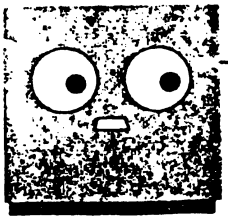
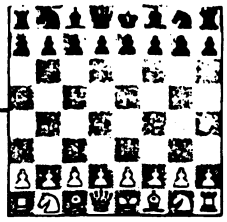


INTERNATIONAL COMPUTER CHESS ASSOCIATION
(I.C.C.A.)



REPRINT

ICCA Newsletter

Vol. 2 No. 1
February 1979

Editor: B. Mittman
Editorial Asst.: J. Cesal
Northwestern University

EDITORIAL

The International Computer Chess Association begins its second year of 1979 with 128 members, as of February 1. The current membership list is enclosed. At the 9th North American Computer Chess Championship in Washington in December, some 50 ICCA members and prospective members met to discuss the future of the organization. It was agreed that an association like ours was very important for the future of computer chess. It should serve as a medium of communication among computer chess programmers and enthusiasts all over the world. It should provide needed liaison with existing computing and chess organizations, such as ACM, IFIP, USCF, and FIDE. Other activities would include developing rules for computer/computer and computer/person chess competitions, establishing a chess program rating system and maintaining world-wide rating information, supporting and encouraging computer chess development, organizing and sponsoring computer chess competitions, etc. A short report of the meeting is included in this Newsletter.

The 9th North American tournament, held at the annual conference of the Association for Computing Machinery, was very exciting. It ended with the crowning of a new North American champion, BELLE, and featured the performance of a surprisingly strong microcomputer program, SARGON II. A report on that tournament and the annual panel discussion follows. A complete set of game scores accompanies this Newsletter.

In the September 1978 issue, we published a letter by Don Beal of Queen Mary College advocating a handicapping system for computer chess tournaments which would take into account computer speed. In this issue we publish several replies to Mr. Beal. We are pleased also to publish an interesting article by David Cahlander of Control Data Corporation entitled "Strength of a Chess Playing Computer".

On behalf of the original organizers of ICCA, I would like to welcome the many new members of the Association. I encourage each of you to use this Newsletter as a way to communicate your ideas, questions, and comments to the other members. In particular, we are currently interested in any ideas you may have concerning the organization, by-laws, and planned activities of ICCA.

Anyone who wishes to become a member of ICCA should fill out the application form on the last page.

NINTH NORTH AMERICAN COMPUTER CHESS CHAMPIONSHIP TOURNAMENT

B. Mittman

The ACM'78 annual conference was held in Washington, D. C. in early December. The North American Computer Chess Championship is one of the popular activities of these conferences. This year BELLE, written by Ken Thompson of Bell Labs, won the tournament with a perfect score of four points. CHESS 4.7 of Northwestern University came in second with three points. CHAOS of the University of Michigan, BLITZ 6.5 of the University of Southern Mississippi, and SARGON II, one of the two microcomputer entries, all tied for third place for 2 1/2 points each. The very exciting game between BELLE and CHESS 4.7 and all of the other game scores, with commentary by Mike Ciamarra of Rockville, Maryland, are included in the accompanying material about the tournament. Local arrangements were handled very effectively by Carl Diesen of the U. S. Geological Survey.

During the tournament several noted chess personalities attended the sessions and played against some of the programs, including Dr. Edward Lasker, who celebrated his 93rd birthday with us, and Mr. Robert Byrne, chess editor of the New York Times.

The annual ACM computer chess panel was held on Monday, December 4. Chaired by Ben Mittman, the panel consisted of Mike Johnson, David Levy, Monty Newborn, Dave Slate, Kathe Spracklen, Ken Thompson, and Tom Truscott. The entry of two microcomputer programs in the tournament generated considerable discussion about the contributions being made by the micro programs in computer chess. Kathe Spracklen pointed out that she and her husband, Dan, have published everything they could about SARGON II and that ideas and improvements made in microcomputer chess technology would contribute greatly to the overall development of computer chess.

