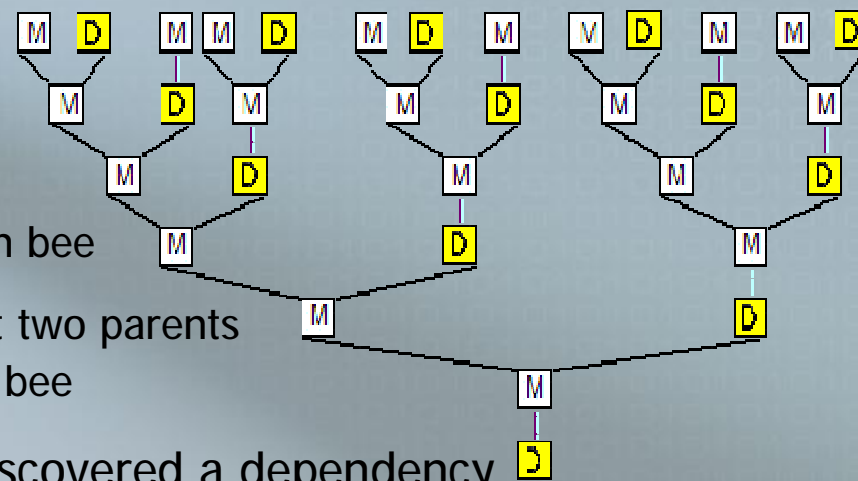
n less known example of Fibonacci sequence

n each drone bee has got only one parent – queen bee

n each queen bee has got two parents – queen bee and drone bee

n successful competitors discovered a dependency and consecutively computed the next values

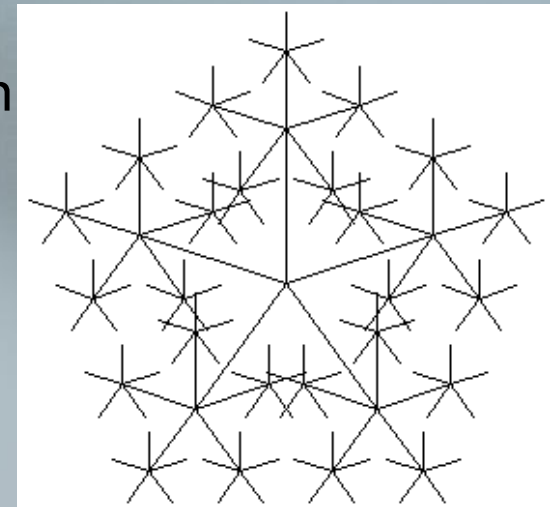
n then the competitors discovered a mathematical model of the problem





Snow-flake

- n The competitors should have to draw recursive graphics – snow-flake.
 - n how competitors understand the concept of recursion?
 - n computing of angles closed by arms of flake
 - n orientation by turtle geometry
 - n requiring of high level of abstraction
 - n insufficient analysis of problem, unrecognized recursive character of graphics





Flags of EU countries

n The competitors should have to create procedure drawing flags of foundation states of EU.

n assignment solved in the final bout

n algorithm solving a class of problems (level of parameterization)

n one independent procedure for every flag

n one parameter determining the state

n decomposition of flags into two groups according to orientation of bands, self procedure for every group

n the highest level of parameterization – only one procedure with parameters (orientation of bands, list of colors and lengths of flag sides)





Conclusions

- n the competitors have appreciated online style of the competition - their solutions are assessed (corrected, marked) straight after finishing of the bout (till two hours), online chat with the competition organizers
- n the teachers have appreciated accessibility of study material, assignments and authorial solution of all problems of the competition
- n the competition helps teachers to encourage learning and self-learning of gifted pupils in programming and also to manage ordinary programming lessons



Future plans

- n to continue in team style of organizing the competition (common preparatory meetings, personal responsibility)
- n to continue in creating problems for competition covering mentioned aims and objectives using analytical approach
- n to improve study materials for the competitors and their feedback during whole competition
- n to prepare online course for teachers focused on methodology of programming teaching
- n to open the competition to foreign competitors too (English version of problems, solutions, study materials)



Acknowledgement

- n to our colleagues Gabriel Semanišin and Gabriela Andrejková for their support and advices and their help in the field of propagation of the competition
- n to our students Alena Hajdová and Jana Brandoburová for their help in preparing assignments of problems and for checking competitors' solutions
- n APVV project LPP-0131-06
"Increasing of knowledge potential"



Thank you for your attention



Contacts

Ján GUNIŠ jan.gunis@upjs.sk

Ľubomír ŠNAJDER lubomir.snajder@upjs.sk

Pavol Jozef Šafárik University in Košice

Faculty of Science

Institute of Computer Science

Division of Didactics of Informatics and Supporting
Technologies

Jesenná 5

041 54 Košice

SLOVAKIA