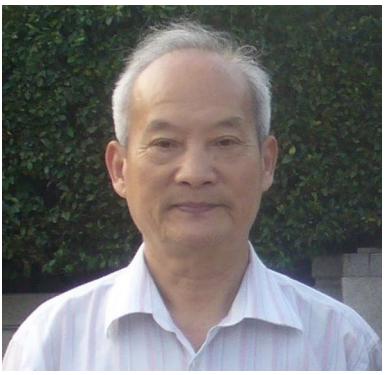
J Comb Optim (2016) 32:331–340
DOI 10.1007/s10878-016-0040-x

GUEST EDITORIAL

Introduction: Special issue dedicated to the memory of professor Wenqi Huang

Weidong Chen[1] · **Zhixiang Chen**[2]

Published online: 11 June 2016



Professor Wenqi Huang was a noted educator and computer scientist in China. He is best known for his quasi-physical and quasi-human approaches to solving a large set of optimization problems. His publications extend across a variety of topics, including recursive analysis, factorization of multivariate polynomials, approximation algorithms for NP-hard problems, and bioinformatics. Huang was born on December

✉ Weidong Chen
chenwd@scnu.edu.cn

Zhixiang Chen
zhixiang.chen@utrgv.edu

1 School of Computer Science, South China Normal University, Guangzhou 510631, Guangdong, China

2 Department of Computer Science, University of Texas - Rio Grande Valley, Edinburg, TX 78539-2999, USA

5, 1938, and passed away on April 24, 2013, at age 75. He is survived by his wife Wenfei Li, his son Jiachun Huang and daughter Jiayuan Huang.

Huang began his academic career in 1964 as a researcher in the Northwest Branch of the Chinese Academy of Sciences, after graduating from Peking University with a Bachelor of Science degree from the Department of Mathematics and Mechanics. In the early years of his research, he had the honor of being mentored by renowned scholars, including theoretical physicist Peiyuan Zhou, mathematician Minde Cheng, and computer scientist Wenjun Wu. In 1973, he joined the faculty of Huazhong University of Science and Technology (HUST), where he was a professor of computer science from 1986 till his death. From 1981 to 1982, he was a visiting scholar in the Department of Mathematics at Cornell University, where he researched on advanced recursive theory under the supervision of Professor Anil Nerode and collaborated with Nerode and Professor Yixing Bao. In 1982 and 1992, he was invited to work with Professor Hao Wang in the Laboratory of Mathematical Logic at the Rockefeller University. Huang served on the Standing Committee of Theoretical Computer Science in China and founded the Institute of Theoretical Computer Science at HUST in 1996. He headed the institute from that time until his retirement in 2012. Today, his research group still contributes significantly to the theoretical studies of computer science in China.

Huang's contributions are well represented by his innovative work on three topics: Quasi-physical and quasi-human algorithms for solving challenging optimization problems; the study of the complexity of resolution; and modern recursive analysis. His seminal work on the first topic was published in 1979, in which he designed the first quasi-physical method for solving the packing problem, opening the door to a class of quasi-physical, and later quasi-human, methods to solve a variety of NP-hard problems. In Huang's quasi-physical emulation of the packing problem, the objects and the boundary of the container are viewed as elastic bodies. Packing a set of objects into the container will result in an elastic potential energy among the objects and the container boundary. A solution to the packing problem would be some arrangement of the objects so that the elastic potential energy thereof is zero. A heuristic to obtain such a solution is to find the zero energy equilibrium positions of the objects within the container. Those positions correspond to the global optimization solution to the emulated elastic dynamic system and hence can be obtained through straightforward numerical calculation. In 1990s, Huang proposed quasi-human methods, drawing upon human's cognitive and behavioral experience in doing the similar jobs to the problems under consideration. Following the philosophy and techniques of these methods, Huang and his students have designed rather effective algorithms for five typical classes of NP-hard problems, i.e., packing problems, scheduling problems, covering problems, SAT, and protein folding prediction problems. Their algorithms were shown empirically to be almost the best algorithms compared with existing algorithms at that time. Huang's contribution to the second topic is evident from the paper he published with his student in the SIAM Journal on Computing in 1987. By that time, a problem asked by Tseitin and mentioned by Galil had remained unsolved for over 20 years: Is one of the shortest paths (from the root to empty) in a resolution tree necessarily a regular one? Huang and his student gave a negative answer to this problem in terms of the consensus method. They proved that there is a DNF such that every shortest consensus path is necessarily