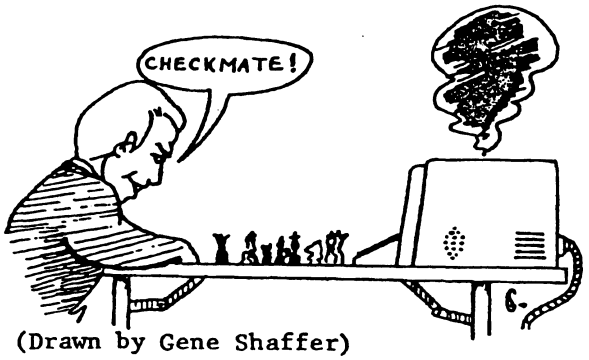
One other development which interested the panel and the audience was the amazing strength of the BELLE program, which won the tournament while running on a PDP-11, equipped with a hardware move generator and evaluator. Ken Thompson described his system, but was much less optimistic about the future strength of computer chess programs than were some of his fellow panelists.

A more complete summary of the panel discussion can be found in the March 1979 issue of the computer chess section of Personal Computing. That issue features computer chess.

* * * * * * * *

LEVY OFFERS NEW CHALLENGE

In order to stimulate interest and to encourage further research in computer chess, Mr. David Levy and OMNI Magazine are offering a $5,000 prize to any programmer or programmer team of the first program that wins a match against him. This challenge has no time restriction. For a copy of the rules of the challenge, please write directly to Mr. Levy. Levy will also wager up to $10,000 (in units of $1,000) that the Levy/OMNI prize will not be won before January 1, 1984.



(Drawn by Gene Shaffer)

FUTURE EVENTS

Planning has begun for the following computer chess events. For further information, please contact the persons named:

European Open Computer Chess Tournament

Tilburg, Netherlands, Mid-1979
Tournament Organizer: Mr. Barend Swets, Chopinstraat 65, Venray, Netherlands

Microcomputer Chess Tournament

Plans are being made for the Second Penrod Memorial Chess Tournament, a microcomputer tournament named after Doug Penrod, the originator of the Computer Chess Newsletter, who died in November 1978. For information about the tournament, write to Don Gerue, 3667 Montalzo Way, Santa Barbara, CA 93105. If you are soliciting a personal response, please enclose a stamped, self-addressed envelope.

Results of the first tournament can be found in the February 1979 issue of Personal Computing. That issue also contains a tribute to the memory of Mr. Penrod.

10th North American Computer Chess Championship

ACM-79, Detroit, Michigan, Oct. 29-31, 1979
Tournament Organizers: Prof. M. Newborn, School of Computer Science, Mc Gill University, Montreal, Quebec, Canada; Prof. B. Mittman, Vogelback Computing Center, Northwestern University, Evanston, Illinois 60201
Local Arrangements: Mr. David M. Dahm, Burroughs Corporation, Burroughs Place, Detroit, Michigan 48232

Third World Computer Chess Championship

IFIP Congress '80, Melbourne, Australia, October 14-17, 1980
Tournament Organizers: Prof. M. Newborn, Prof. B. Mittman, and Mr. David Levy (his address is on page 6.

CHESS CHALLENGE

The following notice appeared in the January 14, 1979 edition of the Chicago Tribune:

ROTTERDAM - A Dutch firm offered $50,000 Saturday to anyone who programs a computer to beat Prof. Max Euwe, former president of the International Chess Federation, at his own game. The program must be drawn up during 1979 and the contest will consist of four matches. Amsterdam-born Euwe, 77, regarded as the world's top chess player in the 1930s, is also a computer specialist. Volmac, the automation company which sponsors the Rotterdam Chess Club, said few computer programs could beat grand masters.

