



On projective monomial curves associated to generalized arithmetic sequences

Eva García-Llorente¹, Isabel Bermejo¹, Ignacio García-Marco²

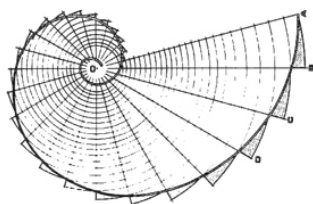
Let K be an infinite field and let $m_1 < \dots < m_n$ be a generalized arithmetic sequence of positive integers, i.e., there exist $h, d, m_1 \in \mathbb{Z}^+$ such that $m_i = hm_1 + (i-1)d$ for all $i \in \{2, \dots, n\}$. Assume that $n \geq 3$ and $\gcd(m_1, d) = 1$. We consider the projective monomial curve $\mathcal{C} \subset \mathbb{P}_K^n$ parametrically defined by

$$x_1 = s^{m_1} t^{m_n - m_1}, \dots, x_{n-1} = s^{m_{n-1}} t^{m_n - m_{n-1}}, x_n = s^{m_n}, x_{n+1} = t^{m_n}.$$

In this work, we characterize both the Cohen-Macaulay and Koszul properties of the homogenous coordinate ring $K[\mathcal{C}]$ of \mathcal{C} using computational techniques. Moreover, we obtain a formula for its Castelnuovo-Mumford regularity and also for the Hilbert series of $K[\mathcal{C}]$ in terms of the sequence, proving that the Castelnuovo-Mumford regularity of $K[\mathcal{C}]$ is attained at the last step of its minimal graded free resolution.

Referencias

- [1] D. Bayer, D. Mumford: What can be computed in algebraic geometry?, En *Computational Algebraic Geometry and Commutative Algebra*, Cortona (1991), 1–48, Cambridge Univ. Press, Cambridge, 1993.
- [2] I. Bermejo, I. García-Marco: Complete intersections in simplicial toric varieties, *J. Symbolic Comput.* **68**(part 1) (2015), 265–286.
- [3] I. Bermejo, I. García-Marco: Complete intersections in certain affine and projective monomial curves, *Bull. Braz. Math. Soc. (N.S)* **45** (4) (2014), 599–624.
- [4] I. Bermejo, P. Gimenez: On Castelnuovo-Mumford regularity of projective curves, *Proc. Amer. Math. Soc.* **128** (5) (2000), 1293–1299.
- [5] I. Bermejo, P. Gimenez: Computing the Castelnuovo-Mumford regularity of some subschemes of \mathbb{P}_K^n using quotients of monomial ideals, *J. Pure Appl. Algebra* **164** (2001), 23–33.
- [6] I. Bermejo, P. Gimenez: Saturation and Castelnuovo-Mumford regularity, *J. Algebra* **303** (2006), 592–617.
- [7] M.P. Cavaliere, G. Niesi: On monomial curves and Cohen-Macaulay type, *Manuscripta Math.* **42** (1983), 147–159.
- [8] A. Conca, E. De Negri, M.E. Rossi: Koszul algebras and regularity, *Commutative algebra*, 285–315, Springer, New York, 2013.
- [9] D. Eisenbud, S. Goto: Linear free resolutions and minimal multiplicities, *J. Algebra* **88** (1984), 84–133.
- [10] P. Li, D.E. Patil, L.G. Roberts: Bases and ideal generators for projective monomial curve, *Comm. Algebra* **40** (1) (2012), 173–191.
- [11] S. Molinelli, G. Tamone: On the Hilbert function of certain rings of monomial curves, *J. Pure Appl. Algebra* **101** (2) (1995), 191–206.
- [12] B. Sturmfels: *Gröbner bases and convex polytopes*. Amer. Math. Soc., Providence, 1996.
- [13] R.H. Villarreal: *Monomial Algebras*, Second Edition. Chapman and Hall/CRC, 2015.



CONGRESO DE JÓVENES INVESTIGADORES

Real Sociedad Matemática Española

Universidad de Murcia, del 7 al 11 de Septiembre de 2015

¹Facultad de Ciencias. Sección de Matemáticas
Universidad de La Laguna
Astrofísico Francisco Sánchez s/n, 38071, Spain
evgarcia@ull.es, ibermejo@ull.es, iggarcia@ull.es

²Laboratoire de L'Informatique et du Parallelisme, ENS Lyon
46, allée d'Italie, 69364 Lyon Cedex 07, France
ignacio.garcia-marco@ens-lyon.fr