non-regular. Huang's contribution to the third topic is reflected in the paper he published with Anil Nerode in 1985. In that paper, they designed an approach to obtaining various new results in constructive analysis by using modern pure recursion theory and gave new definitions for computable real numbers, computable real functions, and degrees of uncomputability. Their definitions are more natural and intuitive than those given previously in literature. Furthermore, their definitions are convenient to use and thus profitable for constructive mathematicians.

This special issue includes eleven papers in Professor Wenqi Huang's memory. These articles represent a good selection of areas in which Huang made his contributions, though not all of those areas. The paper "multi-neighborhood based iterated tabu search for routing and wavelength assignment problem" by X. Wu, S. Yan, X. Wan and Z. Lü presents efficient local search based algorithms to solve both the routing and the wavelength assignment problems simultaneously. They obtain competitive results with the best heuristics in the literature. In "multi-neighborhood based path relinking for two-sided assembly line balancing problem", Z. Yang, G. Zhang and H. Zhu devise a new solution that has the best performance for almost all the benchmark instances. The article "quasi-human algorithm for the two dimensional rectangular strip packing problem" by L. Wang and A. Yin includes an interesting quasi-human algorithm with very good computational efficiency. T. Zhou, Z. Lü, Y. Wang, J. Ding and B. Peng obtain, in "multi-start iterated tabu search for the minimum weight vertex cover problem", an innovative heuristic algorithm which is based on the tabu search methodology and incorporates several other novel strategies. The clique partitioning problem studied by Y. Zhou, J. Hao and A. Goëffon in their paper "three-phased local search approach for the clique partitioning problem" is of long standing significance, and their new method is highly innovative. In the article "tabu search for the real-world carpooling problem", D. Zhang, C. Huang, Y. Si and S. Leung investigate a real-world problem where a group of people, some of them are chosen as drivers, share cars from different locations to a common destination. The authors formulate the problem as an integer linear programming problem and then solve the latter with tabu search. In the paper "solving the maximum vertex weight clique problem via binary quadratic programming", Y. Wang, J. Hao, F. Glover, Z. Lü and Q. Wu transform the classical optimization problem into a continuous, nonconvex quadratic optimization problem and then design a tailored tabu search algorithm that is supported by excellent computational results. An improved constructive heuristic is proposed to solve the strip packing problem by D. Zhang, Y. Che, F. Ye, Y. Si and S. Leung in their paper "hybrid algorithm based on variable neighborhood for the strip packing problem". The computational results show that the new algorithm has better performance than the algorithms previously known. The paper "online tradeoff scheduling on a single machine to minimize makespan and maximum lateness" by Q. Liu and J. Yuan improves the previous work on the competitive ratio of a single-machine problem with the objective of minimizing maximum delivery time by adding the makespan as a secondary criterion. In the paper "Euclidean movement minimization", N. Anari, M. Fazli, M. Ghodsi and M. Safari investigate four movement problems on Enclidean plane and prove an inapproximability result on geometrical grounds. Given a set of black and white points, S. Ehsani, M. Fazli, M. Ghodsi and M. Safari want to find a set of convex polygons with maximum total area that cover all white points but none of black points in "optimal

space coverage with white convex polygons." They obtain an polynomial solution if polygons can overlap. When polygons cannot overlap, they prove that the problem becomes NP-hard and then derive two approximation algorithms.