* * * * * * * *

The following letter was received from David Levy concerning the outcome of his famous bet:

January 9, 1979

Dear Newsletter,

Since my match in Toronto, last August/September, in which I won my ten year old bet, many people have asked me the inevitable question, "Did they all pay up?", meaning the four people with whom I made the bet. I should like to use the pages of the Newsletter to answer this question and to save people from writing to me or asking me about it.

Donald Michie, John McCarthy and Seymour Papert all paid promptly and with good sportsmanship, just as I would have done had I lost.

Edward Kozdrowicki, currently of the Aerospace Corporation in El Segundo, California, has not paid and has refused to respond in a positive fashion to a number of telephone calls and letters.

I trust that this answers all questions relating to the payment of the bet.

HANDICAPPING COMPUTER CHESS PROGRAMS

We received four responses to Don Beal's letter in the September 1978 issue of the ICCA Newsletter, which are printed below:

Allan Gottlieb
York College CUNY
Jamaica, NY 11451

Beal advocates that the apportionment of clock time to computer programs should reflect the power of the hardware on which the programs are running. Thus, when two 370/168 based programs meet, they will divide the times evenly as they do now (e.g., in the World and North America championships). But when a TRS-80 faces a CRAY-1, the former will receive a substantial time handicap. Arguments are given to show that this would be more equitable, would result in games lasting as long as they do currently, and would not cause a deterioration of play. It is with this last point that I wish to take issue.

As is correctly pointed out by Beal, when a fast machine plays a slow one, giving the slow machine most of the time should not lower the overall quality of the game (although the winner's play may be of lower quality). I feel, however, that another factor will likely come into play. Namely, we will start seeing slow machines playing slow machines.

Since there would be no inducement to go to the expense and bother of obtaining a fast machine, all the FORTRAN-based programs will migrate down the product line since 138's are cheaper and more available than 470's and 3033's.

The only exception that I foresee is that of programs with large primary memory requirements (e.g., the version of CHAOS which ran at the last World championship). However, the obvious extension of the above "fairness doctrine" would time penalize such programs. Thus, they might well be reconfigured to use less space. (I believe that CHAOS could have been so reconfigured.)

In conclusion, I feel that while time handicaps would give a better indication of a program's (rather than a computer's) strength and thus would be more "equitable", the quality of the games will suffer as a result. I am not sure whether it is better for us to have our cake or to eat it, but I doubt very strongly that we will be able to do both.

Peter W. Frey
Department of Psychology
Northwestern University
Evanston, IL

(1) Mr. Beal believes that the primary interest in computer chess lies in the contest between different algorithms for chess play. He apparently assumes that the relative effectiveness of two algorithms is independent of computation time. Is it not possible that one algorithm might be more effective when a small time allotment was available but less effective when a large time allotment was available? Let me cite two examples. Consider the important problem associated with material analysis. Most programs incorporate a procedure which analyzes the probable outcomes of existing

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HANDICAPPING COMPUTER CHESS PROGRAMS

(continued from page 4)

capture threats. There are two common techniques for this. One procedure is to develop an exchange evaluator (see, for example, Spracklen & Spracklen, Byte, November, 1978, pg. 16) which statically computes the wisdom or folly associated with any potential capture for the side on-the-move. A second procedure is to make an exhaustive minimax search of all potential captures (see, for example, the chapter by Slate and Atkin in Chess Skill in Man and Machine). This latter procedure takes approximately 50% of the total search time and is therefore a very expensive procedure for determining truth. Which procedure is best? I suspect that an exhaustive minimax capture search would be undesirable on a low-power computer system because it would take up a prohibitive amount of time. On a powerful system, it is more manageable. For a small machine environment, therefore, the static exchange analysis might produce better chess given a reasonable time limit than would an exhaustive minimax capture search. There is no doubt, however, that the latter procedure produces a more accurate analysis when it can be completed.

