Bezdek, Károly; Szalkai, Balázs; Szalkai, István
On contact numbers of totally separable unit sphere packings. (English) Zbl 1348.52013
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A packing of unit balls in $d$-dimensional Euclidean space $E^d$ is called totally separable if any two unit balls can be separated by a hyperplane which is disjoint from the interior of each unit ball in the packing. The authors provide several bounds for the contact numbers of finite unit ball packings that are totally separable. They also deal with the case when centers of the balls in the packing are lattice points of the integer lattice $Z^d$ in $E^d$.

Reviewer: A. E. Litvak (Edmonton)

MSC:
52C17 Packing and covering in $n$ dimensions (aspects of discrete geometry)  
52C15 Packing and covering in 2 dimensions (aspects of discrete geometry)  
11H31 Lattice packing and covering (number-theoretic aspects)  
05B40 Combinatorial aspects of packing and covering

Keywords:
unit sphere packing; touching pairs; density; truncated Voronoi cell; isoperimetric inequality; spherical cap packing

Software:
Flyspeck

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References:
[1] Alonso, L.; Cerf, R., The three-dimensional polyominoes of minimal area, Electron. J. Combin., 3, 1, (1996), Research Paper 27, approx. 39 pp · Zbl 0885.05056
[2] Arkus, N.; Manoharan, V. N.; Brenner, M. P., Deriving finite sphere packings, SIAM J. Discrete Math., 25, 4, 1860-1901, (2011) · Zbl 1268.52014
[3] Ball, K., An elementary introduction to modern convex geometry, (Levy, S., Flavors of Geometry, Math. Sci. Res. Inst. Publ., vol. 31, (1997), Cambridge Univ. Press Cambridge), 1-58 · Zbl 0901.52002
[4] Betke, U.; Henk, M.; Wills, J. M., Finite and infinite packings, J. Reine Angew. Math., 453, 165-191, (1994) · Zbl 0797.52010
[5] Bezdek, A., Locally separable circle packings, Studia Sci. Math. Hungar., 18, 2-4, 371-375, (1983) · Zbl 0588.52014
[6] Bezdek, K., On the maximum number of touching pairs in a finite packing of translates of a convex body, J. Combin. Theory Ser. A, 98, 1, 192-200, (2002) · Zbl 1010.52014
[7] Bezdek, K., Contact numbers for congruent sphere packings in Euclidean 3-space, Discrete Comput. Geom., 48, 2, 298-309, (2012) · Zbl 1259.52013
[8] Bezdek, K., Lectures on sphere arrangements—the discrete geometric side, (2013), Springer New York · Zbl 1281.52001
[9] Bezdek, K.; Reid, S., Contact graphs of unit sphere packings revisited, J. Geom., 104, 1, 57-83, (2013) · Zbl 1273.52022
[10] Böröczky, K., Packing of spheres in spaces of constant curvature, Acta Math. Acad. Sci. Hungar., 32, 243-261, (1978) · Zbl 0422.52011
[11] Davenport, H.; Hajos, G., Problem 35, Mat. Lapok, 2, 68, (1951)
[12] Fejes Tóth, L., Regular figures, (1964), Pergamon Press—The Macmillan Co New York · Zbl 0134.15705
[13] Fejes Tóth, G.; Fejes Tóth, L., On totally separable domains, Acta Math. Acad. Sci. Hungar., 24, 229-232, (1973) · Zbl 0259.52008
[14] Hales, T. C., Dense sphere packing - a blueprint for formal proofs, (2012), Cambridge University Press Cambridge · Zbl 1263.52001
[15] Harary, F.; Harborth, H., Extremal animals, J. Comb. Inf. Syst. Sci., 1, 1, 1-8, (1976) · Zbl 0402.05055
[16] Harborth, H., Lösung zu problem 664A, Elem. Math., 29, 14-15, (1974)
[17] Hlineny, P.; Kratochvil, J., Representing graphs by disks and balls, Discrete Math., 229/1-3, 101-124, (2001) - Zbl 0969.68118
[18] Hoy, R. S.; Harwayne-Gidansky, J.; O'Hern, C. S., Structure of finite sphere packings via exact enumeration: implications for colloidal crystal nucleation, Phys. Rev. E, 85, (2012)
[19] Kertész, G., On totally separable packings of equal balls, Acta Math. Hungar., 51, 3-4, 363-364, (1988) - Zbl 0653.52011
[20] Kuperberg, W., Optimal arrangements in packing congruent balls in a spherical container, Discrete Comput. Geom., 37, 2, 205-212, (2007) - Zbl 1116.52008
[21] Molnár, J., Kreislagerungen auf flächen konstanter krümmung, Math. Ann., 158, 365-376, (1965) - Zbl 0148.16202
[22] Osserman, R., The isoperimetric inequality, Bull. Amer. Math. Soc., 84, 6, 1182-1238, (1978) - Zbl 0411.52006
[23] Rankin, R. A., The closest packing of spherical caps in $n$-dimensions, Proc. Glasgow Math. Assoc., 2, 139-144, (1955) - Zbl 0065.15601
[24] Rogers, C. A., Packing and covering, (1964), Cambridge University Press Cambridge - Zbl 0176.51401

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