Life Is Nothing But a Computer Game

Jan Willemson

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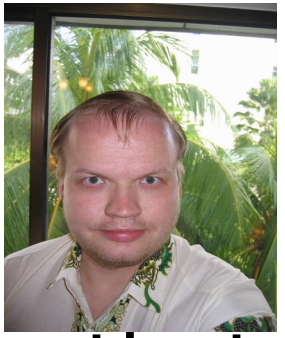
Where did it all start?

- In 1997, I asked  whether he had anything intere sting for me
- ... and he told me that crypto was the most exciting thing in the world
- For 6 years I believed him ...
- ... and in a way I still do ...
- ... but

Who really cares about crypto?

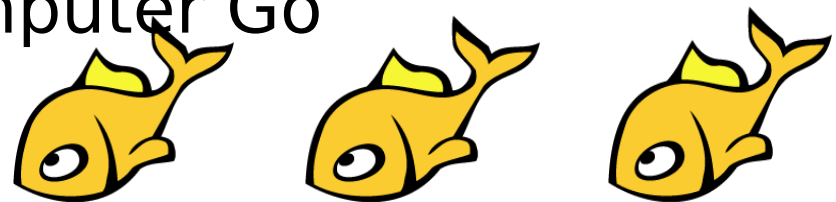
- Cryptographers
- Military
  - Except for Estonian one
- Large industry
  - Except for Estonian one
- Simple people do not want to know anything about it

So what should I do?

- Let's do something that cats would buy!

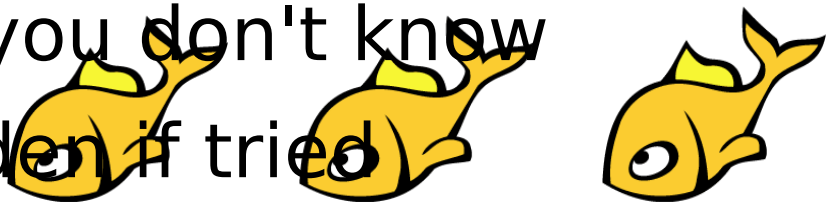
My history with games

- 2002 – the first seminar on Game Theory, mostly it's economical flavour
- 2004 – the first course on Game Theory, purely its combinatorial flavour
  - Plus computer Clobber tournament with 34 participants and automated game playing
- 2005 – the second course on Game Theory, mostly combinatorial, but also some game programming
  - Plus the first Estonian Computer Go Championships



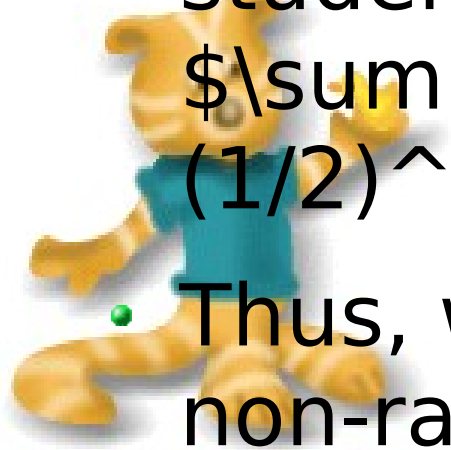
Computer Clobber tournament at Tartu University

- Published in ICGA Journal, Vol. 28, No. 1 (2005), pp 51-54
- The Problem: you have 34 student game programs and you want to grade them
- Are they intelligent or random?
- There is no way of understanding if you only read code
  - Its student-quality and sometimes in a programming language you don't know
  - Randomness can be hidden if tried



Catching random players

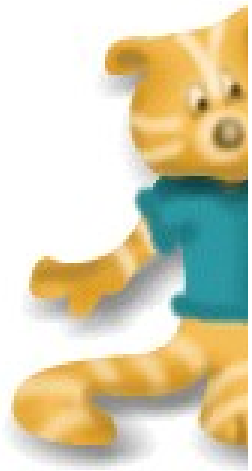
- Let's play the student program against a true random program!
- Say, we play 15 games and the student wins at least 11 of them
- The probability of this happening if the student is random, is $\sum{i=11}^15\binom{15}{i}\cdot (1/2)^i\cdot(1/2)^{15-i}\approx0.059$
- Thus, we can declare a student program non-random with cofidence 94,1%



... if ...

- ... the outcome of a game between two random players is 50-50
- We conducted simulations letting two random programs play 1000 games

Board size	Winning probability	Simulated winning probability
2×3	0	0
2×4	0.7637	0.78
3×3	0.8629	0.857
2×5	0.6039	0.586
2×6	0.3544	0.381
3×4	0.3385	0,319
4×4	0.5133	0.493
6×6		0.524
6×8		0.508
8×8		0.478



Results

- 29 students out of 34 were able to submit programs that significantly outperformed random player
- 2 students submitted programs that won 4 games out of 15, i.e. performed significantly *worse* than the random player!
- The winner of the playoff was Oleg Koshik, whose program lost only one game during the whole tournament

Estonian Computer Go Championships in 2005

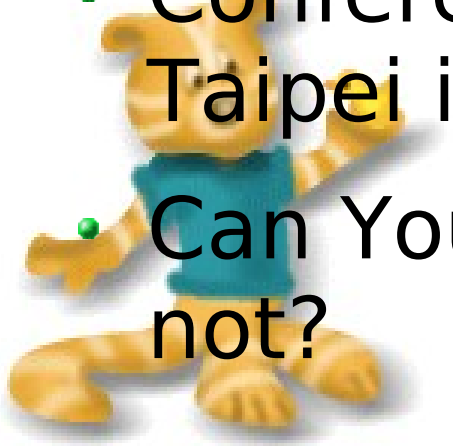
- Held as a part of Game Theory course in spring 2005
- 9x9 Go, Chinese rules
- Random Go programs are far too weak to compare with
- Thus, in order to get the credit, student programs had to lose against GNUGo by less than 81 points (basically, they had to know how to live)

Results

- 7 programs were submitted by teams of 1-3 students
- 5 of them complied with the spec
- 4 of them tried to do better than just living
- In the final tournament, the program by Martin Umda & Toomas Römer won
  - Being the only program that was *not* changed the night before the tournament

Computer Olympics

- Annually, International Computer Games Associacion (ICGA) holds three events:
  - A CG/ACG conference
  - World Computer Chess Championship
  - Computer Olympics
- Conference and the olympics were held in Taipei in September this year
- Can You guess the reason why WCCC was not?



Western games room

Chinese Chess room

Clobber at the Olympics

- This year, Clobber was first included into the Olympiad program
- There were two participants
  - ClobberA by Alexandre Grebennik (sup JW)
  - MILA by Mark Winands

Gold medal – MILA

Silver medal – ClobberA

Lessons learned

- It does pay off to use transposition tables, history heuristic, temporal difference learning, iterative deepening, thinking on the opponent's time and opening books
  - Which MILA had thanks to Mark's 4 years developed game engine that won Lines of Acton tournaments several last years
- Monte Carlo methods are reasonable as middle game heuristics, but extremely bad at recognizing endgames

Future work

- Fine-tuning Monte Carlo analysis so that its estimates would converge to minimax values
- Building a large endgame database and using combinatorial analysis to solve the game earlier than the opponent
- Produce ClobberB for the next year's Olympics in May 2006, Torino, Italy