A second procedure which is of interest in this regard is that of iterative deepening (see Slate & Atkin's chapter or Jim Gillogly's thesis, Carnegie Mellon, 1978). In iterative deepening, the tree search is conducted in stages, each new search being 1 ply deeper than the previous search. This procedure is most effective when used in conjunction with a large look-up table which stores moves and evaluations from prior iterations. The pay-off for the look-up table doesn't amount to much until the tree depth reaches 4 or 5 ply. If a handicapping procedure is used which prevents large machines from conducting deep searches, this useful programming procedure would be of little value. Therefore, the effectiveness of the algorithm is not independent of computing time.

These two examples seem to imply that a basic premise of the handicapping approach is false: the relative effectiveness of different chess algorithms is not independent of computing time.

(2) A handicapping rule seems to encourage the entry of small personal computers. If I wrote a program for my Radio Shack TRS-80, could I enter it in the national and international computer chess tournaments? Would you be willing to provide a 50 to 1 time advantage to me? Would my opponent who is running on a CYBER 176 or CRAY-1 be laughed out of the hotel for competing with a $1000 computer? Would he be happy with a 3-second time allotment? Would the audience enjoy watching games which were of obviously poor quality? Do participants really want to structure the tournament around the lowest level of play rather than the best level of play?

(3) In selecting a handicapping rule, isn't it necessary to consider memory size? A large look-up table can speed the search tremendously, especially in the end game. A small machine without much memory might not be able to take advantage of this option. Why should the handicapping rule be based on addition speed for two 16-bit numbers? In chess programming, the instructions used most frequently are those which are needed for bit board manipulation. Wouldn't it be more to the point to handicap on the basis of the machine's speed for performing a logical "and" or logical "or" on two 64-bit words? If the handicapping rule is not chosen carefully, participants will start competing by choosing a machine which is treated most favorably by the handicapping rule. I doubt if we really want to encourage this kind of competitive activity.

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HANDICAPPING COMPUTER CHESS PROGRAMS

(continued from page 5)

(4) The ultimate goal in chess programming, in my mind, is to produce a machine-software combination which competes effectively with the best human players. The tournaments provide an effective framework for testing new programming ideas. Although it is obvious that the present system favors participants that have access to powerful machines, I doubt that machine strength, by itself, determines the outcome of the tournament. If two programs are about equal, the one running on the more powerful computer will have an advantage. This, however, is not a critical problem because strong programs and strong machines have a tendency to get together. Individuals who control access time to the computing giants would generally prefer a stronger program over a weaker one. I am sure that CDC would be happy to drop the Northwestern program and adopt another if the new one was clearly better. Slate and Atkin did not receive an invitation to use the CYBER 176 until after they had already won several tournaments on a slower machine. If we wish to produce the best possible machine chess, it seems counterproductive to penalize individuals who are sufficiently resourceful to get their program on a powerful computer. In the near future, tremendous amounts of computing power will be available at relatively modest cost. It seems sensible, therefore, to develop chess programs which take advantage of a powerful hardware environment.

David Levy
104 Hamilton Terrace
London, NW8 9UP, England

I appreciate the need for a rational comparison between chess playing programs (rather than the software/hardware combinations), but for the purposes of normal tournament play such a comparison is not easy to achieve. If, for example, we were to handicap the programs in the A.C.M. events, the standard of play of the strongest programs would be much less impressive than at present, and this, in turn, might discourage programmers and/or sponsors from future activity.

It seems to me that a postal tournament might be the answer. CHESS 4.7 could be set at its normal tournament parameters, while other programs could be allowed to consume 5 minutes, 5 hours, or 50 hours of C.P.U. time, as appropriate. I would suggest that a committee of Tony Marsland, Ben Mittman, and Monty Newborn be in charge of the handicapping, and I would be willing to act as tournament director. The (human) entrants would be permitted to use the latest version of their program at every move, and we would rely on their honesty just as the International Correspondence Chess Association relies on the honesty of the humans who participate in I.C.C.A. events.