We are indebted to Professor Ding-Zhu Du for supporting this special issue, to the reviewers of these articles and many more submissions, and to Mr. Venkat Ganesan and other staff at Springer Journals Editorial Office for their tireless efforts in seeing this special issue to completion. We are most grateful to each contributor to this special issue for taking the time and caring to honor the memories of a truly good man who, in his forty years of teaching, had produced twenty one Ph.D. students and supervised fifty six postgraduate research students; cared about his students and was most indefatigable in teaching them. Many of his words have been circulated over the Internet and touched numerous readers. He is a good scholar and a good model for us and for the world he lived in. He will be forever remembered.

Publications by Wenqi Huang

Book

[1] Huang W, Xu R (2006) Introduction to the Theory of Modern Computation: Background, Future and Algorithms for NP-hard Problems (in Chinese). Science Press, Beijing, China

Journal Papers

A. Augur methods

[2] Huang W (1974) A method for improving the precision of augur (in Chinese). J. Huazhong Univ. Sci. & Tech., 01: 92–99
[3] Huang W (1981) A series of base functions for global analytical approach to firing table. Applied Mathematics and Mechanics, 2(5): 575–579
[4] Xu R, Huang W, Ye Y (1999) A new method of augur finding the length of curve with non-analytic expression in space (in Chinese). J. Huazhong Univ. Sci. & Tech., 27(1): 25–28

B. Recursive analysis

[5] Nerode A, Huang W (1985) An application of pure recursion theory to recursive analysis (in Chinese). Acta Mathematica Sinica, 28(5): 625–636
[6] Huang W, Chen Z (1988) Structures in the upper semilattice of k-1-degrees. Advances in Mathematics, 02: 212–214
[7] Chen Z, Huang W (1988) On the recursive structure of complexity classes (in Chinese). J. Huazhong Univ. Sci. & Tech., 16(6): 15–20
[8] Huang W, Chen Z (1989) Nondistributive and noncomplemental properties of the semilattice of k-1-degrees of recursive sets (in Chinese). Acta Math. Sin., 32(4): 517–524
[9] Chen Z, Huang W (1989) K-n-degrees (in Chinese). J. Huazhong Univ. Sci. & Tech., 17 (4): 53–57
[10] Huang W, Chen Z (1989) On set splitting in complexity classes (in Chinese). Chin. Ann. Math.(Ser. A), 10(5): 565–570

[11] Huang W, Chen Z (1989) The complete set problem in complexity classes (in Chinese). J. Huazhong Univ. Sci. & Tech., 17(6): 73–75
[12] Chen Z, Huang W (1990) The lattice embeddability of the upper semilattice of k-1-degrees of recursive sets(in Chinese). J. Huazhong Univ. Sci. & Tech., 18(2): 145–152

C. Factorization of polynomials

[13] Yu X, Lai C, Huang W (1995) A theory and algorithm for factoring bivariate polynomials with integral coefficients (in Chinese). Applied Mathematics - A Journal of Chinese Universities, 10 (1): 34–42
[14] Yu X, Lai C, Huang W (1995) A theory and algorithm for factoring multivariate polynomials with integer coefficients (in Chinese). Math. Appl., 8(3): 339–344
[15] Huang W, Chen L, Yu X (1996) A preprocessing algorithm for fast factoring multivariate polynomials with integral coefficients (in Chinese). Math. Appl., 9(3): 364–368

