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## SPOTLIGHTS ON AMAZONS AND HANGMAN

The broadening of the *Journal´*s scope from Chess to Games has led to much more interest, substantial attention from large research institutes, and many ways to pleasure and entertain our readers. This issue is no exception. The interest for games comes from readers and authors alike. The increased attention can be seen from our successful annual meetings all over the world. At these occasions, the enjoyment of the participants of the Computer Olympiad, the World Computer-Chess Championship, and the Conferences is a stimulus to continue our policy: develop new games, recruit new talent, and aim at perfection.

At this moment the number of different games being played is still growing. If we look at the variety of possibilities within a game then we may see that a small deviation in the rules can lead to a completely new game with rich strategies, possibly requiring new, innovative computer approaches. It is fascinating to observe how the range of search techniques and knowledge representations is distributed over all games and game versions. Enhancements of a technique in one game may be adopted and adapted in another game with completely different characteristics. Yet, within our game world we know that respectable classic games, such as Chess, Go, and Shogi, have lost nothing in their attractiveness for player, spectator, and organiser.

The increasing power of current computers together with their expanding storage capacities are a great help for our techniques, bringing some games into the realm of computer perfection. In this issue we see a fine instance of such a development for the game of Hangman. First, it is shown how such a game can be played perfectly by using a brute-force strategy. Then some optimisations are proposed and two simple algorithms with almost perfect behaviour are introduced. Clearly, new light is shed on an old yet challenging game. A compliment to Charles Reams (University of Cambridge) is due for his contribution, published as a note on pp. 149-153. Paraphrasing A.E. Housman (1859 – 1936), we may state

> Perfect play to hangman's noose,
> the computer clocks will ring.
> A Game once made for other use
> is now solved and is a dead thing.

For longer games, or games with a higher complexity, an adequate heuristic is: partition the game into subgames and then solve the subgames one by one. Most games do not have a structure that allows a direct implementation of this heuristic advice. For Chess, the advice can be seen as "solve elementary endgames, solve

complex endgames, solve configurations with 8, 9, 10, and so on pieces, up to 32." For Amazons, the requested partitioning is inherently imposed by the nature of the game.

Owing to the Amazons' rules some squares are blocked during the game, leading to isolated areas in which one, two, or more Amazons can be locked. Such areas constitute a subgame of the Amazons game. So, in the endgame we may have various subgames. There, we face the questions (1) what is the best move in a subgame? and (2) what is the best subgame to start with? A clear decision criterion is whether the subgame is a one-Amazon subgame or a two-Amazon subgame (with Amazons of different colour). More than two Amazons of different colour complicate matters somewhat, but do not affect the basics of the subdivision. Here, the theory developed by Berlekamp, Conway, and Guy (1982) on the temperature T of a subgame is applicable. In this issue Kloetzer, Iida, and Bouzy (pp. 140-148) report on the results achieved by different search techniques. The Editorial Board is pleased that the authors put the spotlights on this game and the approaches mentioned, but simultaneously they believe that "the article is a teaser for other researchers to improve upon the results given" (according to one of the referees).

We open this *Journal* issue with our spotlights on the Light-up puzzle. It is a combination of constraint propagation, Sudoku, and integer linear programming. There are many variations and many algorithms to try. The article addresses a new topic. So, it was a pleasure to see how authors and referees cooperated to achieve the best presentation. The article is recommended, its challenges are clear, and the contents seriously invite researchers to elaborate upon in various directions.

Some authors are first thrilled by the publication of new ideas and then attempt to combine the new ideas with the old theory. A laudable experiment in this respect is described by a team from Portland, Oregon. They introduce the statistical notion *covariance* as a UCT localization tool in Monte-Carlo Tree Search. Although it is not certain that the results are clear improvements, the ideas are worthy of being investigated more deeply.

All in all, modern scientific investigations are using multifarious compositions of techniques. The results continuously improve. The next conference at JAIST will see the progress of our researchers.

**Reference**

Berlekamp, E., Conway, J. and Guy, R. (1982). *Winning Ways for Your Mathematical Plays*. Academic Press, London, UK. Second edition (2004): A.K. Peters.

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