If this idea meets with sufficient support, we could begin early next year. Perhaps we could discuss the possibility in Washington.

Johann Joss
Eidgenossiche Technische Hochschule
CH-8006 Zurich, Switzerland

1) The proposed measure is adequate for many of today's computers, but it is becoming less accurate in the future. It is not even accurately defined. (What does main memory mean for a machine with a cache memory? A hit or a miss? Typically a cache memory is about 10 times as fast as the main memory, too much difference to be neglected.)

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HANDICAPPING COMPUTER CHESS PROGRAMS

(continued from page 6)

2) It makes small, but fast machines almost unusable for computer chess. The small machines often lack fancy instructions and addressing modes. They have very few registers and a short word length. This slows down the program, but speeds up the proposed benchmark.

3) The amount of memory is very important (e.g., for permutation tables), but not considered in the proposed benchmark.

4) The CPU-time produced by the operating system is often very inaccurate. It may include system overhead, include or exclude partially used clock ticks, interrupt servicing for background jobs (often doing heavy I/O). It may even be multiplied by a certain factor by the installation (e.g., for getting more money for the jobs or for compatibility reasons with older machines). These factors are often unknown to many system users. Sometimes it is based on something completely different (e.g., memory ticks+words transferred to disc).

5) The objection 5) is, for me, not refuted at all. Hardware is becoming cheaper. Homemade computers are getting more and more powerful. I always had troubles in getting the required computing power for my program. I have plans to transport it to a microcomputer with some special purpose hardware added. This hardware will be less powerful than a CYBER 176 and cost less than the CPU time for a single game on such a machine. How is special purpose hardware defined? On a large machine many special functions can be implemented by a simple table access, which are implemented much cheaper by a few gates at about the same efficiency.

6) The proposed benchmark is not typical for chess programs. Most of their arithmetic has to do with address calculations. I think the access to a subscripted variable is a much better measure.

7) The goal of a chess program should be to play good chess and not to win tournaments by forcing the opponent to play speed chess or to lose by time. For me, computer chess is a combination of hardware and software. Finding the appropriate hardware is a very important (and often very difficult) step in the development of the program.

8) I think that the biggest disadvantage of the present situation is that it is very difficult to organise for a tournament. When new communication facilities become available, which charge the user on a character basis and not connect time, long range telephone calls will no longer be expensive. Everybody could use his computer at home, where he is responsible for the required computing power.

I feel that the present situation is not ideal. I propose another solution:

1) There should be sufficient tournaments so that every program can participate every year in some tournament.

2) There should be at least one tournament without any hardware restrictions. This is needed since these tournaments should represent the state of computer chess.

3) Time sharing systems should guarantee at least 50% use of CPU, so that the degradation caused by the time sharing system is in the proposed error bound.

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STRENGTH OF A CHESS PLAYING COMPUTER

David Cahlander
Control Data Corporation
Arden Hills, Minnesota

Ken Thompson states that the rating of a chess program is:

$$\text{USCF rating} = 400\ N^{1/8} \qquad (1)$$

where N = total number of nodes examined

Under tournament conditions, CHESS 4.7 on the CYBER 176 takes about 300-350 μs to examine a node. Tournament conditions are 40 moves in two hours. We use 1 1/2 hours for the first time control, using 30 minutes for unexpected happenings. The number of nodes examined is:

$$N = \frac{90\ \text{min} \cdot 60\ \frac{\text{sec}}{\text{min}}}{40\ \text{moves} \cdot 325_{\mu}\text{sec/node}}$$

$$N = 415{,}000\ \frac{\text{nodes}}{\text{move}}$$

$$\text{USCF rating} = 400 \cdot (415{,}000)^{1/8}$$

$$\text{USCF rating} = 2015$$

The number of nodes in an α-β tree is about

$$N = 2\ m^{\frac{d}{2}} \qquad (2)$$

where m = total number of legal moves
d = depth in plies

Assume about 30 legal moves, what depth is searched?