D. Computation theory

[16] Huang W, Yu X (1987) A DNF without regular shortest consensus path. SIAM Journal on Computing, 16(5): 836–840
[17] Huang W, Lai C, Chen Z (1987) The hardness of the grid problem G_i under the routine resolution method. Zeitschr. Math. Logik und Grundlagen Math., 33(1):79–84
[18] Lin H, Lai C, Huang W (1989) A global analysis on the construction of disjunctive normal form (DNF)(in Chinese). Chinese Journal of Computers, (2): 148–152
[19] Chen Z, Lai C, Huang W (1990) An approach to approximately quick solutions of the validity problem of DNFs (in Chinese). Chinese Journal of Computers, 13(10): 779–787
[20] Song E, Huang W (1992) Notes on the boolean circuit computation model (in Chinese). J. Huazhong Univ. Sci. & Tech., 20(5): 129–134
[21] Song E, Huang W (1992) An approximately fast algorithm for deciding the validity of disjunctive normal forms (DNFs) (in Chinese). Chinese Science Bulletin, 37(23): 1947–1949
[22] Song E, Jin R, Huang W (1993) Note on the P=?NP problem relativized (in Chinese). J. Math. Res. Expo., 13(3): 443–450
[23] Song E, Huang W, Lai C (1994) A further analysis on the construction of disjunctive normal form (DNF) (in Chinese). Chinese Journal of Computers, 17(5): 384–387
[24] Song E, Huang W (1994) Investigations on the relativized P and NP problem (in Chinese). J. Huazhong Univ. of Sci & Tech., 22(6):25–30
[25] Jin R, Song E, Huang W (1994) A new lower bound for the network complexity of a boolean function (in Chinese). Chinese Journal of Computers, 17(5): 376–379
[26] Huang W (1995) An ordinary differential equation method for solving the CNF-satisfiability problem (in Chinese). J. Huazhong Univ. Sci. & Tech., 23(3): 1–3

E. Quasi-physical and quasi-human methods
E.1. Packing

[27] Huang W, Zhan S (1979) A quasi-physical method for solving packing problems (in Chinese). Acta Mathematicae Applicatae Sinica, 1979, 2(2):176–180
[28] Zhan S, Huang W (1983) Computer aided design for the problem of geometric distribution (in Chinese). Acta Mathematicae Applicatae Sinica, 1983, 6(1):34–46
[29] Huang W, Li Q, Yu X (1986) A quasi-physical method for solving the three dimensional packing problem (in Chinese). Acta Mathematicae Applicatae Sinica, 9(4): 443–453
[30] Liu J, Huang W, Chen L (1991) A quasi-physical method for solving the scheduling problem of space utilization. Science in China (Series A), 34 (9): 1144–1152
[31] Huang W, Wang G (1992) A basic algorithm for computer-aided design of material arrangement. Journal of Computer Science and Technology, 7(1): 56–61
[32] Huang W, Zhu H, Xu X, Song Y (1993) A heuristic algorithm for solving the square packing problem (in Chinese). Chinese Journal of Computers, 16(11): 829–836
[33] Huang W, Song E, Chen L, Song Y (1995) A fast approximate practical algorithm for solving three-dimensional packing problems (in Chinese). Numerical Mathematics: A Journal of Chinese Universities, 17 (1): 21–30
[34] Huang W, Xu R, Chen W, Zhang J (1998) Physicalification and personification for solving unequal circle packing and CNF-SAT problems (in Chinese), J. Huazhong Univ. of Sci & Tech., 26(9): 5–7
[35] Huang W, Xu R (1999) Two personification strategies for solving circle packing problem. Science in China (Series E), 42(6): 595–602
[36] Huang W (2001) Concrete physics method for solving NP hard problem. Wuhan University Journal of Natural Sciences, 6(1–2): 140–146
[37] Wu Y, Huang W, Lau S, Wong CK, Young G (2002) An effective quasi-human based heuristic for solving the rectangle packing problem. European Journal of Operational Research, 141(2): 341–358
[38] Wang H, Huang W, Zhang Q, Xu D (2002) An improved algorithm for the packing of unequal circles within a larger containing circle. European Journal of Operational Research, 141(2): 440–453
[39] Huang W, Kang Y (2002) A heuristic quasi-physical strategy for solving disks packing problem. Simulation Modelling Practice and Theory, 10(3–4): 195–207
[40] Chen C, He D, Huang W (2003) An approximation algorithm for solving the problem of packing unit equilateral triangles in a square (in Chinese). Chinese Journal of Computers, 26(2): 212–220
[41] Huang W, Yan K (2004) A short note on a simple search heuristic for the disk packing problem. Annals Operations Research, 131(1–4): 101–108
[42] Huang W, Chen M (2006) Note on an improved algorithm for the packing of unequal circles within a larger containing circle. Computers & Industrial Engineering, 50 (3): 338–344
[43] Huang W, Liu J (2006) A deterministic heuristic algorithm based on Euclidian distance for solving the rectangles packing problem (in Chinese). Chinese Journal of Computers, 29(5): 734–739
[44] Huang W, Chen D, Xu R (2006) A new heuristic algorithm for rectangle packing. Computers and Operations Research, 34(11): 3270–3280

