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*A dyadic view of rational convex sets*

Comment.Math.Univ.Carolin. 55,2 (2014) 159 –173.

**Abstract:** Let $F$ be a subfield of the field $\mathbb{R}$ of real numbers. Equipped with the binary arithmetic mean operation, each convex subset $C$ of $F^n$ becomes a commutative binary mode, also called idempotent commutative medial (or entropic) groupoid. Let $C$ and $C'$ be convex subsets of $F^n$. Assume that they are of the same dimension and at least one of them is bounded, or $F$ is the field of all rational numbers. We prove that the corresponding idempotent commutative medial groupoids are isomorphic iff the affine space $F^n$ over $F$ has an automorphism that maps $C$ onto $C'$. We also prove a more general statement for the case when $C, C' \subseteq F^n$ are barycentric algebras over a unital subring of $F$ that is distinct from the ring of integers. A related result, for a subring of $\mathbb{R}$ instead of a subfield $F$, is given in Czédli G., Romanowska A.B., *Generalized convexity and closure conditions*, Internat. J. Algebra Comput. **23** (2013), no. 8, 1805–1835.

**Keywords:** convex set; mode; barycentric algebra; commutative medial groupoid; entropic groupoid; entropic algebra; dyadic number
**AMS Subject Classification:** Primary 08A99; Secondary 52A01

## References

[1] Burris S., Sankappanavar H.P., *A Course in Universal Algebra*, Graduate Texts in Mathematics, 78, Springer, New York–Berlin, 1981; The Millennium Edition, http://www.math.uwaterloo.ca/∼snburris/htdocs/ualg.html.
[2] Cox D.A., *Why Eisenstein proved the Eisenstein criterion and why Schönemann discovered it first*, Amer. Math. Monthly **118** (2011), no. 1, 3–21.
[3] Czédli G., Romanowska A.B., *An algebraic closure for barycentric algebras and convex sets*, Algebra Universalis **68** (2012), 111–143.
[4] Czédli G., Romanowska A.B., *Generalized convexity and closure conditions*, Internat. J. Algebra Comput. **23** (2013), no. 8, 1805–1835.
[5] Fulton W., *Algebraic Curves. An Introduction to Algebraic Geometry*, 2008; `http://www.math.lsa.umich.edu/~wfulton/CurveBook.pdf`
[6] Ježek J., Kepka T., *Medial Groupoids*, Academia, Praha, 1983.
[7] Matczak K., Romanowska A., *Quasivarieties of cancellative commutative binary modes*, Studia Logica **78** (2004), 321–335.
[8] Matczak K., Romanowska A.B., Smith J.D.H., *Dyadic polygons*, Internat. J. Algebra Comput. **21** (2011), 387–408; DOI:10.1142/80218196711006248
[9] Pszczoła K., Romanowska A., Smith J.D.H., *Duality for some free modes*, Discuss. Math. Gen. Algebra Appl. **23** (2003), 45–62.
[10] Romanowska A.B., Smith J.D.H., *Modal Theory*, Heldermann, Berlin, 1985.
[11] Romanowska A.B., Smith J.D.H., *On the structure of semilattice sums*, Czechoslovak Math. J. **41** (1991), 24–43.
[12] Romanowska A.B., Smith J.D.H., *Modes*, World Scientific, Singapore, 2002.