$$\ln N = \ln 2 + \frac{d}{2} \ln m$$

$$\frac{d}{2} = \frac{\ln N - \ln 2}{\ln m}$$

$$d = 2\,\frac{\ln 415{,}000 - \ln 2}{\ln 30}$$

$$d = 7.2\ \text{ply}$$

An interesting relationship can now be determined between the depth searched and the USCF rating. From (1) and (2):

$$N = \left(\frac{\text{USCF}}{400}\right)^{8}$$

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STRENGTH OF A CHESS PLAYING COMPUTER

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$$\left(\frac{USCF}{400}\right)^8 = 2\, m^{\frac{d}{2}}$$

$$\frac{USCF^{16}}{400^{16} \cdot 2^2} = m^d$$

$16 \log USCF - k = d \log m; \quad k = \log (400^{16} \cdot 2^2)$

$= \log (436^{16})$

$$d = \frac{16 \log USCF - k}{\log m}; \quad k = 42.2350$$

$$d = \frac{16 \log \left(\frac{USCF}{436}\right)}{\log m} \qquad (3)$$

Conversely, the USCF rating can be obtained from the search depth:

$$USCF = 400 \cdot N^{1/8}$$

$$N = 2\, m^{\frac{d}{2}}$$

$$USCF = 400\, (2)^{1/8} \cdot m^{\frac{d}{16}} \qquad (4)$$

Search Depth as a Function of Playing Strength for a Chess Program

USCF Rating	Node Count	Depth(m-30)
1000	1500	3.9
1200	6600	4.8
1400	23000	5.5
1600	65K	6.1
1800	168K	6.7
2000	390K	7.16
2200	840K	7.61
2400	1.7M	8.0
2600	3.2M	8.4
2800	5.8M	8.7

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MEETING OF ICCA IN WASHINGTON

The meeting of the ICCA at the ACM Conference in Washington resulted in the suggestion that several committees be formed to handle ICCA planning. These proposed committees are:

- Bylaws
- Tournament rules and organization
- Liaison with other organizations
- Planning for a computer chess rating system

Several people at the meeting signed up to serve on these committees. Unfortunately, the list of volunteers has since disappeared. Therefore, all members who are interested in serving on any of these committees are urged to write to Prof. Mittman as soon as possible.

It was suggested that the bylaws committee prepare a proposed set of statutes which would be mailed to all members this year for review. These statutes would be discussed during the 10th North American championship in Detroit next October, before being sent out for ratification by the membership.

Any suggestions in the above areas should be sent to ICCA Headquarters as soon as possible so that they may be forwarded to the appropriate committee. The following letter from Harry Shershow, the computer chess editor of Personal Computing, contains some specific suggestions of interest.

"After listening to the discussions at the ICCA meeting, I arrived at certain opinions which your organization might consider:

1) The prizes for winner and runners up of the computer chess tournament should be presented by the ICCA, not by an officer of the ACM. This ceremony would help publicize the existence of the ICCA and would help establish it as a viable organization and not simply a name at the top of a letterhead.

2) The obtaining and selecting of appropriate prizes should be made by the ICCA. It seems to me that there shouldn't be too much trouble in convincing some large manufacturer of computer hardware to establish a permanent fund for the prizes. Such prizes should be a little more desirable than merely a "loving cup". Personally, I would prefer a gold medal struck for the winner, silver medals struck for runners up, and bronze medals to be sold to attending members of the ACM conference. As an illustration of how such medals can be made into interesting collector's items, I suggest you study the methods of the Israeli Mint. Whenever they issue a commemorative medal, the medal itself is usually done by some outstanding artist, and it is boxed in a beautiful case. But what makes the Israeli medals so desirable and why they sell so many of them is the special booklet which describes the medal and also describes in detail the events depicted on the medal. Sale of the metal at the ACM conference, either during the conference itself, or perhaps beforehand, upon mail registration, would bring money into the treasury of the ICCA for future activities and for expense reimbursement.