[45] Chen D, Huang W (2006) A novel quasi-human heuristic algorithm for two-dimensional rectangle packing problem. International Journal of Computer Science and Network Security, 6(12): 115–120
[46] Chen M, Huang W (2007) A two-level search algorithm for 2D rectangular packing problem. Computers & Industrial Engineering, 53(1): 123–136
[47] Huang W, He K (2007) A new heuristic algorithm for cuboids packing with no orientation constraints. Computers and Operations Research, 36(2): 425–432
[48] Chen D, Huang W (2007) A new heuristic algorithm for constrained rectangle packing problem. Asia-Pacific Journal of Operational Research, 24 (4): 463–478
[49] Huang W, Chen D (2007) An efficient heuristic algorithm for rectangle packing problem. Simulation Modelling Practice and Theory, 15(10): 1356–1365
[50] Huang W, Zhao L (2007) A quasi-human algorithm for solving cuboid packing problem (in Chinese). J. Huazhong Univ. Sci. & Tech., 35(11): 34–36
[51] Huang W, Chen D, Xu R (2007) A new heuristic algorithm for rectangle packing. Computers & Operations Research, 34(11): 3270–3280
[52] Lü Z, Huang W (2008) PERM for solving circle packing problem, Computers & Operations Research, 35(5): 1742–1755
[53] Liu J, Huang W (2008) A fast local search algorithm for solving circle packing problem with constraints of equilibrium (in Chinese). Journal of Image and Graphics, 13(5): 991–997
[54] Huang W, Ye T (2008) Quasi-physical algorithm for the equal circles packing problem (in Chinese). J. Syst. Sci. Math. Sci., 28(8): 993–1001
[55] Huang W, He K (2009) A pure quasi-human algorithm for solving the cuboid packing problem. Science in China, Series F: Information Sciences, 52(1): 52–58
[56] Huang W, He K (2009) A new heuristic algorithm for cuboids packing with no orientation constraints. Computers & Operations Research, 36(2): 425–432
[57] Huang W, He K (2009) A caving degree approach for the single container loading problem. European Journal of Operational Research, 196(1): 93–101
[58] Li W, Huang W, Jiang D, Liu X (2010) A heuristic algorithm for cube packing with time schedule. SCIENCE CHINA Information Sciences, 53(1): 18–29
[59] He K, Huang W (2010) A caving degree based flake arrangement approach for the container loading problem. Computers & Industrial Engineering, 59(2): 344–351
[60] He K, Huang W (2010) Solving the single-container loading problem by a fast heuristic method. Optimization Methods and Software, 25(2): 263–277
[61] Huang W, Ye T (2010) Greedy vacancy search algorithm for packing equal circles in a square. Operations Research Letters, 38 (5): 378–382
[62] Huang W, He K (2010) Optimal time scheduling of three-dimensional space packing (in Chinese). J. HuaZhong Univ. Sci. & Tech., 38(12): 102–104
[63] He K, Huang W (2010) A quasi-human algorithm for solving the three-dimensional rectangular packing problem. SCIENCE CHINA Information Sciences, 53(12): 2389–2398
[64] He K, Huang W (2011) An efficient placement heuristic for three-dimensional rectangular packing. Computers & Operations Research, 38(1): 227–233
[65] Huang W, Ye T (2011) Global optimization method for finding dense packings of equal circles in a circle. European Journal of Operational Research, 210(3): 474–481

