

Participating ACM International Collegiate Programming Contests: A Personal Retrospection

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Mission

■ Mission:

The ACM International Collegiate Programming Contest (ICPC) provides college students with opportunities to interact with students from other universities and to sharpen and demonstrate their problem-solving, programming, and teamwork skills.

■ Goals:

- Problem-solving.
- Programming.
- Teamwork.

■ History:

- Since 1977.
- Since 1990 (?): international.
- 2002: won by Shanghai JiaoTong University!

Formats of the Problem Set

■ Basic guidelines:

- Typically six to eight problems are attempted in a five hour period.
- Level of difficulties:
 - ▷ *Two problems could be solved in an hour by a first or second year student,*
 - ▷ *two more problems that could be solved in an hour by a third year student,*
 - ▷ *and two that will likely determine the winners.*
- Our goal is that every team solves two problems, that every problem is solved, and that no team solves them all.

■ Format:

- Problems should be presented with no more than a page of text, a helpful illustration, a sample input set with its accepted output set.
- Write the problem assuming that English is the second language of the reader.
- Any culture or discipline specific aspects should be thoroughly explained. If the explanation is more than a paragraph, think up another problem.

- In the future, want to include visual problems. Experimentation is currently through the IBM VisualAge for Java Challenge.

Scope of the Contest

- Problems of simple algorithmic nature with almost no heuristic solutions.
- Problem-solving:
 - hide problems into a story,
 - story is related to local site,
 - some problem requires advanced English comprehension, but the solution is trivial,
 - need to pay special attention to lots of details.
- Differences between ACM ICPC and IOI:
 - ICPC:
 - ▷ *float-point numbers with limited precision*
 - ▷ *team contest*
 - ▷ *problem descriptions in English*
 - ▷ *no partial credit*
 - IOI:
 - ▷ *more difficult problems*
 - ▷ *individual contest*
 - ▷ *problem descriptions in Chinese*
 - ▷ *partial credit*

Types of Problems

- graph theory: 2000 (A,E,F); 2001(H); 2002 (C,E)
- geometry: 2000 (D,H); 2001 (B,D); 2002 (A,F,G,I)
- efficient enumeration (about $12!$ and increasing): 2000 (B,C); 2001 (C,G,I); 2002 (B,D)
- simulation (story-reading): 2000 (G); 2001 (A,E,F); 2002 (?)

	2000	2001	2002
graph	A,E,F	H	C,E,H
geometry	D,H	B,D	A,F,G,I
enumeration	B,C	C, G, I	B, D
simulation	G	A,E,F	?

Trend

- What is in?
 - geometry
 - **GETTING MORE DIFFICULT!**
- What are out?
 - implementation of complicated data structures
 - numerical methods
 - image processing
- **Graph theory remains to be the basic core!**

		2000	2001	2002
	easy	4	5	2
■ Level of difficulties:	medium	3	4	5
	difficult	1	0	2
	champion	?	6	7

Teamwork

- **Knowing your teammates.**
- **Scheduling:**
 - Only one machine is available.
 - Be able to develop code and test cases on working papers.
- **Psychology.**
- **Paying attention to fine details.**

How to Prepare?

- **Self studies:**
 - English!
 - Take courses and read standard textbooks!
- **Solving past problems:**
 - Do this one problem set at a time, not problem by problem.
 - Reading exercises.
 - Online exercises.
- **Real-time simulation:**
 - Do not try to solve all problem sets off-line.
 - Keep record on the whole process, who solves which problems and the timing data.

Database for the Test

- Gather problem sets from all regions.
- Formulate test data (and solutions) and accumulate them into a database.
- Label each problem according to level of difficulties, required knowledge and special remarks.
- Functions:
 - find problems in a particular domain;
 - check answers;
 - knowing the trend;
 - educational purposes.

During the Contest

- **Time allocation: each team finds out its best schedule.**
 - Problem reading, labeling and assigning of easy problems: 0.5 hour.
 - Solving at least two easy problems: another 0.5 – 1 hours.
 - Solving medium problems: one hour per problem.
 - Solving difficult problems: one hour per problem.
- **Problem allocation: assume teammates A, B and C.**
 - **Goal: to solve 7 problems.**
 - ▷ *A: 2 easy and one medium.*
 - ▷ *B: 2 medium.*
 - ▷ *C: one medium and one difficult.*
 - **Goal: to solve 6 problems.**
 - ▷ *A: 2 easy and one medium.*
 - ▷ *B: 2 medium.*
 - ▷ *C: one difficult.*
- **Try to do reasonable testing before submitting.**

Conclusion

- It's a two-tiered contest:
Need to win the regional title to advance to the world final!
- Need to be excellent in all areas.
- Communication skill.
- Leadership.

Have fun!