3) The ICCA should decide, beforehand, the rules under which the computer chess tourney should be run, and these rules should be printed in the form of a booklet to be distributed to any organization planning to hold a computer chess tournament either on the micros or on the big computers. The ICCA rules should be as binding at a computer chess tournament as USCF rules are at a human chess tournament.

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MEETING OF ICCA IN WASHINGTON
(continued from page 10)

4) Applications to ICCA sponsored tournaments should be sent to ICCA, and it should be the function of ICCA to select participants. Perhaps, with the growing interest in computer chess, there should be some preliminary, regional "run-offs" to select appropriate participants.

5) The ICCA, to establish its authority as governing organization for chess tournaments should, at once, issue guidelines for game documentation and notation. Perhaps the one big thing ICCA can do is to order that the symbol for knight in chess be "S" (for the German, Springer) instead of "N". There already is an argument to the effect that this continent is the only one using "N" but that "S" is used by almost every other foreign country. The other symbols of algebraic notation should also be made official, after due consideration of the fact that the games will eventually be read or analyzed by Russians, Roumanians, Chinese, etc., all of whom use different symbols for chess pieces. The current symbols (K,N,R,B,Q and P) are abbreviations for American (or English) words. Foreign readers should not be required to learn English in order to understand our English symbols. This, then, should be an order of business of the ICCA, which represents the International Chess Fraternity, not the English alone.

6) ICCA should establish its own rating system for all computer chess programs whether it be a program run on an IBM 375 or one run on a micro Z-80. Right now, the USCF, to which every organization looks for chess ratings, will not rate commercial machines, such as BORIS or CHESS CHALLENGERS, and are very uncertain about rating computer programs at all. Perhaps Dr. I. J. Good's formula on "The Marking of Chess Players" should be the basis for formulating an ICCA rating system. Because science prefers to deal with percentages, rather than abstract figures, as a measure of achievement (100% meaning perfect) then, perhaps, machines should be given a percentage rating, in the same way that baseball players are rated in batting average percentages. How the ICCA should arrive at those ratings would be the culmination of a study or submission of proposals."

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HANDICAPPING COMPUTER CHESS PROGRAMS
(continued from page 7)

4) There should be other tournaments with restricted machines. This gives small machines a fair chance to compete successfully. Commercially available machines may be limited by their selling prices, homemade machines by a chip count or a chip price. The memory should not be included in this calculation, but calculated separately.

5) One should get support from computer companies, so that access to a bigger machine can be offered as a prize to the winner of a small tournament.

STRENGTH OF A CHESS PLAYING COMPUTER

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Playing Strength of a Chess Program

Depth	USCF rating (m=30)	USCF rating (m=40)	M nodes (m=30)	M nodes (m=40)
1	540	550	10^{-5}	$1.2 \cdot 10^{-5}$
2	670	690	$6 \cdot 10^{-5}$	$8 \cdot 10^{-5}$
3	825	871	$3 \cdot 10^{-4}$	$5 \cdot 10^{-4}$
4	1020	1100	$1.8 \cdot 10^{-3}$	$3.2 \cdot 10^{-3}$
5	1260	1380	.0098	.02
6	1560	1740	.054	.128
7	1930	2190	.3	.81
8	2390	2760	1.6	5.1
9	2955	3470	8.9	32
10	3655	4374	49	205

ICCA APPLICATION FORM

Dues for 1979: $5.00 (U.S.)

Enclosed is a ☐ check (U.S. only) made out to ICCA

or ☐ international money order

Name: _____

Address: _____

City: _____

State or Province: _____ Zip Code: _____

Country: _____

Please mail to:

ICCA
Vogelback Computing Center
Northwestern University
Evanston, Illinois 60201
USA