[66] Huang W, Ye T (2011) Quasi-physical global optimization method for solving the equal circle packing problem. SCIENCE CHINA Information Sciences, 54(7): 1333–1339
[67] He K, Huang W, Jin Y (2012) An efficient deterministic heuristic for two-dimensional rectangular packing. Computers & Operations Research, 39(7): 1355–1363
[68] Yu L, Huang W (2012) Two strategies for solving the equal sphere packing problem (in Chinese). Journal of Software, 23(9): 2285–2296
[69] Huang W, Ye T, Chen D (2012) Corner occupying theorem for the two-dimensional integral rectangle packing problem. SCIENCE CHINA Information Sciences, 55(11): 2466–2472
[70] Fu Z, Huang W, Lü Z (2013) Iterated tabu search for the circular open dimension problem. European Journal of Operational Research, 225(2): 236–243
[71] He K, Mo D, Ye T, Huang W (2013) A coarse-to-fine quasi-physical optimization method for solving the circle packing problem with equilibrium constraints. Computers & Industrial Engineering, 66(4): 1049–1060
[72] He K, Jin Y, Huang W (2013) Heuristics for two-dimensional strip packing problem with 90°rotations. Expert Systems with Applications, 40(14): 5542–5550
[73] Huang W, He K (2013) On the weak computability of a four dimensional orthogonal packing and time scheduling problem. Theoretical Computer Science, 501: 1–10
[74] Huang W, Fu Z, Xu R (2013) Tabu search algorithm combined with global perturbation for packing arbitrary sized circles into a circular container. SCIENCE CHINA Information Sciences, 56(9): 1–14

E.2. Covering

[75] Huang W (1989) A quasi-physical method for solving the covering problem: an approach to tackling NP-hard problems (in Chinese). Chinese Journal of Computers, 12(8): 610–616
[76] Huang W, Wang G (1994) A quasi-mechanical method for solving the rectangle covering problem: an approach to tackling NP hard problems. CVGIP: Graphical Model and Image Processing, 56(3): 267–271
[77] Feng Y, Huang W, Zhou X (1996) A quasi-physical algorithm for solving the problem of a radar group monitoring an object group. Science in China (Series E), 39(2): 126–135

E.3. SAT

[78] Li W, Huang W (1995) A mathematic-physical approach to the satisfiability problem. Science in China (Series A), 38 (1): 116–128
[79] Huang W, Li W (1998) A hopeful CNF-SAT algorithm - its high efficiency, industrial application and limitation. J. Comput. Sci. Tech., 13(1): 9–12
[80] Huang W, Jin R (1999) Quasiphysical and quasisociological algorithm Solar for solving SAT Problem. Science in China (Series E), 42(5):485–493
[81] Jin R, Huang W (2000) Parallel computing: an effective method for improving the efficiency of solving SAT problems (in Chinese). Journal of Software, 11(3): 398–400

[82] Zhang D, Huang W, Wang H (2002) Personification annealing algorithm for solving the SAT problem (in Chinese). Chinese Journal of Computers, 25(2):148–152

[83] Huang W, Zhang D, Wang H (2002) An algorithm based on tabu search for satisfiability problem. J. Comput. Sci. Tech., 17(3): 340–346

E.4. Scheduling

[84] Huang W, Zeng L (2004) Local search algorithm with hybrid neighborhood and its application to the job shop scheduling problem. J. Southwest Jiaotong Univ., 12 (2): 95–100

[85] Huang W, Yin A (2004) An improved shifting bottleneck procedure for the job shop scheduling problem. Computers & Operations Research, 31(12): 2093–2110

[86] Wang L, Huang W (2005) A new local search algorithm for job shop scheduling problem (in Chinese). Chinese Journal of Computers, 28(5): 809–816

[87] Huang W, Huang Z, Wang L (2006) An tentative taboo search algorithm for job shop scheduling. Wuhan Univ. J. Nat. Sci., 11(3): 547–550

E.5. Protein

[88] Huang W, Huang Q, Shi H (2004) An quasi-physical algorithm for 3D protein structure prediction (in Chinese). J. Wuhan Univ., 5: 586–590

[89] Huang W, Lü Z (2004) Personification algorithm for protein folding problem: improvements in PERM. Chinese Science Bulletin, 49 (19): 2092–2096

[90] Huang W, Huang Q, Shi H (2004) A 2D-Euclidean model and its related quasi-physical algorithm for protein structure prediction (in Chinese). Journal of Computer Research and Development, 41(11): 1959–1965

[91] Huang W, Lü Z, Shi H (2005) Growth algorithm for finding low energy configurations of simple lattice proteins. Physical Review E, 72: 016704

[92] Chen M, Huang W (2006) Heuristic algorithm for off-lattice protein folding problem. Journal of Zhejiang University Science, 1:7–12

[93] Lü Z, Huang W (2006) Algorithm for model study of off-lattice protein folding. Biophysical Reviews and Letters, 1(2): 107–117

[94] Liu J, Huang W (2006) Studies of finding low energy configurations in off-lattice protein models. Journal of Theoretical and Computational Chemistry, 5(3): 587–594

[95] Liu J, Huang W (2007) Quasi-physical algorithm of an off-lattice model for protein folding problem. Journal of Computer Science and Technology, 4: 569–574

[96] Chen M, Huang W, Lü Z (2007) An improved PERM method for protein folding problem of HP model (in Chinese). Journal of Computer Research and Development, 44(9): 1456–1461

[97] Huang W, Lai X , Xu R (2011) Structural optimization of silver clusters from Ag_{141} to Ag_{310} using a modified dynamic lattice searching method with constructed core. Chemical Physics Letters, 507 (1–3):199–202

[98] Ye T, Xu R, Huang W (2011) Global optimization of binary Lennard-Jones clusters using three perturbation operators. Journal of Chemical Information and Modeling, 51(3): 572–577

[99] Lai X, Xu R, Huang W (2011) Prediction of the lowest energy configuration for Lennard-Jones clusters. Science China Chemistry, 54 (6): 985–991
[100] Lai X, Xu R, Huang W (2011) Geometry optimization of bimetallic clusters using an efficient heuristic method. Journal of Chemical Physics, 135(16): 164109
[101] Lai X, Huang W, Xu R (2011) Geometry optimization of atomic clusters using a heuristic method with dynamic lattice searching. Journal of Physical Chemistry A, 115(20): 5021–5026
[102] Xu R, Ni H, Huang W (2012) Heuristic algorithm for predicting ground state structure of Au_{13-75} clusters (in Chinese). Scientia Sinica Physica, Mechanica & Astronomica, 42:134–140

E.6. Others

[103] Li H, Huang W (1984) An intuitive approach to Lagrange equation for constrained system (in Chinese). J. Huazhong Univ. Sci. & Tech., 12(2):19–22
[104] Chen L, Song E, Huang W (1994) A fast algorithm for evaluating the distance between two convex polygons (in Chinese). Chinese Journal of Computers, S1: 116–121
[105] Huang W, Song E, Chen L, Wang Q (1995) An invincible algorithm for chess playing (in Chinese). J. Huazhong Univ. of Sci & Tech., 23(5):1–4.
[106] Song E, Huang W (1995) A fast algorithm for solving optimal combination solutions of paired linear programming problems (in Chinese). Journal of Computer Research and Development, 32(10): 6–12
[107] Song E, Huang W (1996) An intersecting-side algorithm to determine whether convex regions bounded by multiple constrains are empty (in Chinese). Chinese Journal of Computers, 19(9): 704–708
[108] Huang W, Zhao X (2002) Qusi-physical and quasi-sociological algorithms for solving the problems of orthogonal arrays (in Chinese). Journal of Computer Research and Development, 39(2):205–212
[109] Huang W, Wang L (2005) Novel local search method for the traveling salesman problem. J. Southwest Jiaotong Univ., 13(1): 1–4
[110] Lü Z, Huang W (2009) Iterated tabu search for identifying community structure in complex networks. Physical Review E, 80:026130
[111] Huang W, Xiong Z (2009) Composite string matching algorithm based on Boyer-Moore method (in Chinese). J. Huazhong Univ. Sci. & Tech., 37(12): 48–51